

A background image showing a snowy, rocky landscape. In the distance, a person is visible walking through the snow. The overall scene is bright and wintry.

**Arctic IoNS 2019 Alaska Native & Rural
Arctic “Insights” Community Workshop
University of Fairbanks NW Campus
Nome, Alaska
18-19 April 2019**

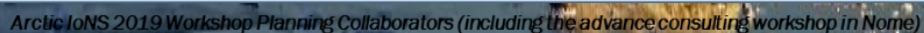


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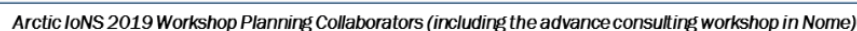
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The 2019 Arctic Incidents of National Significance Workshop (IoNS) is the third workshop in an annual series of events designed and conducted by the Arctic Domain Awareness Center (ADAC)¹ to discover key drivers in the emerging Arctic environment that impact the ability of the US Coast Guard and other stakeholders to conduct safe, secure, and effective operations. This body of knowledge is then used to prioritize gaps and articulate key research questions that can direct future science and technology investments by the Department of Homeland Security's Science and Technology Directorate toward addressing high-priority gaps. The workshops bring together stakeholders from U.S. federal, state, and local government agencies, Alaska Natives and Alaska Native regional corporations, international partners, other Alaska community members, and private sectors into a collaborative event with the science and engineering communities to ensure the quality and relevance of the research questions.

The 2019 Arctic IoNS was conducted in two parts (the first is the subject of this report and the second is documented in a subsequent report):

- ADAC partnered with Sandia National Laboratories to plan and execute the Nome “Insights” Workshop, 18 – 19 April 2019 at University of Alaska Fairbanks Northwest Campus in Nome, Alaska. ADAC and Sandia acknowledge and appreciate the extensive support of the following organizations:

 ARCTIC DOMAIN
AWARENESS CENTER

The objective of the “Insights” workshop was to gather Alaska Native and rural Alaskan perspectives in order to:

1. Understand gaps in capabilities needed to support effective crisis response during and after a scenario in which multiple significant challenges are present.
2. inform the subsequent Anchorage Arctic IoNS 2019 workshop

The workshop scenario was used to elicit insight and perspective from Alaska Natives and other rural Alaskans on the immediate crisis response efforts which would be undertaken by volunteer first responders from rural Alaska Native villages and to understand likely shortfalls in crisis response. This information was intended to inform emergency response planners on flaws or inconsistencies in their assumptions, to describe the key concerns or gaps that remote populations would experience during these types of incidents, and to discuss how their communities might act as force multipliers during an ongoing crisis. Insights were also sought regarding post-crisis effects on Alaskans over both short- and longer-term time scales that might be exacerbated by remoteness, impact on subsistence ways of life, and other unique circumstances in this Arctic region.

Executive Summary

The storytelling element of the Insights workshop uncovered several overarching general concerns/observations and 4 gap themes:

1. General Observations
2. Communication Technologies and Related Issues
3. Ice Effects and Extreme Weather Conditions
4. Near-Coast Infrastructure Resilience
5. Preparedness and Integrated Emergency Incident Response Effectiveness
 - a. Tools, Technology, and Training
 - b. Planning and Policy

General Observations

Alaska Native and rural communities are concerned about an array of emergencies, with most residents placing a higher priority on issues such as disaster- and weather-related food shortages, supply and transportation system interruptions, and pandemics from virus and infectious disease. Experienced local emergency managers stressed the importance for any solutions to work broadly across the spectrum of possible risks, including multi-faceted domain awareness (i.e., both inland at seaward domain awareness) and ensuring all response solutions are flexible enough to address a broad set of incidents specifically in an Arctic environment. Similarly, the response framework and forces should be flexible and adaptable. Native and rural Alaskans are ready and willing to be a trained and resourceful component of the incident response command structure.

Other concerns arose including the need to record baseline critical environmental conditions, such as currents, temperature, ice conditions, and wildlife, as they are vital for rural regional understanding and illustrating the true magnitude of future climate changes. Related to these issues is the need to protect sensitive information. While not a part of this exercise, as always, oil spill solutions remain a top concern.

As subsistence living is challenged by loss of traditional hunting and fishing areas (such as sea ice declination), it was noted that crisis tipping points can occur much more rapidly. Participants relayed a common desire for more cooperative research with Alaska Natives and other rural residents and more rural outreach leading to local-community developed ideas and solutions.

Communication Technology and Related issues

Consistently available and effective communication is not available. Western

Alaskan residents have to combine a variety of different technologies and systems - VHF radio, In-reach, satellite phones, etc. for different conditions. These ad-hoc systems are not always reliable, cannot be integrated, and are too costly for most residents. The participants stated that lives were being lost due to the of lack of small, portable, affordable, communications systems that anyone can use without licensing requirements. To be truly effective, new methods of communication may need to leverage social media. Finally, any communication electronics need to work and be workable in extreme cold.

Ice and Extreme Weather Conditions

Ice conditions are becoming increasingly unpredictable. Younger individuals are not gaining traditional survival knowledge concerning normal ice behavior and human physical effects in extreme conditions. This issue is compounded by changing ice and weather conditions that may challenge traditional assumptions and knowledge. Thus, the inherent risks inherent in traveling greater distances now necessary to successfully conduct subsistence activities are substantially increased.

Near-coast Infrastructure Resilience

Storms and conditions are increasing in frequency, unpredictability, and severity. 100-year storms are no longer unusual, and most infrastructure was only built to withstand much less challenging wave and storm surge conditions. To make conditions even more challenging, sea walls no longer stand at their expected height due to coastal erosion and sea wall degradation. Timely flood warning systems are needed at night and in bad weather when visibility is low - including in homes where people are sleeping and for people in remote areas. Current evacuation locations are likely to be flooded; so large scale evacuation centers are needed in areas above storm surge.

Preparedness and Integrated Emergency Incident Response Effectiveness

Tools, Technology, and Training

Resources for managing the effects of an extreme event in the Arctic need to be in place. Not only tools and medical supplies, but expertise as well. Training and exercises are usually conducted in good weather, but bad weather is where proper training and/or equipment is most necessary, and also where gaps in proper training and/or equipment will be most apparent. Means to train for harsh Arctic conditions, as well as methods to collect, integrate, disseminate, and collaborate are needed in advance so distributed resources and responders are able to both be informed and to anticipate and respond to the larger event as it unfolds. Affordability is a critical element; as long as emergency response technology is unaffordable, it is irreplaceable. Participants highlighted that strategically placed oil spill response equipment with trained community residents is key to reducing the environmental impacts of Arctic spills.

Planning and Policy

The view of the current formal response framework is that there is a gap in having a realistic and comprehensive Incident Management Systems that includes locals and private sector, in addition to government. There also seems to be a shortfall in understanding and bridging the differences between larger communities like Nome and small rural locations. There may be specific areas in which events are most likely to turn sour, which should be identified and have prior planning put into place. It was suggested that investments in “big ticket” response capability should be prioritized through informed analysis of existing response capabilities. If local experts are incorporated into larger scale response, they too will need training and resourcing.

Alaska Natives and rural communities are concerned that they are not the highest priority compared to entities *in extremis* in the region. This is exacerbated by the policy of not deploying USCG year round, although some of the worst conditions are now experienced with storms in their off season.

Delphi Prioritization Voting

The Delphi prioritization voting results revealed that participants were concerned about a multitude of topics. Many of these topics were reflected in the storm-related storytelling portion of the workshop as well. Participants voted on a variety of topics that answered a series of 11 questions which were posed to three separate breakout groups. The answers to these questions were grouped into generalized themes, since some voted-upon responses were either redundant or very similar. However, because the context of these voted-upon responses matters greatly, the voted-upon responses to the questions themselves are given in the Breakout Group Voting Results section.

In terms of generalized theme, participants noted that the two paramount topics were Technology/Material Solutions and Food/Food Security. Both of these were tied for the most-voted theme, with 23 votes each. The next most important theme was Need for Increased Clarity/Communications Pathways, with 15 votes. After that, Culturally-informed Triage/Disaster Response was the next most voted-upon theme, with 14 votes. Finally, Training was also a commonly discussed and voted-upon theme, with 12 votes. The single response (not generalized theme) with the most votes was Integration of Local Knowledge into Systems, which signals that there is a very clear need for this to occur. These were not the only topics voted upon by workshop participants, but voting revealed that these themes were the most important.

