Arctic Risk Management Network: Linking Regional Practitioners and Researchers to Improve Mitigation Through Participatory Action Research by Community Monitors about Erosion and Surges to Improve Forecasting

Anne Garland, With Applied Research in Environmental Sciences Nonprofit, Inc. (ARIES)

Heather Seemann, North Slope Borough Office of Emergency Management (NSB OEM)

Thomas Ravens, University of Alaska, Anchorage, School of Engineering

Jacquelyn Overbeck, Alaska Coastal Hazards, DGGS

With Applied Research in Environmental Sciences Nonprofit, Inc. (ARIES), Alaska Sea Grant and the NSF NNA funds, this project continues the development of the Utqiagvik, AK. (Barrow) community-based monitoring network for coastal observations and develops the coastal hazards forecasting system focused on the forecasting of coastal surge, flooding and coastal erosion. The existing coastal monitoring system consists of repetitive survey of and weather/wave observations at six cross-shore transects along the city shoreline which was initiated in 2015 by ARIES and North Slope Borough Office of Emergency Management (NSB OEM). The Alaska Coastal Corps of Observers (AkCCO, Smith, 2011} survey and observation methodology was implemented. The transects monitor critical infrastructure identified with the NSB OEM. The coastal monitoring system was expanded in 2017.

First, community observers document storm surge heights with photos and videos during surge events. This included a near shore landmark which was graduated with stadia marks. Second, the survey methodology was expanded with auto levels/stadia and included the coastal gravel berm as the community surge barrier. Third, an Argus video camera is being deployed on a public utility pole to document the near-shore wave conditions and water level. A HOBO is planned for installation on the near shore landmark with the graduated stadia marks for redundant evidence of water levels. As with the transect surveys and the surge level photography, the camera and HOBO will be maintained by coastal monitors. Fourth, the Alaska Coastal Hazards of DGGS are collaborating for data storage, profile and map visualizations and distribution to researchers based on community protocols for data access. Fifth, a green engineering survey of the surge barrier is continued since 2014 with an ecology study of the tundra plants that seasonally migrate to the gravel berm. The tundra plants are observed to be sea spray resistant, stabilize the gravel matrix, and seasonally colonize consistently based on the nearby vegetation. After the ecology study, a community garden with the tundra colonies is planned along a section of the landward berm for health, heritage, and hazard reduction. The garden section will be a seasonal experiment for its impacts by surges and stabilization capabilities prior to expanding the garden further on the berm. The coastal monitors include families and their children who are using this green engineering research for school projects. Sixth, in 2016 a near shore and lagoon study of harmful algal blooms was initiated with the NOAA Phytoplankton Monitoring Network, the NSB Wildlife Management, and ARIES which is expanding in collaboration with offshore cruise studies of the toxic species that impact the subsistence economy of the NSB communities (Anderson, 2018). The maritime traffic and storm water are increasing the risk of pollutants and nutrient changes along with the warming weather and more precipitation to encourage growth of harmful algal blooms.

Data collected by the monitors and the technical observation systems are used to calibrate and validate the storm surge, coastal flooding, and coastal erosion forecasting system with computer engineers at

University of Alaska, Anchorage. In the event of a large storm, erosion forecasts generated by the project can be provided to the AK National Weather Service and the North Slope Borough Risk and Emergency Management Office to take pro-active measures to improve control of erosion and flooding of critical infrastructure. The forecasting based on long term hindsight observations, can inform decision making at various government scales to prepare and select mitigation options locally and regionally. The mitigation of coastal risks impacts the safety of maritime commercial traffic, maritime distribution and supply chains, and potential port installations for the economic benefits of Arctic communities. This transdisciplinary project serves as a demonstration of how community-based coastal monitoring efforts, coastal hazards forecasters, coastal ecology researchers, and emergency managers can collaborate to share knowledge and mitigate risk with the increasing coastal hazards. There is a conscious approach to recruit, train, and have monitors as integral participants of the research team who provide feedback and input to methodology using participatory action research. The monitors also provide a corps of risk awareness educators about coastal risks with special events during the year such as library exhibits, school activities, interactive discussions with various sectors of the community, and applied theater with relevant script readings, such as participation in Climate Change Theater Action (http://www.climatechangetheatreaction.com/).

The project includes public education and workforce development with HS curricula about coastal erosion and hazards with funds from the Gulf Research Program. Community volunteers, camp youth, and students are directly engaged with the project team and have the opportunity to place base learn, experience interactive activities, and do projects relating to coastal monitoring, water quality, coastal forecasting, green engineering, and emergency management.

References

Don Anderson, 2018, https://www2.whoi.edu/site/andersonlab/current-projects/arctic-habs/

Orson Smith, 2011, Alaska Corps of Coastal Observers Training Manual Draft
https://aoos.org/community-based-monitoring/