Managed Retreat as a Strategy for Climate Change Adaptation in Small Communities: Public Health Implications

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Health Impacts of Climate Change

Climate change:
- ↑ temperature
- Sea level rise
- Weather extremes

HEAT	Heat stress, cardiovascular failure, ↓ work capacity
SEA LEVEL RISE & SEVERE WEATHER	**Injuries, fatalities, community disruption**
AIR POLLUTION	Asthma, cardiovascular disease
ALLERGIES	Resp allergies, poison ivy
VECTOR-BORNE DISEASES	Malaria, dengue, hantavirus, encephalitis, Rift Valley fever
WATER-BORNE DISEASES	Cholera, cryptosporidiosis, campylobacter, leptospirosis
WATER & FOOD SUPPLY	Malnutrition, diarrhea, harmful algal blooms
MENTAL HEALTH	Anxiety, post-traumatic stress, depression, despair
RESOURCE SCARCITY & COMPETITION	Forced migration, civil conflict

Background

- Sea level rise and related hazards associated with climate change are making some communities uninhabitable
- Small communities typically have few resources for planning or disaster response
- Managed retreat, or planned relocation, is a proactive response prior to catastrophic necessity
- Managed retreat has disruptive health, social, cultural, and economic impacts on communities that relocate

Managed Retreat: Potential Impacts on Health

- Determinants of health
  - Food security
  - Housing
  - Access to health care and social support services
  - Maintenance of social ties and cultural identity
  - Access to water, sanitation, and energy
  - Access to education
  - Source of livelihood

Managed Retreat: Potential Impacts on Health (cont.)

- Direct health risks
  - Exposure to infectious diseases such as malaria
  - Exposure to environmental toxins
  - Mental health associated with stress of relocation
  - Injury - trauma, drowning

Methods

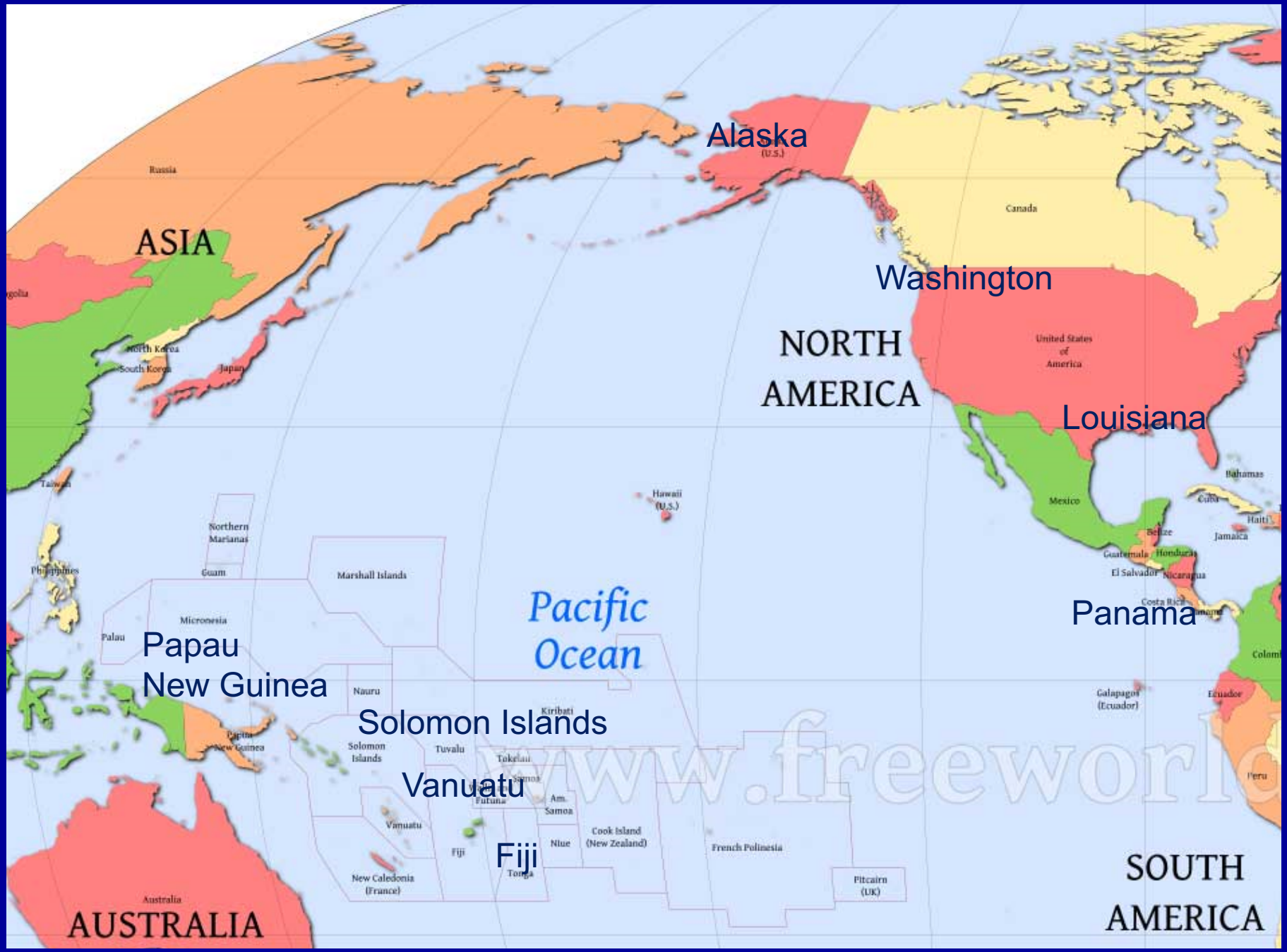
- Searched peer-reviewed and gray literature for reports on small communities at various stages of relocation due to sea level rise, storm surges, coastal erosion, subsidence, salt water intrusion
- Initial literature findings led to additional relevant communities
- Preference for communities with detailed information available