As mentioned before, these generalized themes reflect the needs expressed from the storm-related storytelling. Workshop participants are extremely aware of, and concerned for, the vulnerability of the ecosystems that they rely upon for subsistence. In addition, participants know that their ability to protect these valuable ecosystems is largely dependent on their ability to respond quickly, which in turn is directly tied to having the necessary resources and training. In a slightly longer-term scope, participants wish to have better and clearer communication pathways with state and federal agencies. When an outside response assets arrive (i.e., state

and federal on-scene crisis response), workshop participants want the outside response assets to be aware of and protect the ecosystems that the workshop participants rely on.

Scenario Description

The foundation of this workshop, and for each Arctic Incidents of National Significance (Arctic IoNS) workshop, is a specific scenario. Each scenario is specifically designed to stress the capabilities of crisis response efforts at the local, state, and federal levels. The scenario serves as a springboard for discussion that is intended to find gaps between research and current crisis response capability. The ultimate goal for all Arctic IoNS workshops is to form research questions that will be used to pursue funded RFPs, which if successful will be used to create research projects. It is important to note that all ADAC research projects are ultimately designed to be operator-driven. Additionally, ADAC research is meant to provide ADAC's principal customer, the United States Coast Guard

(USCG), with practical maritime mission support tools that address shortfalls in USCG crisis response capability.

This workshop's hypothetical scenario involves the formation of a bomb cyclone (with winds equivalent to a Category 2 hurricane) off the Bering Straits. The bomb cyclone batters Western Alaska, disabling the navigation and communication

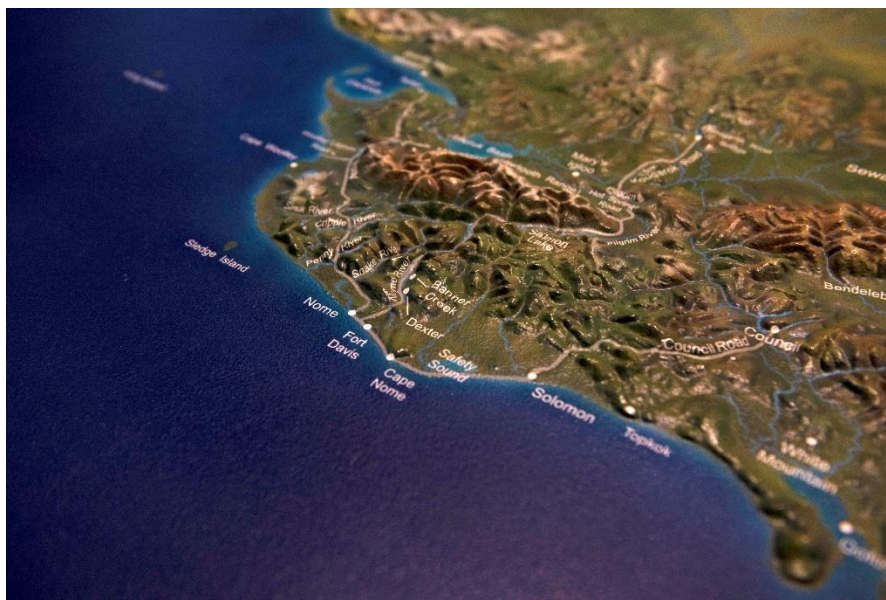


*Figure 1. Nome and surrounding regions from map in Carrie M. McLain Memorial Museum in Nome, Alaska.
Credit: ADAC Media.*

systems of a large container ship in the process. As a result, containers of potentially hazardous materials are thrown overboard. Some containers float, some containers are partially submerged, and some containers sink, which creates a latent detection challenge. Additionally, many containers are washed ashore. The bomb cyclone also damages petroleum product storage tanks in Western Alaska, causing leakage into marine environments.

The Anchorage Arctic IoNS 2019 scenario is intended to stress the system in the following ways:

- Arctic communications – highlighting limitations in voice and data communications;
- Challenging Arctic Maritime Domain Awareness and understanding to effect decision-making;

- Arctic Incident Response Logistics and Resourcing – including but not limited to latent detection challenges;
- Ability to effectively exercise the current USCG-led Area Contingency Plan.

The following list indicates the Anchorage Arctic IoNS 2019 scenario key drivers, as outlined by the USCG:

- The scenario should prompt efforts to address latent detection capability (principally of chemicals and associated hazards located across isolated regions),
- The scenario should incorporate perspectives and potential resources of rural Alaska native communities,
- The scenario should address tracking of hazardous materials lost at sea (principally born by trans-shipment containers),
- The scenario should activate U.S. Federal, State of Alaska and Local government Incident response.

Workshop Method

The workshop began with an opening prayer and the lighting of a traditional seal oil lamp provided by Sitnasuak Native Corporation. After prayers and lighting of the lamp, introductions were made and the workshop quickly moved into full swing. A plenary presentation was given by Mary David of Kawerak, Inc., a Bering Straits regional non-profit Alaska Native corporation located in Nome. Randy “Church” Kee gave an introductory presentation outlining the structure and goals of the workshop following Mary David’s presentation.

After the workshop introductions and initial presentations, workshop participants divided into three separate breakout groups. The purpose of these breakout groups was to collect Alaska Native concerns relating to the workshop scenario. As Alaska Natives and other rural residents are the first responders to the workshop scenario (or any similar incidents in remote areas of Alaska), their input, concerns, and extremely specialized

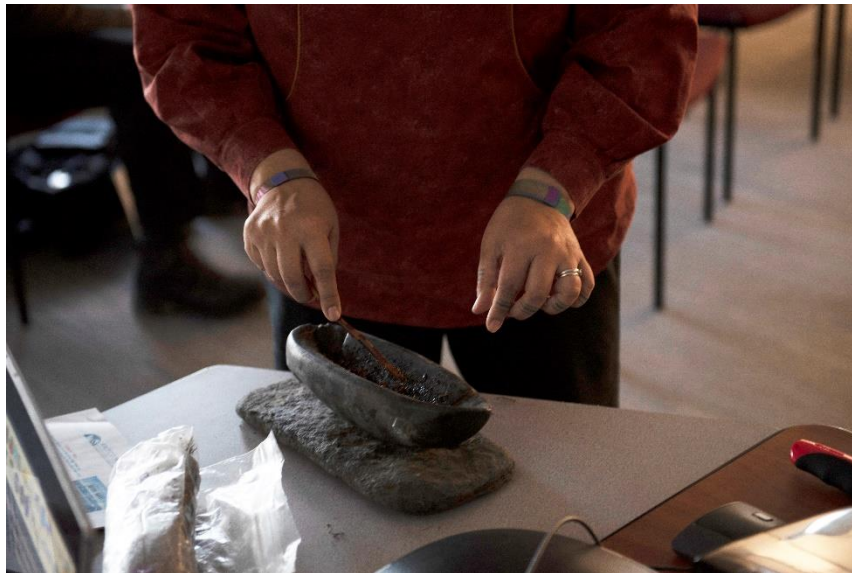


*Figure 2. Seal oil lamp being prepared for opening ceremony.
Credit: ADAC Media.*

knowledge of the local area is critical to informing the research aimed at addressing the scenario key drivers as outlined by the USCG.

The Arctic Domain Awareness Center, Sandia National Laboratories, University of Alaska Fairbanks, and University of Alaska Anchorage acted as moderators, facilitators, and recorders in the breakout groups.

Facilitators and

moderators were tasked with guiding discussion towards a specific set of 11 questions, keeping the discussions productive, and assisting the brainstorming process. Recorders were tasked with documenting the specific problems and solutions that each breakout group generated. Breakout groups were collectively tasked with coming up with problems, solutions, and/or recommendations to each of these 11 questions.

The breakout groups themselves were composed of participants from a diverse set of backgrounds, and each breakout group had at a USCG representative in addition to residents from Alaska Native villages spanning Western Alaska and the North Slope. Additionally, representatives from the following agencies were present: Alaska Department

of Public Safety, National Weather Service, University of Alaska Anchorage, University of Alaska Fairbanks, Kawerak Inc., Bering Straits Native Corporation (regional for-profit ANCSA corporation), and Sitnasuak Native Corporation (village for-profit ANCSA corporation).

Once the breakout groups had concluded, the Delphi method was used to vote on the problems, solutions, and/or recommendations. Each participant was given three votes, which could be distributed amongst problem statements or solutions as they pleased – for example, a particularly important topic could be voted on multiple times by the same person. Voting responses were separated into two separate categories: urban/non-Alaska Native residents, and rural/Alaska Native residents. For simplicity's sake, these will be referred to as simply “urban” and “rural” votes. Additionally, urban votes were demarcated by a black dot in the center of the sticker.

