Increasing Resilience in Alaska’s Environmentally Threatened Communities

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American Planning Association Housing and Community Development Division Webinar
January 29, 2021
Alaska by the Numbers

Alaska is 1/5 the size of the contiguous Lower 48.

The average rural community population in Alaska is <500.

95% of the 144 environmentally threatened communities facing infrastructure impacts from erosion, flooding and permafrost thaw are small and low-income.

Over 1/3 of all Federally Recognized Tribes are in Alaska.

229 Alaska Tribes
345 Other Tribes

200 off the road system
136 on the road system

200 of Alaska’s 336 communities are off the road system.

Each year the average rural Alaskan harvests 295 pounds of food from the land and waters.

In February 2020, the cost of gas in Noatak, AK was $10/gallon.

Adapted with permission from the Alaska Climate Adaptation Science Center.
Indigenous Peoples and Languages of Alaska

- 11 distinct cultures
- At least 20 languages among those cultures

Map: Alaska Native Language Center and University of Alaska Institute of Social & Economic Research
**Increased Precipitation**
More frequent and severe precipitation events can cause flooding and erosion.

**Increased Wind Speeds**
High wind speeds can amplify the impact of storms.

**Rising Air Temperatures**
Warming air temperatures lead to permafrost thaw and the loss of sea ice.

**Coastal Erosion**
Rising sea level contributes to coastal flooding and erosion.

**Sea Level Rise**
Rising sea level contributes to coastal flooding and erosion.

**Loss of Sea Ice**
Barrier sea ice buffers the coastline from severe storms.
Ice Jam Flood in Galena, 2013

Photo: NWS
Erosion

Newtok, Summer 2006

Newtok, Summer 2019

Photo: VSW

Photo: ANTHC
Thawing Permafrost

Shifting Boardwalk in Newtok

Photo: ADN
Protection-in-place: The use of shoreline protection measures and other controls to prevent or minimize impacts. These measures allow the community to remain in its current location.

Managed retreat: Moving a portion of the community away from hazard-prone areas to locations in the community or adjacent to the current site. In order to successfully retreat, a community needs developable land nearby.

Relocation: Moving the entire community to a new location that is not connected to the current site. Relocation is the option of last resort.
Protection-in-Place

Photo: Alaska ShoreZone

Rock revetment in Kivalina
Managed retreat in Napakiak

Photo: City of Napakiak
Relocation

Newtok’s new village site, Mertarvik

Photo: UMCOR
Phases of Community Resilience

**Assess Risk**
- Collect site-specific baseline data such as LIDAR, bathymetry, tidal determinations, river currents, sediment transport, flood history, and geotechnical investigations.
- Determine the suitability of available climate projections and downscale models if appropriate.
- Conduct hazard-specific forecasts such as shoreline mapping, inundation and storm surge modeling, hydrodynamic modeling, permafrost degradation modeling, etc.

**Planning**
- Develop strategies to respond to the risks identified in the previous step, accounting for the requirements of individual types of infrastructure, such as power plants, water and sewer distribution lines, barge landing sites, schools, washeterias, community centers and other vital offices or facilities.
- Identify both near-term and long-term solutions.
- Decide whether project(s) should be managed locally or with outside assistance.

**Implementation**
- Carry out preferred solutions or pathways through locally-managed construction or outside project management contractors.
- Includes permitting, contracting, administrative reporting, and reimbursement processes.

Local Understanding of Risk  
Local Actions to Reduce Risk  
Increased Local Resilience
Challenges & Vulnerabilities of Rural Alaska

Level of technical expertise required for most projects

Lack of redundancy in physical infrastructure systems

Limited communication infrastructure

Development Costs

- High transportation costs due to the vast distances between villages
- Lack of roads - about 60% of Alaska’s communities are not connected by roads
- Lack of local resources (gravel) for projects
- Harsh temperatures
- Shortage of remote construction workers
Housing Development Costs

Construction
Total development costs (including land, platting, roads, water and sewer in addition to home construction) typically range from $450,000 - $750,000 a unit*

Infrastructure
- Infrastructure construction typically costs millions of dollars.
- Piped water and sewer services may never be feasible In many rural communities
- The housing developer (tribe, housing authority, or community organization) is responsible for connecting houses to roads, water, and sewer

* Alaska Housing Finance Corporation
Impacts to Housing Stock

Overcrowding
Nearly 12 times the national average in some rural communities

One-Star Homes
Require at least 4 times the energy of home built to standards

Poor Ventilation
Resulting in widespread mold + residents with respiratory illnesses

Many homes not built for harsh winter weather
Exacerbation of Existing Stressors

Overcrowding + Lack of Housing
Approximately 12 times the national average in some areas

Increased Accidents + Injuries
Attributed to extreme weather events, such as droughts, floods, storms, and ice loss

Access to Clean Water
Impacts human health - waterborne diseases; decreased availability and quality of drinking water