Results

- Identified 8 small island or coastal communities at various stages of relocation in the United States and internationally
- Affected populations range from 60 to 2700 persons
- Mostly low income indigenous peoples
- Many rely at least in part on subsistence fishing and agriculture

Case Studies

- Kivalina, Alaska, US
- Taholah, Washington, US
- Isle de Jean Charles, Louisiana, US
- Gardi Sugdub Island, Panama
- Vunidogoloa, Fiji
- Tegua Island, Vanuatu
- Taro Island, Solomon Islands
- Cartaret Islands, Papua New Guinea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Kiribati
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Cook Island
(New Zealand)
French Polinesia
Pitcairn
(UK)
Fiji
Tonga
New Caledonia
(France)
Vanuatu
Solomon
Islands
Bahamas
Cuba
Haiti
Jamaica
Belize
Guatemala
Honduras
El Salvador
Nicaragua
Costa Rica
Galapagos
(Ecuador)
Ecuador
Peru
Australia

Kivalina, Alaska

- Isolated Alaskan Native island community of 400
- Relocation needed due to repeated flooding and erosion
- Multiple failed attempts at shoreline stabilization
- No federal or state funding for relocation
- Sites for relocation consider storm surge and coastline erosion vulnerability, water supply, and costs
- No agreement reached on the best site

Taholah, Washington

- Quinault Indian Nation coastal community of 825 people
- Repeated flooding and risks of tsunamis and storm surges
- Received a $700,000 grant in 2013 from the federal Administration for Native Americans for relocation planning
- Houses, businesses, and community structures to be built ½ mile from existing village
- Plan designed with extensive community input
- Best practices for resilience, walkability, energy efficiency, and stormwater management
- Land clearing for new village began late 2016