Plenary Presentation

ADAC's Nome IoNS 2019 Workshop was lighter on plenary presentations when compared to other ADAC workshops. Given the duration of the workshop (one business day) and the objective of the workshop (gathering Alaska Native perspectives), the workshop was not oriented toward plenary presentations. However, a presentation was given by Mary Davis of Kawerak, Inc. and an introductory presentation to the workshop structure was given by Randy "Church" Kee of ADAC. A hard copy of a presentation concerning Shishmaref relocation by Tony A. Weyiouanna Sr. was distributed but not presented.

Mary David's plenary focused on how Kawerak, Inc. addresses and represents Native



Figure 3. Kawerak, Inc. Executive Vice President Mary David speaking at Arctic IoNS 2019.

Credit: ADAC Media.

Alaskan concerns. The primary mission of Kawerak is "Advancing the capacity of our People and Tribes for the benefit of the region." Kawerak acts as a regional hub and Alaska Native advocate for all marine concerns in the Bering Straits, and also provides services to Bering Straits residents. There are a multitude of concerns that Alaska Natives living the Bering Straits have, but the

primary concerns are increased ship traffic in the Bering Straits and ship traffic's impact on the ecosystem and the subsistence way of life. Other concerns include coastal erosion, pollution and impacts to food/subsistence, oil's impact on wildlife, increasing expanses of open water due to declining sea ice, annual increases in ship traffic, impacts to marine mammals and hunters, and water pollution such as gray water and ballast water.

Kawerak conducted Bering Strait Voices on Arctic Shipping (BSVAS) workshops, which gather ocean policy professionals and Bering Straits leaders, in order to discuss regional impacts due to increased shipping. In 2014, Kawerak formed the Marine Program, spearheaded by a Marine Advocate, to represent Bering Straits Alaska Natives and their concerns.

Storm-related Storytelling

Local residents from several villages were encouraged to share their Arctic severe weather experiences in the form of Storm Stories. The stories highlighted difficulties posed by isolation that goes beyond the great distances involved to include routine challenges with communications, transportation, and coordinating governmental assistance.

Background for the following Unalakleet resident's description of events: incident synopsis summary of NTSB report:

On June 2, 1990, a Boeing 737 operated by MarkAir, Inc., struck the ground during a runway approach 12 km short of the runway. The aircraft skidded a few hundred feet, coming to rest with an engine and the tail section separated from the wings and fuselage, respectively. The incident resulted in no fatalities, one serious injury, and three minor injuries. The aircraft sustained catastrophic damage during the incident and was later determined to be a total loss.

Mr. Charlie Lean described the events surrounding a 1990 plane crash and the process by which local residents shifted the response from a search for the location of the downed aircraft to a larger-scale recovery operation involving many community members serving in unfamiliar roles. Community awareness of the incident was somewhat gradual and increased as more community members became involved in the response effort as no official public broadcast of critical information occurred. Many community members gained situational awareness through anecdotal information from initial responders and search party reporting via VHF radio. Mr. Lean described receiving basic instruction for this scenario in advance of the incident; however, it was not effective as it placed all the responsibility for the response with the state DOT and left out local responders. This incident provides an illustration of the prolonged time it takes for other-than-local responders to arrive and emphasizes the unfortunate reality that communities will likely need to home-grow response efforts for the first 48-72 hours of many incidents, particularly in severe weather. Community response challenges were exacerbated by lack of an officially recognized community Incident Management hierarchy or clear triage of community needs as specific requests for assistance were ignored or modified by third parties. Many of those outside of the community decisions denying or delaying requests for assistance were made outside of Unalakleet and based on incomplete or erroneous information. The local community felt ignored or trivialized by commercial stakeholders and the full scope of the incident and subsequent response effort was minimized.

Mrs. Igluguq Okleasik recounted the loss of her Father in Law in Nome and emphasized the multitude of hardships that Climate Change is creating for local families. The speaker lost her Father in Law when he fell through the ice while fishing in January when ice used to be solid and safe. Very recently, an entire family perished when they fell through the ice and drowned outside of Noatak. Community members report that as the

weather and ice conditions change, subsistence hunters and fishers are required to travel farther distances over potentially unstable ice to obtain food, increasing the risk of falling through and needing assistance. As seasonal weather patterns change and ice conditions become less predictable, community members are assuming increased risks in maintaining traditional hunting-fishing subsistence lifestyles. Better tools and forecasts with increased resolution and improved accuracy are desperately needed, particularly fresh and saltwater ice thickness forecasts and thin ice awareness tools. With the increased awareness provided by high precision forecasts and ice condition reports, it is possible to successfully mitigate the increased risks posed by changing weather patterns and increase the safety of those venturing on the ice.

Mr. Howard Farley relayed his concerns surrounding a November 1974 series of storms and corresponding low-pressure systems that flooded Nome and several surrounding villages. The storms were unusual in that they pushed ashore from the Southwest and did not push the shore-fast ice out away from the shoreline. The resident speaker described the



*Figure 4. Native Alaskan resident sharing concerns.
Credit: ADAC Media.*

rising water level easily overwhelming the 12-foot seawall and beginning to flood local buildings. Many Nome residents displaced by the rising waters sought refuge in nearby businesses while the storm flooded and displaced many nearby buildings. Community members needed to turn sled dogs loose from dog camps due to the deadly threat of

rising water levels drowning the animals. The storms gradually turned nearby shore fast ice into a viscous material that offered no protection from the wind and waves as the community felt the full impacts of the storms. The community relied on CB radios at the time and they were useful as the most common and accessible communications equipment.

Currently, any village that has internet can subscribe to an AIS feed and track ships for situational awareness of potential maritime incidents. During the busy summer months, the continuously active local fishing fleet does a great job of looking out for one another and assisting others in distress. The majority of the community heavily utilizes VHF radios for communications and enjoy the simplicity and portability those systems provide. VHF's

effectiveness is due in large part to the high percentage of local residents that communicate with VHF and forward VHF messages among members of the community.

An Utqiagvik resident speaker relayed her personal experiences surrounding a February 2006 Storm. She was requested to conduct a pickup of a critically ill patient from a remote local village just before the arrival of a serious winter storm. The forecast data and meteorological information provided indicated a substantial amount of risk to the evolution due to the impending storm, but that same information lead the team to understand that they would have some time to execute the evolution before the worst of the storm hit. Once arriving at the Village for the patient pickup, the team quickly realized that the weather was deteriorating much more rapidly than expected, and the patient needed to be quickly transferred to the aircraft and flown out. After embarking the patient, the aircraft attempted to take off in rapidly deteriorating conditions. As the plane sped down the runway, complete loss of visibility and hurricane force crosswinds blew the aircraft on its side. The team then had to transport the patient and 450 pounds of medical gear back to the village clinic and perform more advanced-than-trained-for medical care with very basic equipment. The local village was required to adapt and manage the situation from within, utilizing volunteer emergency personnel and equipment from the transport aircraft. Many individuals performed admirably over the next 40 hours, covering multiple duties beyond their training and testing the limits their capabilities. The events of this storm illustrated the hard truth that too often, isolated communities are on their own during severe weather events and responders cannot reach people as they threatened by severe weather events and must wait until the weather has subsided before providing assistance.

The North Slope heavily relies on forecast models, as observational weather collection is extremely limited due to large distances between observers. When forecast models provide inaccurate data, the risks to responders and operators increase drastically. The effectiveness of emergency response operations depend greatly on the planner's ability to predict weather conditions and adjust response operations to leverage favorable conditions and mitigate risks posed by severe weather. It is often up to first responders to be ready and prepared for Arctic residents and visitors, because it may be impossible to receive backup and additional resources right way.

A St. Paul resident speaker provided remarks on how the increased frequency and severity of winter storms are destroying infrastructure and endangering residents. Recent storms are becoming increasingly powerful and more frequent, a 50 to 100 year storm, is now occurring almost every year. Current planning and infrastructure is inadequate to ensure community safety and provide reliable platforms for use by emergency responders. As an example, one recent storm producing up to 50FT waves overwhelmed the breakwater and water holding ponds allowing storm surge to come within 4 inches of interrupting power to the community. As such, engineers and planners need to acknowledge climate change and the corresponding increased severe storm activity and develop new infrastructure and

emergency management strategies to meet community needs and ensure future response operations are successful.



*Figure 5. Seaward view from UAF Northwest Campus. Nome, like many coastal communities in Alaska, is located mere feet from the coastline. Sea ice illuminated by the rising sun can be seen on the horizon. Additionally, this photo is actually aligned with the horizon – the tilted lamp post is caused by freeze/thaw cycles in permafrost, a common infrastructure problem in Alaska.
Credit: ADAC Media.*

Mr. Tony Weyiouanna provided a personal account of witnessing climate change through the last 35 to 40 years of living and working in the local community. He described current average temperatures of about 30 degrees warmer than 20 years ago and how those increases have warmed the permafrost hastening erosion. The warming trends have produced thin and unpredictable ice conditions increasing the dangers to those transiting the ice in search of food sources. Local community members utilize snow machines, ground parties, and 4 wheelers for search and rescue. Responders should have basic first-responder medical training and knowledge including the ability to recognize the signs and symptoms of the various stages of hypothermia and how best to treat those symptoms. As the observable effects of global warming have become more apparent, it is more evident that the climate is changing, dramatically necessitating a more significant response.