Food Insecurity
Diminished food quality and quantity of subsistence resources; decreased access

Decreased Mental Health
Acute events and slower-moving impacts close to home are causing anxiety, depression, and post-traumatic stress disorder
Newtok 2006-Present

1993
Community decision to relocate

1994
Review of alternate sites/Site selection process

2003
Land exchange with USFWS for site control

2006
Request to State for Assistance
Newtok Planning Group 2006-Present

**Newtok**
- Newtok Village Council
- Newtok Native Corporation

**State of Alaska**
- Commerce, Community, and Economic Development/Community and Regional Affairs—*group coordinator*
- Environmental Conservation/Village Safe Water Program
- Transportation and Public Facilities
- Military and Veterans Affairs/Homeland Security and Emergency Management
- Education and Early Development
- Health and Social Services
- Alaska Energy Authority
- Alaska Governor’s Office
- Alaska Legislative Representatives

**Regional + Non-Profit Organizations**
- Association of Village Council Presidents, Regional Housing Authority
- Alaska Native Tribal Health Consortium
- Coastal Villages Region Fund
- Lower Kusko kwim School District
- Rural Alaska Community Action Program
- Yukon-Kusko kwim Health Corporation

**Federal**
- U.S. Army Corps of Engineers, Alaska District
- Economic Development Administration
- National Oceanic and Atmospheric Administration
- DoD Innovative Readiness Training Program
- USDA, Rural Development
- USDA, Natural Resources Conservation Services
- Housing and Urban Development
- Bureau of Indian Affairs
- Federal Aviation Administration
- Environmental Protection Agency
- Denali Commission
- Alaska Congressional Delegation Representatives

Source: Vice News
Conceptual Community Layout Planning

2008

2011

2015

Photo: Sally Russell Cox
The relocation of Newtok will be defined by our Yup'ik way of life.

Our Guiding Principles are:

- To remain a distinct, unique community – our own community
- To stay focused on our vision by taking small steps forward each day
- To make decisions openly and as a community and look to elders for guidance
- To build a healthy future for our youth
- Our voice comes first – we have first and final say in making decisions and defining priorities
Guiding Principles for Newtok Relocation

- To share with and learn from our partners
- No matter how long it takes, we will work together to provide support to our people in both Mertarvik and Newtok
- Development should:
  - Reflect our cultural traditions
  - Nurture our spiritual and physical well-being
  - Respect and enhance the environment
  - Be designed with local input from start to finish
  - Be affordable for our people
  - Hire community members first
  - Use what we have first and use available funds wisely
- To look for projects that build on our talents and strengthen our economy
Developing Mertarvik

[Map of Mertarvik with color-coded areas for different construction phases and labels for key locations such as Tank Farm, Ungwaraq Road, Chimnaq Road, Astapakers Road, and Future Airport (Not Shown on Map).]

Legend:
- 2019 Road Construction
- Existing Houses in Use
- Construction Camp
- Power Plant
- 2020 Road Construction
- Isolation Units
- Continuation of House Pads
- 2020 BIA Home Construction
Mertarvik Housing

HUD Native American Housing Assistance and Self Determination Act of 1996 (NAHASDA)

Bureau of Indian Affairs Housing Improvement Program

FEMA Hazard Mitigation Grant Program (housing buyouts)

FEMA Pre-Disaster Mitigation Program (housing pads)

Congressional Allocation to Denali Commission (Cold Climate Housing Research Center homes)

Cares Act (isolation units which will later revert to community housing)
Mertarvik Housing Policies

• Identifies how families will become eligible for housing based on level of threat and income
• Developed by the Newtok Village Council and reviewed by state/federal agencies with housing expertise
• Compliments other policies for the relocation effort, including procurement and purchasing policies and construction standards
Lessons Learned

Community-Driven Approach
• Empowers and honors community decision-making, sovereignty, and self-determination
• Prioritizes local workforce development

Engaged Partnerships and Governmental Coordination
• Addressing funding and technical assistance gaps requires collaboration, leveraging of resources, and coordination of expertise

Data Collection + Risk Assessments
• Foundational to community understanding risk and making informed decisions about adaptation

Reprioritized Development
• The speed and severity of environmental threats may necessitate the development of pioneer housing before final infrastructure is in place.
2019 Alaska Statewide Threat Assessment

Statewide Threat Assessment: Identification of Threats from Erosion, Flooding, and Thawing Permafrost in Remote Alaska Communities

Report Prepared for the Denali Commission

By
University of Alaska Fairbanks Institute of Northern Engineering
U.S. Army Corps of Engineers Alaska District
U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory

November 2019
Congressional Request to Bureau of Indian Affairs:

“...develop a report outlining the unmet infrastructure needs of tribal communities and Alaska Native Villages in the process of relocating to higher ground as a direct result of the impacts of climate change on their existing lands.”

