Arctic Mining: Environmental issues, mitigation and pollution control for marine and coastal mining-
Workshop March 21, 22, 23, 2023

Title: Lessons Learned from the Last Century - Mining Waste and Regulation in Greenland
Speaker: Jens Søndergaard, Senior Research Scientist, Aarhus University/ DCE
Biography: *Senior Researcher, PhD, Jens Søndergaard studies trace metal cycling in the Arctic, especially mining pollutants and long-transported pollutants such as mercury as a basis for environmental assessments. My research area lies in the interface between environmental chemistry, geochemistry, analytical chemistry and biology.*
What is the Purpose of your Talk? The purpose of the talk is to give an overview of the main lessons learned from the last century of mining in Greenland, in relation to environmental impact from mining waste and how these lessons have improved the regulation.
Abstract: Greenland has a long mining history starting with mining of cryolite in 1854 in Ivittuut, South Greenland. However, it was not until the early 1970s that the first environmental studies were conducted. Like many other countries, Greenland has a legacy of long-lasting pollution from former mine sites. Mining activities at three legacy mine sites in Greenland; the cryolite mine in Ivittuut (1854-1987), the lead-zinc mine in Mestersvig (1956-1963) and the lead-zinc mine in Maarmorilik (1973-1990), resulted in significant pollution of the environment, mostly by lead and zinc. The polluted marine areas at Ivittuut, Mestersvig and Maarmorilik encompassed areas within a distance of at least c. 10-15 km from the mines during the mining periods, and although the pollution has decreased, it can still be measured today. At Ivittuut, the pollution was predominantly caused by leaching from waste rock placed in the tidal zone along the coastline and between the mine pit and the Arsuk Fjord. At Mestersvig, the pollution was caused by several sources including uncovered tailings deposited on a mountain slope adjacent to a river and exposed to leaching, erosion and dust dispersion; spills and dust dispersion of concentrate during transport and loading; and later collapse of a quay after mine closure. At Maarmorilik, the pollution was mainly caused by dissolution and dispersion of tailings following deposition of tailings into a small partly enclosed sill-fjord. The sill-fjord was unexpectedly affected by seasonal vertical mixing and ocean currents, which caused transport of pollutants across the sill to the larger Qaamarujuk Fjord system. After mine closure, pollution from the tailings ceased due to natural sedimentation covering the tailings. Today, waste rock deposited on the steep mountain slopes is considered the dominant source of pollution at Maarmorilik. The three legacy mine sites in Greenland have enabled studies of dispersion, bioaccumulation, and toxicological effects of mining pollution under Arctic conditions during the past 50 years. Since the 1970s, monitoring of Greenland mine sites has been performed regularly at operating and closed mines by the authorities and numerous environmental studies have been carried out by research groups. This has provided valuable information for the development of a regulatory system in Greenland with specific requirements for environmental impact assessments (EIAs), environmental monitoring, use of chemicals etc. to help minimize the impact of new mining activities. Moreover, the knowledge is applied in the 'daily' advisory to the Greenland authorities by the Danish Centre for Environmental and Energy and Greenland Institute for Natural Resources. The talk will focus on the main environmental issues at the three legacy mine sites in Greenland, the actions taken, the lessons learned, and how these lessons are applied in the current regulatory system to minimize pollution.