Communities should re-emphasize passing-on traditional tribal information including recognizing and evaluating snow and ice conditions to ensure that community knowledge is retained and members navigate snow and ice more effectively.

Currently, responders in Shishmaref utilize a wide variety of tools including VHF, in-reach, GPS, cell phones, and maps. The most effective approach for our community is to combine all of these resources and use each as needed because each area has specific communications problems.

A Little Diomedes resident speaker has also witnessed increasing severe weather coinciding with climate change. One example provided was of a very large severe weather event in November 2011 that produced 130 MPH winds and killed several people. The community was isolated due to the weather and the performance of advanced medical procedures through tele-medicine including inserting a chest tube became necessary. Little Diomedes utilizes In-reach for the tracking of resources and personnel as well as SAR. The combined capabilities of communications and location reporting make In-reach an important tool for emergency response management, but it has its limited in cold weather conditions and steady acquisition of satellite signals as one travels across terrain and sea areas.

A Unalakleet resident speaker relayed an incident where her parents slept through a flood that rose from the ocean to their house, and all occupants in the house were completely unaware of the flooding. The resident stated the increasing need for communications alert systems for residents during storms to warn of storm surge and provide evacuation instructions. Communities need to acquire emergency equipment to build breakwaters and ensure that existing equipment is operational. Communities need to become more involved storm planning and preparedness by building or identifying evacuation sites and shelters and ensuring community participation in emergency planning meetings.



*Figure 6. Large expanses of Open Ocean and low-lying coastlines exacerbate storm surge.
Credit: ADAC Media.*

A Kawerak, Inc. speaker expressed great concern that most local communities do not have knowledge and training on the resources that may be available to assist them. Communities need to work to collaborate and directly connect to the response framework that exists at State and Federal levels to ensure understanding and enhance cooperation. Many Villages express interest in becoming active participants in emergency management training and emergency response planning, but find themselves disconnected from the state/federal planning and response decision-makers. With local level involvement in the response system, commonality between stakeholders and response planners will grow increasing cooperation and effectiveness.

Breakout Group Questions

All three breakout groups were tasked with addressing the same series of 11 questions. These questions were primarily aimed at addressing the challenges posed by the hypothetical scenario. The 11 questions posed to breakout groups were:

1. What are concerns in preparedness and response to a severe weather event in participant “local areas of concern?” (Realizing that participants from across the Western and North Slope Alaska may be present).
2. What are local “incident coordination” practices and expectations for responding crisis support teams?
3. How would local regional response teams seek to communicate with vessel masters, local mariners, and rural/coastal communities in crisis?
4. How might local populations communicate and create force multipliers in terms of communication, situational awareness, and response?
5. Outline current abilities in differing regions to communicate under crisis conditions (voice and data). How effective/reliable are these communication systems?
6. If hazardous materials come ashore, (assuming chemicals and materials that are non-explosive) what would be the local concerns and what response would be undertaken?
7. As a result of the storm severity, what subsistence issues, should response personnel understand?
8. If the storm caused substantial damage to specific ports, harbors, or airfields, what priority of response would participants expect or request?
9. A severe storm along coastal regions could cause longer enduring economic issues. What areas of concern due participants see as most pressing? (e.g., mines, fisheries, movement of commerce, other?)
10. A severe storm could impact/damage important cultural sites or perhaps culturally relevant processes. What insights can participants provide to help identify important or priority culturally relevant sites or processes to increase understanding for response personnel?
11. Describe crisis response decision context needs and priorities in wake of a regional-wide disaster.

Breakout Group Voting Results and Data

Although there were well over a hundred individual responses to the questions, participants ended up voting on approximately 45 separate topics. The voting results are given below in Table 1, in terms of generalized themes. Because there were many individual responses, there were some redundancy in voting topics. Redundant topics that gained votes were merged into one single, overarching, generalized vote – for example, all votes on multiple different subjects dealing with training were merged into a single training topic. The rural and urban votes are denoted in separate columns.

Table 1. Generalized voting categories and associated rural and urban vote distributions.

Generalized themes from voting	Rural votes	Urban votes	Total votes
Technology/Material Solutions	20	3	23
Food/Food security	18	5	23
Need for Increased Clarity/Communication Pathways	12	3	15
Culturally-Informed Triage/Disaster Response	10	4	14
Training	8	4	12
Integration of Local Knowledge into Systems	5	3	8
Planning/Logistics	1	4	5
Governance	4	0	4
Public Health	3	0	3
Indigenous Research Component	2	0	2
Self-Sufficiency	2	0	2
Pollution	1	0	1

Figure 1 below shows the overall distribution of votes by generalized theme in a pie chart. Note that the majority of responses (roughly 84%) were allocated towards the top six responses, identified below.

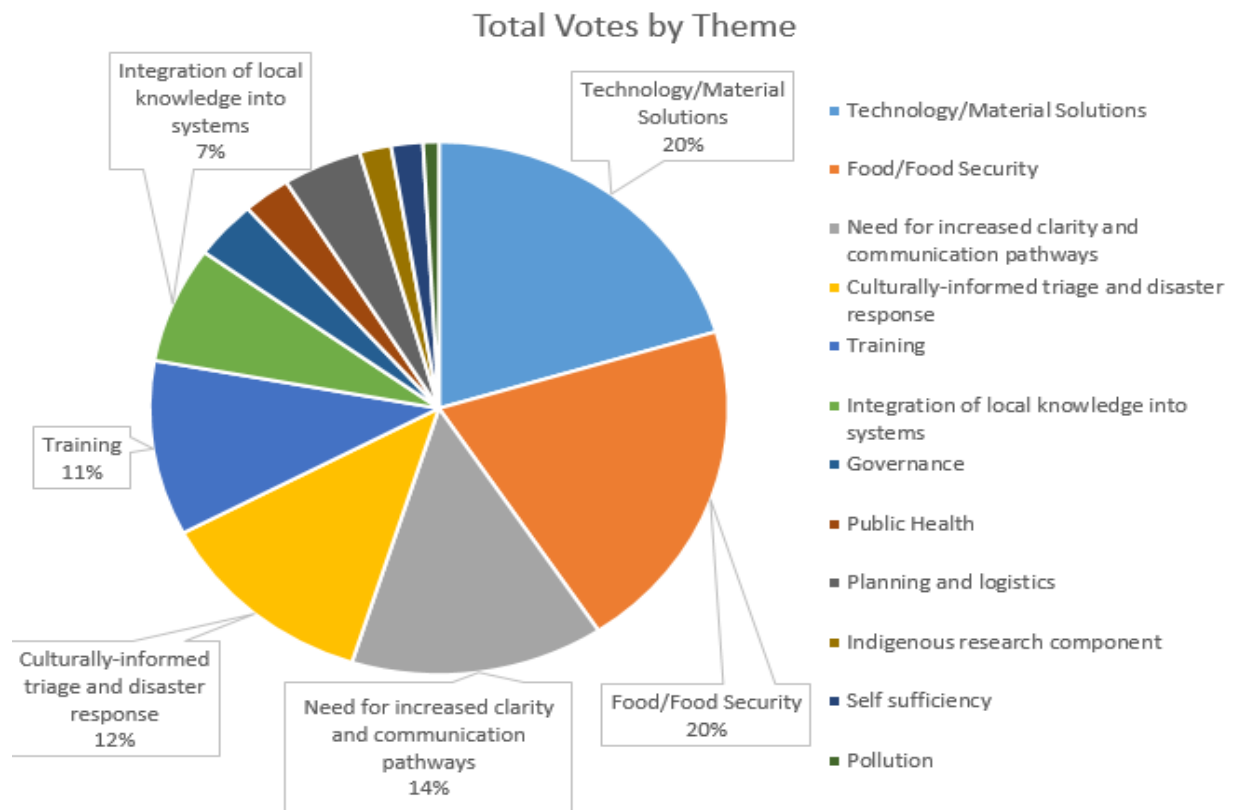


Figure 7. Total votes by theme, in addition to percentage of votes allocated to the six most voted-upon topics.