[1] FY 2020 House appropriations report 116-100
[2] Including 4 Alaska Native Non-Profits and 4 Alaska Native Regional Health Corporations
[3] Communities in Threat Groups 1 and 2 for erosion, flooding and thawing permafrost
Estimating Unmet Needs

Unmet Need = Total Need − Existing Support

The $$ needed over next 50 years to protect infrastructure

The $$ currently available through federal programs. About $13 million average per year
Estimating Infrastructure Costs

Protect-in-Place

Can physical measures be implemented to mitigate threats?
- Yes
- No

Select: Identify the type of structure mitigation from a list of options.

Quantify: Use map products to delineate quantities (length, area, quantity).

Estimate: Determine cost based on regional unit cost factors (quantity x unit cost).

Managed Retreat

Is there a safe place within the existing community to move threatened facilities?
- Yes
- No

Quantify: Use map tools to delineate the extend of the community impacted by the threats.

Estimate: Determine the cost from baseline relocation cost modified by regional and population factors.

Relocation

Is relocation to the new site the only feasible mitigation option?
- Yes
- No

Estimate: Determine the cost from baseline relocation cost modified by regional and population factors.
Estimating Unmet Needs

Unmet Need = Total Need - Existing Support

- Unmet Need: $77-97 million/year (-$80 million average) over next 10 years
- Total Need: $90-100 million/year over next 10 years*
- Existing Support: $13 million average/year

*Alaska Native villages face an estimated $3.5 billion in threats to infrastructure over the next 50 years from erosion, flooding, and permafrost thaw.
Results Summary

• Total Need: $3.45 Billion
  - $3.5 Billion over 50 years
  - $90 - $110 million per year over the next 10 years
  - Additional $830 million for hub communities

• Vulnerability Assessment
  - 119 communities need 1 or more assessments
  - $32M required for assessments

<table>
<thead>
<tr>
<th>Geographical Region</th>
<th>Regional Costs</th>
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<tbody>
<tr>
<td>Aleutian and Pribiloff Islands</td>
<td>$68,805,000</td>
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<tr>
<td>Arctic Slope</td>
<td>$281,600,000</td>
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<tr>
<td>Bristol Bay</td>
<td>$72,290,000</td>
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<tr>
<td>Interior</td>
<td>$158,480,000</td>
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<td>Northwest</td>
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<td>South East and South Central</td>
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<tr>
<td>Yukon Kuskokwim</td>
<td>$1,673,535,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$3,453,850,000</strong></td>
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• Key Assumptions
  - Threats can be addressed as mitigation
  - Professional judgements don’t represent community decision-making
  - Costs in 2020 dollars
• Key Mitigation Framework Elements:
  o Guiding Principles
  o Dedicated Management/Leadership Positions
  o Coordinating Structure of Required Support Capabilities
  o Assigned Agency Roles and Responsibilities
  o Adoption by Both State and Federal Leadership

• Modeled after FEMA’s National Disaster Recovery Framework
A Phased Approach to Village Relocation

1: Relocation Decision
   - Establish local relocation coalition
   - Ensure administrative procedures, procurement and financial policies are in place
   - Obtain professional services as necessary
   - Select local relocation coordinator
   - Find support for community travel costs
   - Develop emergency response / evacuation plan
   - Implement temporary protection measures

2: Site Selection and Acquisition
   - Define community criteria for relocation site
   - Identify potential relocation sites
   - Analyze potential relocation sites
     - Perform aerial photography and site mapping
     - Perform geotechnical - hydrological investigation of alternative relocation sites
   - Conduct the site selection process

3: Getting Ready
   - Acquire title to land

4: Pioneering
   - Conduct baseline enviro studies
   - Conduct geotechnical and bathymetric studies
   - Complete planning stage topographical study
   - Conduct airport relocation study
   - Complete barge loading analysis + design study
   - Prepare quarry recon, report
   - Prepare sanitation facilities prelim. engineering report

5: Transition
   - Complete Strategic Mgmt Plan
   - Select airport + townsite sites
   - Construct barge landing
   - Prepare master plans for energy, water/sewer + housing
   - Environmental Analysis
     - Prepare community layout
     - Prepare airport layout plan
     - Design/construct homes, access roads, landfill
     - Design evacuation shelter, water + wastewater systems

6: The Final Move
   - Build/relocate clinic
   - Design telephone + cable systems
   - Build remaining townsite roads (Townsite Roads Stage III)
   - Build/relocate remaining homes (housing Stage III)
   - Design/build piping water/sewer + water treatment systems
   - Design/build power grid
   - Build cross-wind runway

7: Decommissioning the Old Village
   - Conduct inventory + assessment of remaining buildings, infrastructure and facilities at old village
   - Develop a plan for assessing the site
   - Conduct field assessment to determine safe contaminant levels for subsistence use
   - Prepare a Site Characterization Report
   - Remediate the old village site
Contact:

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