Isle de Jean Charles, Louisiana

- Native American coastal community of 175 people
- Hurricane-related flooding, soil subsidence, coastal erosion, sea level rise
- Received U.S. Dept. of Housing and Urban Development $48 million relocation grant in 2016 - first such U.S. climate change refugee grant
- Progress slowed by a strong sense of place attachment, lack of community consensus on whether and where to move, lack of job opportunities, distrust of government

Gardi Sugdub Island, Panama

- Island community of indigenous Guna people with 300 families and strong cultural identity
- Seeking to relocate to mainland due to sea level rise and to accommodate population growth
- Land cleared at new 42 acre mainland site, funded by local residents and community families who live in capital city
- Despite government promises, slow progress in building new school complex, a health center, and replacement housing
- Malaria and yellow fever risk not on island but may be at new site

Vunidogoloa, Fiji

- Small island village of 140 persons successfully moved two kilometers inland in 2014
- Years of flooding and salt water intrusion; seawall failure
- Factors contributing to its successful relocation include public involvement in decisions, use of both government and community resources, the availability of community-owned land nearby, and assistance in adjusting agriculture and fishing livelihoods
- Local official: "Relocation [is] not about moving houses, it's about moving lives."

Tegua Island, Vanuatu

- Small tropical coral atoll with population of ~ 60 people
- Self-sufficient with residents belonging to an extended family
- After many floods, cyclones, earthquake and tsunami, town planned and moved to new higher site 300 meters inland
- Community built 6 communal structures with post-tsunami Canadian relief funds
- Adaptive factors: human capital, social capital, belief systems, resources and distribution, options, information and awareness, history of dealing with climate stress

Taro Island, Solomon Islands

- Small coral atoll is a provincial capital with population of 600
- 3 prior evacuations related to tsunamis and seismic activity
- Plans for relocating to a new site began in 1994
- Provincial government recently stopped funding for island's infrastructure
- Province purchased 1200 acres of swampy forest land for new town site on mainland 2 km away by boat
- Planners working with community on design of new town
- Government funding inadequate so far

Cartaret Islands, Papua New Guinea

- 6 islands, 150 acres, <4 feet above sea level, 2700 people
- Coastal erosion and groundwater salinization problems
- Relocation attempts since 1960s by government unsuccessful
- Problems with lack of suitable land, coastal fishing access, livelihoods, food insecurity, community engagement, malarial mosquito exposure, interactions with new neighbors, relevance of traditional environmental knowledge
- Land donated by Catholic Church for relocation helpful
- Large role of Autonomous Bougainville Government to move families

Factors Contributing to Successful Managed Retreat

- Availability of suitable land, ideally near original site
- Availability of funding
- Community engagement in planning process
- Assistance in maintaining agriculture and fishing livelihoods
- Improved infrastructure in new site - water, sanitation, housing, schools, energy, community center, health services

Barriers to Relocation

- Lack of funding
- Place attachment
- Community disagreement on when and where to move
- Relocation driven by external decision makers rather than by community
- Availability of suitable land
- Potential loss of livelihoods
- Potential cultural conflicts in new location

Beyond the 8 Case Studies: Need for Managed Retreat in Other At Risk Communities

- Alaska: at least 30 other communities including Newtok, Shaktoolik, and Shishmaref
- Washington state: other Native American coastal communities including Hoh and Quileute tribes
- Panama: at least 40 other island communities
- Fiji: at least 45 other villages

Public Health Considerations

- Case studies provide suggestions of health impacts, but few reports explicitly describe health implications of managed retreat
- Measuring changes in rates of disease may be difficult in small communities
- Health impacts seen in populations migrating due to war, drought, and other reasons may be relevant

Research Implications

- Conduct surveillance before and after relocation to better document health impacts, such as changes in infectious diseases, access to food, water, housing, health care
- Compare health impacts in
    1. a population that relocates early as sea level rise affects their community
    2. a similar community that delays relocation

Research Implications (cont.)

- Compare health impacts in population relocation due to sea level rise to health impacts in populations migrating due to war, drought, and other reasons
- Examine relevance of frameworks to protect the rights of displaced persons from other contexts, such as refugee camps

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