Table 2 below shows the specific topics that were covered by the Technology/Material Solutions general theme. Speed and bandwidth for internet, satellite and cell phones was shown to be the largest concern, which makes sense – the ability to call for help and receive/transmit information quickly and effectively should make the largest difference in the response ability. The ability to call for help and access the Western Alaska Area Contingency Plan (amongst other important first responder documentation) is critical. Additionally, VHF as communications equipment was noted to be the penultimate voted-upon communications solution. Other material response assets included a need for oil spill response equipment, communications devices that can operate in extreme cold weather, and the potential for drones to enhance situational awareness. Other material assets included a need for a rescue tug, and a recommendation that drones/UAS be used for situational awareness.

Table 2. Technology/Material Solutions specific identified problems, solutions, or recommendations.

Problems, solutions, or recommendations	Rural votes	Urban votes	Total votes
Universal limiting factor: speed and bandwidth	6	1	7
VHF as a communication asset (due to range)	4	0	4
Oil spill response equipment	3	1	4
Rescue tug: awareness/resources or other "good Samaritan" measures:	3	0	3
Drones for situational awareness	2	1	3
Weather from weather apps, NOAA weather forecast, calling other locals for current conditions or predictions	1	0	1
Beach cleanup/use of drones to identify particular beaches which collect debris	1	0	1

Table 3 below shows the specific topics identified under the Food/Food Security theme. Many of the votes indicated that response personnel should understand the importance of food security and marine wildlife's importance to Alaska Native subsistence way of life. The impact of the scenario on food security alone was a large concern amongst respondents. Since the price of supermarket-purchased food in the Alaskan Bush is prohibitively high, rural residents rely heavily on a healthy and thriving ecosystem that can support subsistence efforts inclusive of food, health and culture.

Table 3. Food/Food Security identified problems, solutions, or recommendations.

Problems, solutions, or recommendations	Rural votes	Urban votes	Total votes
Response personnel should understand: food security	5	2	7
Impact of fisheries/food security	3	2	5
Subsistence fisheries threatened	2	0	2
Response personnel should understand food	2	0	2
Response personnel should understand all marine wildlife: macroalgae, shellfish, invertebrates, fish/seabirds and eggs	1	0	1
Participants request priority response on food and water, shelter, and fuel paths	1	0	1
Effects of oil pollution on animals and people who eat them is a pressing concern	0	1	1
Subsistence crash prevention/economic disaster declaration	1	0	1
Stabilize property and environment	1	0	1
Cultural/subsistence recovery	2	0	2

Table 4 below shows the specific problems, solutions, or recommendations that gained votes and were categorized under the generalized theme of Need for Increased Clarity/Communications Pathways. Many of these problems, solutions, or recommendations dealt with gaps in communication between agencies and between local and state entities. Liaisons between local and state entities were a common theme, as were needs for sharing local/traditional knowledge.

Table 4. Identified problems, solutions, or recommendations under the Need for Increased Clarity/Communications Pathways theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Incident coordination practice and expectations: Responsibilities/liaisons	2	0	2
Coordination pathways for local knowledge	2	0	2
Traditional knowledge not as shared	2	0	2
Who resources are via regional team	1	0	1
Response personnel should have knowledge of what happened/knowledge of responding agencies and what they are doing	1	1	2
Communities and agencies need to understand what each offers/cross-entity communication	1	1	2
Facebook messenger and other social media are used to spread word of first response/help	1	0	1
Integrate response from outside of local area to local incident command	1	0	1
Tribal liaison	1	0	1
Early notification of progress of event	0	1	1

Table 5 below shows the problems, solutions, or recommendations identified under the Culturally-Informed Triage/Disaster Response theme. These responses are somewhat intertwined with the Need for Increase Clarity/Communications Pathways responses above in Table 4. Between the two main responses in Table 5 and the responses in Tables 3 and 4 above, there seems to be a common thread for communicating to response personnel how important subsistence and food security are. This is ostensibly spurred by the need to mitigate as much damage as possible to the ecosystems that Alaska Native subsistence and food security rely on. This could also be considered another way to rephrase the need for

traditional ecological knowledge integration into mapping systems and algorithms as noted in Table 7 below, as well. Note that there is a great deal of crossover in some of the subjects that Tables 3, 4, and 5 address. Although this made classifying separate concerns more difficult, it highlights how intertwined communications, preservation of ecosystems/subsistence ways of life, economics (likely in terms of supermarket food costs and Alaska Native art), and culturally-informed triage and disaster response are.

Table 5. Identified problems, solutions, or recommendations identified under the Culturally-Informed Triage/Disaster Response theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Make sure response personnel understand how intertwined subsistence/economics/food security/spiritual health are	6	1	7
Culturally informed standard crisis and recovery triage of priorities	4	0	4
Local elders/AK natives with subject matter expertise	0	2	2
Sensitive data communities don't want to share	0	1	1

Table 6 below shows the problems, solutions, or recommendations generalized under the Training theme. Note that although the “Training, communications, equipment” problem was categorized under Training, it could just as readily be covered under the Technology/Material Solutions theme. Again, this serves to underscore the uniquely linked nature of crisis response in rural Alaska.

Table 6. Identified problems, solutions, or recommendations generalized under the Training theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
First response assistance/training	2	0	2
Training	2	1	3
Knowledge, skills, abilities	1	0	1
Training for community resilience in village, on the ground, start training in schools, weather service training, other providers/integrated training	0	2	2
Training, communications, equipment	3	1	4

Table 7 below shows the problems, solutions, or recommendations identified under the Integration of Local Knowledge into Systems theme.

Table 7. Identified problems, solutions, or recommendations generalized under the Integration of Local Knowledge into Systems theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Integrate local knowledge into systems and algorithms	5	3	8

Table 8 below shows the problems, solutions, or recommendations identified under the Planning/Logistics theme.

Table 8. Identified problems, solutions, or recommendations generalized under the Planning/Logistics theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Use different approaches and have different levels and types of capabilities	1	2	3
Plan for contingencies, interdependencies	0	2	2

Table 9 below shows the problems, solutions, or recommendations identified under the Governance theme.

Table 9. Identified problems, solutions, or recommendations generalized under the Governance theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Disaster declaration for inbound teams (remove funding burden from local government)	3	0	3
Response personnel should understand local governments	1	0	1

Table 10 below shows the responses and votes identified under the Public Health theme.

Table 10. Identified problems, solutions, or recommendations generalized under the Public Health theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Response personnel should understand public health	2	0	2
Workshop participants see public health as most pressing issue	1	0	1

Table 11 below shows the responses and votes identified under the Indigenous Research Component theme. The Indigenous Research Component could also be linked to some of the other responses grouped in with other themes, such as Integration of Local Knowledge into Systems and Algorithms. It was noted in some of the breakout groups that Alaska Natives have a long and rich history with the land, and have intimate knowledge of the ecology, weather patterns, and other rural components.

Table 11. Identified problems, solutions, or recommendations under the Indigenous Research Component theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Proximity place-based study, research, and economy	1	0	1
Indigenous research component/exception bonus turned into requirement	1	0	1

Table 12 below shows the responses and votes identified under the Self-Sufficiency theme. Self-sufficiency was discussed during the storm-related storytelling segment of the workshop in addition to some of the breakout groups.

Table 12. Identified problems, solutions, or recommendations generalized under the Self-Sufficiency theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Self-sufficiency as a local crisis response practice or expectation	2	0	2

Table 13 below shows the responses and votes identified under the Pollution theme.

Table 13. Identified problems, solutions, or recommendations generalized under the Pollution theme.

Problems, solutions, or recommendations	Rural Votes	Urban Votes	Total votes
Need to figure out where hazardous materials could enter marine/freshwater	1	0	1

The top two identified generalized themes, Technology/Material Solutions and Food/Food Security, were tied in terms of total responses. Technology/Material Solutions had slightly more responses from the rural population, while Food/Food Security had slightly more responses from the urban population. The only theme where urban votes outnumbered rural votes was Planning/Logistics, which had four urban votes and one rural vote.

The single problem, solution, or recommendation that garnered the most votes was Integration of Local Knowledge into Systems/Algorithms. This single suggestion garnered 8 votes, which shows that it is a singularly important topic. In addition, it garnered 5 rural votes and 3 urban votes (62.5% rural – 37.5% urban). Integration of Local Knowledge was in a very close second with regards to the most even distribution of votes amongst both urban and rural voters for all problems, solutions, or recommendations that gained more than two votes. Impact of fisheries/food security (60% rural – 40% urban) had the most evenly distributed split between rural and urban voters for topics that gained more than two votes.

