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Arctic Facilities and Infrastructure Environmental Change Risk Index

As the Arctic region is exposed to the impacts of climate change, increased coastal erosion, and more frequent precipitation, structures once protected by shore-fast ice and securely anchored in permafrost are now exposed to an increasingly dynamic and adverse environment. The imminent threat of infrastructure failure has the potential to cause significant environmental harm and disrupt socioeconomic stability and food security of U.S. Arctic residents. Recognizing that i) the Arctic is experiencing the most dramatic impacts from climate change on the planet; ii) there is a prevalence of ageing oil and other infrastructure constructed upon increasingly unstable permafrost coastlines and riverine landscapes; and iii) there has been multiple small to large scale infrastructure failures documented in the Arctic over the past decade.

This project responds these concerns as expressed by U.S. Coast Guard (USCG) District 17 to provide an environmental risk index oriented to Arctic coastal regions as a decision support tool to assess environmental impacts to coastal facilities and infrastructure that are under the purview of USCG inspections. This research will focus on conducting a coastal facilities and infrastructure engineering risk analysis along western and northern Alaska. The study will draw experts from a range of disciplines and utilize a collaborative set of workshops and smaller standing working groups to solicit expert opinion that will be used to derive data to apply to models, and test, and deliver an “Arctic facilities and infrastructure environmental change” risk index. The project team will actively seek to coordinate with relevant international Arctic scientists, engineers, and other stakeholders to share and co-develop approaches that are mutually beneficial to those similarly challenged by Arctic environmental change.

The project will primarily focus on bulk oil/fuel containers and pipelines, and piers, docks, and platforms in permafrost coastal and riverine landscapes of the Bering, Chukchi and Beaufort Seas. Analysis will use appropriate qualitative and quantitative approaches for the data being used and questions posed with attention to uncertainty. Products will inform responders and inspectors of the current and predicted future structural integrity of those facilities, and the bearing capacity, stability, and susceptibility to erosion of the surrounding/ supporting landscape. The research effort will produce three products: a comprehensive Arctic facilities and infrastructure environmental change knowledge product, an operationally relevant Arctic facilities and infrastructure environmental change risk index, and an Arctic inspector and responder structural environmental impacts training guide.