The theme data suggests that first and foremost, the chief concerns of rural inhabitants are: having the assets to send and receive communications and documentation; mitigating damage to ecology in order to sustain Alaska Native subsistence; communicating to response personnel the importance of maintaining ecosystems and ecology in order to provide food security through subsistence; and integrating local knowledge into existing algorithms and systems. However, these themes were grouped by ADAC staff by common topics, so there is some amount of flexure in which problems, solutions, or recommendations fall under which themes. With that in mind, the meta-metrics (such as Figure 1) may not necessarily be accurate since there may be some implicit subjectivity/bias in terms organizing which topics that fall under which themes, but simply are meant to serve as a general guide for how votes were distributed.

The tables below indicate responses to specific questions. As mentioned above, there was a good deal of crossover in some answers to these questions – for example,

training was posed as an answer to multiple questions. Table 14 shows the responses to Question 1. For reference, Question 1 was “What are concerns in preparedness and response to a severe weather event in participant “local areas of concern?” (Realizing that participants from across the Western and North Slope Alaska may be present)”

Table 14. Voted-upon participant responses to Question 1.

Problems, solutions, or recommendations	Rural votes	Urban votes
Early notification of progress of an incident	0	1
Plan for contingencies, interdependencies	0	2
Rescue tug: awareness/resources or other "good Samaritan" measures	3	0
First response assistance/training	2	0
Training	2	1
Total	7	4

Table 15 shows the responses to Question 2, which was “What are local “incident coordination” practices and expectations for responding crisis support teams?”

Table 15. Voted-upon participant responses to Question 2.

Problems, solutions, or recommendations	Rural votes	Urban votes
Self-sufficiency	2	0
Knowledge, skills, abilities	1	0
Responsibilities/liaisons	2	0
Disaster declaration for inbound teams (remove funding burden from local government)	3	0
Coordination pathways for local knowledge:	2	0
Facebook messenger and other social media to spread word of first response/help	1	0
Total	9	0

Table 16 shows the responses to Question 3, which was “How would local regional response teams seek to communicate with vessel masters, local mariners and rural/coastal communities in crisis?”

Table 16. Voted-upon participant responses to Question 3.

Problems, solutions, or recommendations	Rural votes	Urban votes
Integrating response from outside of local area to local incident command	1	0
VHF (due to range)	4	0
total	5	0

Table 17 shows the responses to Question 4, which was “How might local populations communicate and create force multipliers in terms of communication, situational awareness, and response?”

Table 17. Voted-upon participant responses to Question 4.

Problems, solutions, or recommendations	Rural votes	Urban votes
Training for community resilience in village, on the ground, start in schools, weather service training, other providers/integrated training	0	2
Traditional knowledge not as broadly shared	2	0
Who local resources are via regional team	1	0
Tribal liaison	1	0
Drones for situational awareness	2	1
Total	6	3

Table 18 shows the responses to Question 5, which was “Outline current abilities in differing regions to communicate under crisis conditions (voice and data). How effective/reliable are these communication systems?”

Table 18. Voted-upon participant responses to Question 5.

Problems, solutions, or recommendations	Rural votes	Urban votes
Universal limiting factor: speed and bandwidth	6	1
Use different approaches and have different levels and types of capabilities	1	2
Weather from weather apps, NOAA weather forecast, calling other locals for current conditions or predictions	1	0
Total	8	3

Table 19 shows the responses to Question 6, which was “If hazardous materials come ashore, (assuming chemicals and materials that are non-explosive) what would be the local concerns and what response would be undertaken?” Question 6 had the second-most total votes and rural votes out of any question. About half of the total votes for Question 6 came from the “Local knowledge integration into systems/algorithms.”

Table 19. Voted-upon participant responses to Question 6.

Problems, solutions, or recommendations	Rural votes	Urban votes
Need to figure out where hazardous materials could enter marine/freshwater	1	0
Training, communications, equipment	3	1
Beach cleanup/ use of drones to identify particular beaches which collect debris	1	0
Local knowledge integration into systems/algorithms	5	3
Subsistence fisheries threatened	2	0
Total	12	4

Table 20 shows the responses to Question 7, which was “As a result of the storm severity, what subsistence issues, should response personnel understand?” Question 7 received the most rural votes and total votes out of any question. This could suggest that

communicating the importance of subsistence and subsistence issues to response personnel (perhaps including state officials as well as on-scene cleanup personnel) is very important to Alaska Natives and other rural residents. As suggested by the Food/Food Security theme, it could also indicate that food security is extremely important to rural Alaska Natives and other rural residents.

Table 20. Voted-upon participant responses to Question 7.

Problems, solutions, or recommendations	Rural votes	Urban votes
Impact on fisheries/food security	3	2
All marine wildlife: macroalgae, shellfish, invertebrates, fish/seabirds and eggs	1	0
Food	2	0
Public health	2	0
Food security	5	2
Make sure response personnel understand how intertwined subsistence/economics/food security/spiritual health are	6	1
Total	16	3

Table 21 shows the responses to Question 8, which was “If the storm caused substantial damage to specific ports, harbors, or airfields, what priority of response would participants expect or request?”

Table 21. Voted-upon participant responses to Question 8.

Problems, solutions, or recommendations	Rural votes	Urban votes
Food and water, shelter and food, fuel paths	1	1
Oil spill response equipment	3	0
Total	4	1

Table 22 shows the responses to Question 9, which was “A severe storm along coastal regions could cause longer enduring economic issues. What areas of concern due participants see as most pressing? (e.g., mines, fisheries, movement of commerce, other?”

Table 22. Voted-upon participant responses to Question 9.

Problems, solutions, or recommendations	Rural votes	Urban votes
Knowledge of what happened/knowledge of responding agencies and what they are doing	1	1
Effects of oil pollution to animals and people who eat them	0	1
Subsistence crash prevention/economic disaster declaration	1	0
Resident public health	1	0
Total	3	2

Table 23 shows the responses to Question 10, which was “A severe storm could impact/damage important cultural sites or perhaps culturally relevant processes. What insights can participants provide to help identify important or priority culturally relevant sites or processes to increase understanding for response personnel?”

Table 23. Voted-upon participant responses to Question 10.

Problems, solutions, or recommendations	Rural votes	Urban votes
Sensitive data communities don't want to share	0	1
Local elders/AK Natives with SME (subject matter expertise)	0	2
Tribal governments	1	0
Proximity place-based study, research, and economy	1	0
Total	2	3

Table 24 shows the responses to Question 11, which was “Describe crisis response decision context needs and priorities in wake of a regional-wide disaster.”

Table 24. Voted-upon participant responses to Question 11.

Problems, solutions, or recommendations	Rural votes	Urban votes
Culturally-informed standard crisis/recovery triage of priorities	4	0
Stabilize property and environment	1	0
Cultural/subsistence recovery	2	0
Communities and agencies need to understand what each offers/cross-entity communication	1	1
Indigenous research component/exception bonus turned into requirement	1	0
Total	9	1

Breakout Group Discussion Summaries

Question 1: What are the concerns in preparedness and response to a severe weather event in participant “local areas of concerns?”

Common responses for breakout groups (or responses that were discussed or raised amongst multiple breakout groups independently of each other) discussed communications and the resiliency of communications infrastructure as primary concerns. Communities were noted to have multiple forms of communication – for example, St. Paul has ALRS, two antenna relays with backup generators, satellite phones, and Nixle. The multiple modes of communication were noted to be a necessity; in the absence of these communications, there’s no way to maintain effective situational awareness or provide assistance to remote areas. Additionally, if communications are down, it likely cannot be repaired until after the storm has passed (compounding any other problems). Cell phones were noted to not necessarily be the primary method of communication. Another common thread amongst breakout groups for Question 1 were discussions about dedicated vessels for SAR (Search and Rescue) – some communities have them, and some do not. Readily available access for rural communities to reliable storm warnings ahead of time was also a common thread. Social media and texting as forms of communications was also a common thread. It was noted that texts can still work, even if cell phone calls do not. The need for familiar faces and already-established relationships between local, state, and federal entities was a common thread. Ways to monitor ship traffic in the region was a common thread, as well. A final thread was a sense that the USCG needed an expanded presence in Western Alaska.

Divergent responses, or topics that were only discussed by a single breakout group, were plentiful. Evacuating young children and elders, as well as a lack of evacuation equipment, were noted concerns. It was also noted that it is extremely important to notify the USCG before help is needed, since it takes time for the USCG to deploy resources to remote locations. There was a discussed lack of common understanding between local, state, tribal, and federal entities in terms of what resources were available at each level of governance. Small communities are often immediate first-responders out of necessity, especially if lives are in danger. These first responders should not be part of the casualties, and therefore need training (for example, medical training), assistance, and preparation. Differences between communities and their infrastructure resources were noted - not all communities have multiple redundancies for certain resources, which is especially true for airports and communications. Also, if certain communities lose power there is no way for quickly notify other communities that they have lost power (i.e., no dead man’s switch or similar procedure).

Question 2: What are the local “incident coordination” practices and expectations for responding crisis support teams?

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Stronger regional ties as an expectation were a common thread between breakout groups for Question 2.

Breakout groups tended to have more divergent responses to Question 2 than Question 1. In other words, divergent responses were topics that only occurred in a single breakout group. There was some discussion surrounding the capacity (housing, infrastructure, trained personnel) to house out-of-region personnel and where funding for rural communities to provide for personnel might come from. Practices included calling the police and state troopers first, as well as the Nome volunteer fire department. One expectation was that non-local response personnel should contact communities as to when they are coming. Another expectation was that emergency responders (rural first responders) will respond, but not for long. Communities also expect to receive regular updates and information during responses. Similar to Question 1, there was noted need as to who the “go-to” familiar face is for crisis response at multiple levels of government. Finally, it was noted that anything to do with marine resources (even at a broad level) is a public health and food security concern.

Question 3: How would local regional response teams seek to communicate with vessel masters, local mariners and rural/coastal communities in crisis?

Common threads to Question 3 were VHF radio as a means of communication between parties.

Divergent responses in terms of communication included social media, cell phones, In-Reach, and satellite phones – it was noted that not all of these are present in various communities due to expense or availability of infrastructure. Harbor Masters (if present in communities) were noted to be an important source of communications between communities and vessels. There was a need for knowing when boats are exiting an area as well, especially since insurance was said to stress that vessels need to be out of a region by a certain seasonal timeframe.

Question 4: How might local populations communicate and create force multipliers in terms of communication, situational awareness, and response?

Question 4 had largely divergent responses. In terms of response, some answers to Question 4 brought up concerns about how non-local mariners can respond to distressed vessels and how to deal with non-local mariners in communities at full capacity. In terms of communication, a repeater station to increase radio signal range was suggested as a recommendation. The lack of inter-connectivity between disparate communications networks was noted as an issue. HAM radio operators becoming less and less common was also noted as a communications issue. Utilizing drones to help with situational awareness and communications was a recommendation. Whether there were specific local area communication groups or frequencies was a question. Proper training was noted as a generalized force multiplier, with the caveat that training should not be centralized to only large communities, and the frequency of training should be increased. Apps were suggested as a way to maintain situational awareness.

Question 5: Outline current abilities in differing regions to communicate under crisis conditions (voice and data). How effective/reliable are these communication systems?

The common thread that was answered specifically for Question 5 was that different villages have different capabilities.

However, many of the same points in prior questions regarding communication can still be made here. Cost is a very significant gatekeeper when it comes to communications devices and their prevalence in rural Alaskan villages. VHF, social media (Facebook), text messaging, HAM operators (which are increasingly uncommon), satellite phones, and In-Reach were all noted as possible communication systems. However, it was noted in Question 5 and elsewhere that one significant challenge is linking disparate communications networks. Increased bandwidth and speed to rural Alaska was noted by one breakout group as a need. When voting occurred, increased bandwidth and speed garnered a significant amount of votes.

Question 6: If hazardous materials come ashore (assuming chemicals and materials that are non-explosive), what would be the local concerns and response?

A common discussion amongst breakout groups was a need for a list of contacts (USCG, Alaska Department of Fish and Game, etc.) to call in the case hazardous materials do come ashore. Another common discussion was a need for an emergency operations manual “for dummies” – a simple, generalized, and basic manual for how to deal with response. Another common question that came up was, who is responsible for removing the hazardous materials? Limiting access to containers washed ashore was also a common topic of discussion. Another common thread was training community members/locals on what may be hazardous, what to look for, and what to avoid. Finally, tracking containers before they come ashore - through modeled gyres and currents - and forecasting where they might wash ashore were also common discussions amongst breakout groups.

One divergent topic of discussion was how to integrate rural Alaskan residents’ perspectives and local knowledge into models and databases. Simulation of realistic weather scenarios and events without putting people in danger was another divergent topic of discussion.

Question 7: As a result of the storm severity, what subsistence issues, should response personnel understand?

The main common thread between discussions for Question 7 was food security, but to categorize the question as only “food security” is an extreme simplification due to the extremely interlinked nature of storm surge interaction with sea ice and how that might affect residents. Sea ice decline (in terms of areal extent and earlier seasonal sea ice melt) was noted amongst several groups as a chief concern; sea ice reduces wind fetch, which in turn reduces wave height when waves reach the shoreline. The storm’s impact along with hazmat on fisheries and crab could have long-lasting impacts due to the loss of crab pots and damaged equipment. Additionally, issues of authority over treating these food security issues and questions of disaster declaration funding for subsistence crashes were noted.

Some divergent topics of discussion were access to medicine following the storm, ensuring responders understand how intertwined subsistence activities are to all aspects of nature (seasons, ecosystem, etc.), and damaged infrastructure as a result of the storm.

Question 8: If the storm caused substantial damage to specific ports, harbors, or airfields, what priority of response would participants expect or request?

The main common thread to Question 8, which was not as discussed as other topics, was that airfields are generally 12 feet or less above sea level, and as such are vulnerable to storm surge flooding.

Question 8 generally had divergent responses. One group noted that food, shelter, and safety were more important than actual sources of transportation. Another group discussed that resupply could be impossible or not a viable option if infrastructure is completely destroyed.

Question 9: A severe storm along coastal regions could cause longer enduring economic issues. What areas of concern due participants see as most pressing? (e.g., mines, fisheries, movement of commerce, other?)

Question 9 also was not as discussed as other topics. The main common discussion were food security issues in terms of both groceries and subsistence foods. The supply chain for groceries could be disrupted as a result of infrastructure loss, and subsistence could be disrupted due to equipment loss. Another common topic of discussion was loss of commerce/economic damage - fisheries, groceries, a fish processing plant at St. Paul, and administrative infrastructure (job loss) were all noted as vulnerabilities.

There were several divergent topics of discussion, as well. Downstream contaminants could travel upstream as a result of storm surge, especially near White Mountain. Fuel supplies were a noted issue. One group postulated that loss of life and injury were a worst-case scenario. If power and communications were damaged, it was noted that they should be brought back on-line as soon as possible.

Question 10: A severe storm could impact/damage important cultural sites or perhaps culturally relevant processes. What insights can participants provide to help identify important or priority culturally relevant sites or processes to increase understanding for response personnel.

The single common thread for Question 10 was the U.S. Department of the Interior as a source of identifying/archiving historical and cultural sites.

However, in divergent discussions participants also noted that elders with subject matter experience and whaling captains were also good sources for identifying culturally relevant sites/processes. One group noted that elders and Alaska Natives with subject matter expertise then backed by whaling captains and state and federal agencies. Regional organizations and archives could be sources and repositories of culturally relevant information, as well as tribal governments. It was discussed that many culturally relevant sites revolve around subsistence, and that subsistence items can be both economic and cultural. Many small communities also prepare for a year's food in advance, and that the preparations for the year's food supply only occur at a specific time of year.

Question 11: Describe crisis response decision context needs and priorities in wake of a regional-wide disaster.

There only common thread for Question 11 was a need for communication. Two-way communication between agencies and local knowledge holders should be conducted during the storm and after the storm. Additionally, efforts to address storm damage should be coordinated, since a lack of coordination could lead to the loss of irreplaceable resources.

The divergent responses to this discussion were plentiful. It was noted that different prioritization may be necessary for different communities, and some regions may disagree with other regions' priorities. State On-Scene Coordinators should send agents to communities to assess damage and determine the most damaged aspects of a community (e.g., coastline, water treatment facilities). Health and safety was noted by one group to be the highest priority. Due to the timing of storms (late fall and early winter), the full extent of storm damage might be not determinable until spring. Cultural, economic, and subsistence recovery were discussed to be important priorities. Crisis triage (first-response priorities) needs to be culturally-informed.

Conclusions and Acknowledgements

The Arctic IoNS Nome “insights” workshop provided incredible insights that are useful to support the subsequent Arctic IoNS workshop held at UAA in late May 2019. This “advance” Arctic IoNS workshop successfully engaged Alaska Native and rural Alaskan perspectives in order to understand gaps in capabilities needed to support effective crisis response during and after a scenario in which multiple significant challenges present themselves at once. The substance of the preceding report is not only useful for driving much of the preparation for the Arctic IoNS Ma 2019 workshop, it actually is well positioned to serve as a stand-alone knowledge product.

ADAC and the University of Alaska extends our sincerest appreciation and most profound “thank you” to a remarkable team of professionals who supported this workshop...starting with workshop partner’s Sandia National Labs. Their individual and collective investment in this workshop has provided an immense amount of insight concerning the improvements needed to aid the USCG and community in responding to a complex crisis in the Arctic region.

Accordingly, ADAC and Sandia NL Labs are very appreciative of the efforts of the following workshop planners, organizers, supporters and collaborators:

- Headquarters U.S. Coast Guard Arctic Advisor to the Commandant;
- Headquarters U.S. Coast Guard Office of Emerging Policy—“Evergreen;”
- U.S. Coast Guard District 17 Arctic Planners;
- U.S. Coast Guard Academy Center of Arctic Study and Policy (CASP);
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- National Oceanic and Atmospheric Administration;
- National Weather Service;
- Trent University;
- Pacific NW National Laboratories.

Workshop organizers will follow-up with the subsequent Arctic IoNS 2019 Anchorage report.



Arctic IoNS 2019 Workshop Planning Collaborators (including the advance consulting workshop in Nome)

Appendix: All Vote-able Responses to Questions

Question 1: What are the concerns in preparedness and response to a severe weather event in participant "local areas of concerns?"

Communications -local, offshore, regional -deal with remoteness -deal with distance between communities -help neighbors help each other
Need centralized locations and ability to get people there in cold, wind, rain -transportation, equipment, generators, comms
Early notification of progress of an incident (for example, "taken care of," "getting worse") to responders to prioritize resources
Plan for contingencies, interdependencies - understand what to do with unexpected failure, or chains of failure
Deal with skill gaps or scarce experts (for example, the doctor is injured)
How do we make drills and exercises more realistic and stressing (without killing participants)
Rescue tug or other good Samaritan measures: awareness/resources
Crew rescue and SOLAS (safety of life at sea)
Local info with respect to cargo manifest
Ship AIS tracking within Bering Sea
Rescue Capacity reduction for SAR/crew
"Peace time" communications between local, state federal government resources
First response assistance/preparation/training
Rural Alaska resiliency via redundancy

Weather forecast/monitor
Proximity of support from outside
Emergency ops manual or Youtube
Training -translated into local dialects for one-pager -include one-pagers in area contingency plans

Question 2: What are the local “incident coordination” practices and expectations for responding crisis support teams?

Self sufficiency
Knowledge, skills, abilities
Relationships/liaisons
NGB capability/integration
Disaster declaration for inbound teams/remove funding burden from local government
Coordination pathways for local knowledge
National response center, #1 call to make
Call Nome
Facebook messaging and other social media
Text
EOC at Ft. Rich (JBER)
Laminated call list and flip book (and training)
First response assistance/preparation/training
Rural Alaska resiliency via redundancy
Weather forecast/monitor
Proximity of support from outside
Emergency ops manual or Youtube
Training -translated into local dialects for one-pager -include one-pagers in area contingency plans

Question 3: How would local regional response teams seek to communicate with vessel masters, local mariners and rural/coastal communities in crisis?

Multiple ways to communicate? -VHF, Satcom, CB radio? -Internet? Speed?
Integrating response from outside of local area to local incident command?
VHF (due to range)
Cell phone
Social media (messenger, Facebook)
Landlines
Satellite phones (for some organizations and commercial fishers, too expensive for many)
In-Reach (great capability, new, expensive and requires subscription)

Question 4: How might local populations communicate and create force multipliers in terms of communication, situational awareness, and response?

Traditional knowledge not as broadly shared
Who local resources are via regional team -Know your team
Tribal liaison
Need a known face
Drones for situational awareness
Commercial mariners could cause more chaos as they come to shore - more stress -but might be helpful for detecting pros won't take on hazardous material -could be comms repeaters to extend message range
Ham operators are a thing of the past
Increase/expand networks locally to give ground truth, predictions, and create broader situational awareness -so need a way to identify Persons of Contact
USCG training for community resilience in village, on the ground, start in schools, weather service training, other providers. Integrated training
Targeted community, prioritized

Question 5: Outline current abilities in differing regions to communicate under crisis conditions (voice and data). How effective/reliable are these communication systems?

Rural Alaska reliability of telecoms
Universal limiting factor: speed and bandwidth
VHF/HF/Ham radio relays
Satellite phones provided
Hardline/pots
Local residents commonly face communications issues; resiliency until overwhelmed
Local understanding and local language and terminology
Snow and ice named by region: how do we capture this?
Local - great weather application "with precision"
Weather from weather apps, NOAA weather forecast, calling other locals for current conditions or predictions
Facebook or other social media
Radios
"Looks good, I am just going... by myself." (mostly younger folks)
Understand that different communities use different approaches and have different levels and types of capabilities

Question 6: If hazardous materials come ashore (assuming chemicals and materials that are non-explosive), what would be the local concerns and response?

Need to figure out where hazardous materials could enter into marine or freshwater
Limit access to area and only use trained response individuals
Education and communication about dangers
Concerns of impacts to wildlife (contamination, entanglement, ingestion)
Where to store, dispose, sequester
Ideas: 1. tracking devices on containers, 2. Phone numbers of who to contact (ADF&G, USFWS, ADEC, etc.)
Training, communications, money, and equipment
Re-allocation of taxes, OPA-90, etc.
Human exposure
Beach cleanup. Use of drones to identify particular beaches which collect debris -have to clean every year -likely candidate for oil spill "collection point" -surface current -CFOS, Bering surface current
Big data - what makes it big?
Education about resources
1. Knowledge of local knowledge -into systems/algorithm -local knowledge integration -repository? -"8 years of collection onto the beach" -Mapping -Arctic ERMA shore data -All-Hazards? -Disconnect -what's important -Common user-defined situational awareness
2. Geographic response strategies -endangered species consideration

3. State's community response network
4. Small community emergency response plan
5. ERMA training
6. Kawerak local current traditional knowledge base
Subsistence fisheries threatened
Coordination with local responders to monitor orphan containers
Isolate or redirect to mitigate threat
Public notification/awareness
General aviation - spotters
Community authorities provide security
CST/State regional hazmat team capacity

Question 7: As a result of the storm severity, what subsistence issues, should response personnel understand?

Impact on fisheries/food security -hazmat risk to fisheries -impact of response on fisheries and closures -rookeries/shoreline wildlife activity
All marine wildlife, macro algae, shellfish, invertebrates, fishes/seabirds and eggs
Food
Public health
Food security/subsistence crash prevention
Agency management responsibilities
Help for loss recovery
More proactive closures of fishing/crabbing areas (need)
Make sure response personnel understand how intertwined subsistence/economics/food security/spiritual health are
Questions 7-10 are not separable!

Question 8: If the storm caused substantial damage to specific ports, harbors, or airfields, what priority of response would participants expect or request?

Food and water, shelter and food, fuel paths
Food security issues will persist
Effects on the shoreline impact interior communities due to supply chain
Spill response as a result of storm damage
Boom response - to contain then recover oil from the water. Proven technology matters.
Withdrawal of oil within ice environment
New technologies for collection?
Herding and burning? Congealing?
Oil spill response equipment

Question 9: A severe storm along coastal regions could cause longer enduring economic issues. What areas of concern due participants see as most pressing? (E.g. mines, fisheries, movement of commerce, other?)

Food security as a result of pollution resulting from storm damage
"Leaking oil" - a pressing concern
Knowledge of what happened? Knowledge of responding agencies (and what they are doing)
Effects of oil pollution to animals and people who eat them
Subsistence crash prevention i.e. economic disaster declaration
Resident public health
Power
Communications
Livelihood recovery
Economic drivers (primary)

Question 10: A severe storm could impact/damage important cultural sites or perhaps culturally relevant processes. What insights can participants provide to help identify important or priority culturally relevant sites or processes to increase understanding for response personnel.

Identify contaminants
Protect shores, bird habitats; areas can only access eggs or meat at certain times of the year (needs to be in plans to prioritize response)
Could be "proprietary" sensitive data communities don't want to share
State historical/cultural protection office
Local elders/AK natives with SME (subject matter expertise)
Whaling captains
Regional corporation archives
Tribal governments
Accountability
Regional responsibility
Tribal research protocols
Proximity place-based research, economy, and study

Question 11: Describe crisis response decision context needs and priorities in wake of a regional-wide disaster.

Standard crisis/recovery, triage of priorities (culturally informed)
Life and safety
Stabilize property and environment
Cultural/subsistence recovery
Communities and agencies need to understand what each offers -cross entity communication
Prioritize precious resources
1. PAH's (Poly Aromatic Hydrocarbons) - compare oiled wildlife to non-oiled wildlife to show impact and establish baseline
2. marine spill response research
3. Indigenous research component - exception bonus turned into requirement
4. "Technology bias?" -reduce the bias -research centered in the Arctic? -knowledge co-production - it is key
5. Give the information back? -Communication and communication gaps
6. More buoys