

Title: *Ecosystem Services, Climate Change, and the Arctic Environment*

Workshop Preface:

A recent article outlined several of the impacts of climate change in the Arctic region and their importance on a global scale. An excerpt from this article is below and the link follows.

"Nowhere are the impacts of climate change more evident and staggering than in the Arctic. The region—which encompasses 17 percent of the globe and is almost one and a half times the size of the United States—is warming two times faster than any other region on Earth.⁹ Furthermore, Arctic sea ice has shrunk by 75 percent since the 1980s, according to a recent analysis, with ice-free summers in the Arctic Ocean "very likely" by midcentury.¹⁰ Another new study published in the Proceedings of the National Academy of Sciences forecasts a dramatic acceleration of global warming as the reflective surface of the snow-covered Arctic sea ice recedes and the dark, open Arctic waters absorb the sun's heat.¹¹ These and other effects of a warming Arctic not only directly threaten the health, safety, and prosperity of the 4 million people who live in the High North—but they also have tremendous economic, environmental, and security implications for the United States and the rest of the world."

<http://www.americanprogress.org/wp-content/uploads/2014/03/Arctic-brief.pdf>

Workshop Overview:

Given climate change and the expansion of industry (oil and gas operations, mining, etc.) in the Arctic, there is a need to have a better understanding of the ecosystem services provided by the Arctic and how they may be influenced by these actions. This workshop will provide an overview of the evolution of ecosystem services and the interrelationship of the arctic ecosystem to the provision of services. We will also touch on issues of climate change and the growth of extractive industries in the Arctic. This workshop will serve as a precursor to the two planned Arctic Sessions (see below) and will provide supplemental information supporting these sessions.

1. Arctic Ecosystem Services and Climate Change
2. Arctic Ecosystem Services: Policy and Adaptive Decision-Making

The goal of the workshop is to provide an overview of: 1) "Marine ecosystem services" of the Arctic, 2) resource economics methods and application to quantifying Arctic ecosystem services, 3) an overarching perspective of changing climate in the Arctic, and 4) provide for an interactive discussion with the panel and audience members. Each keynote speaker will have 20 minutes for snapshot talk to present the state of the art and the issues to be discussed. After the talks, ENVIRON (Joseph Nicolette) and the Fram Centre (Nina Jørgensen and Lionel Camus) will facilitate discussions with the audience. The workshop will include support and attendance of Arctic Specialists from both the Fram Centre and ENVIRON.

Agenda:

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| 8:00-8:15 | Introduction and Overview of Ecosystem Services, <i>Joseph Nicolette</i> (ENVIRON) |
| 8:15-8:30 | Overview of the Fram Centre and Arctic Research, <i>Nina Jørgensen and Lionel Camus</i> (Fram Centre) |

- 8:30-8:50 Arctic Marine Ecosystem Services, *Professor Claire Armstrong*, (Fram Centre – The Arctic University of Norway: Tromsø, Norway)
- 8:50-9:10 Marine Mammal and Deepwater Considerations, Sue Ban and Jack Word (ENVIRON)
- 9:10-9:30 Physical Changes in the Arctic, International Director Kim Holmén, The Norwegian Polar Institute, The Fram Centre
- 9:30-10:00 Break**
- 10:00-10:20 Comparing Valuation of Arctic Resources for Policy Making, Mark Rockel (ENVIRON)
- 10:20-11:30 Panel Discussion, Q&A
- 11:30-11:45 Conclusions by Joseph Nicolette, Nina Jørgensen, and Lionel Camus

Target Audience: The target audience for this workshop would include both beginning and more experienced practitioners. In particular, the workshop would be of interest to 1) private sector representatives (oil and gas, mining, etc.) looking to evaluate the potential linkage of ecosystem services to their exploration and extractive operations and their corporate goals; and 2) public sector representatives looking to understand the interrelationship and linkages between ecosystem service flows, the changing environment, and policy direction.

Workshop Organizers:

The workshop organizers are Joe Nicolette (ENVIRON International Corporation) and Lionel Camus & Nina Jørgensen (Akvaplan-niva - Framcentre):

ENVIRON International Corporation - Since 1982, ENVIRON has worked with clients around the world to help resolve their most demanding environmental and human health issues. We combine resources across geographic boundaries and technical and scientific disciplines to provide clients with the best, most responsive teams—whether responding to existing challenges, evaluating opportunities to improve performance or seeking to reduce future liabilities. Clients benefit from our unique ability to bring clarity to issues at the intersection of science, business and policy.

The **Fram Centre** is the short name for FRAM - High North Research Centre for Climate and the Environment. The Fram Centre is based in Tromsø, Norway and consists of about 500 scientists from 20 institutions involved in interdisciplinary research and outreach in the fields of natural science, technology and social sciences.

Organizers Qualifications:

Joseph Nicolette is currently a Principal at ENVIRON International Corporation with over 28 years of experience in the environmental consulting field. Mr. Nicolette is ENVIRON’s Global Ecosystem Service Director and has worked in the ecosystem service field over the past 20 years. Within his practice area, ecosystem services (ecological, social, and economic) are incorporated into overarching strategies designed to balance risks, benefits and tradeoffs associated with competing alternatives. He is an ecologist with expertise in impact and restoration assessment using natural resource ecological and human use approaches. He has conducted ES projects for both private sector companies and the USEPA. Projects have been both in the U.S. and International (Italy, France, U.K., and Spain) focusing on ES. This work focused on the valuation of ES metrics. Mr. Nicolette provides advice in developing site risk and

environmental liability management strategies. He has incorporated ecosystem service valuation metrics into environmental sustainability modeling and net environmental benefit analysis.

Dr. Lionel Camus of Akvaplan-niva (APN) is the adjunct assistant professor at the University of Tromsø and head of the Petroleum and Environment Research Group in Akvaplan-niva (since 2004), which receives funding from the Norwegian Research Council, the EU, the oil industry and the Ministry of Environment Norway. For the last 15 years he has been studying the biological effects of hydrocarbons in Arctic fauna, especially phyto and zooplankton, crustaceans, and fish such as the polar cod. Lionel holds a PhD in Marine Arctic Ecotoxicology from the University of Plymouth (UK) where he studied the biological effects of hydrocarbons on Arctic marine organisms with an EU Marie Curie grant and financial support from Elf Norway. He has worked as an environmental consultant for Inuvialuit Environmental and Geotechnical in Canada. He carried out a post-doctorate at the University Centre in Svalbard (Norway) in 2002-2004. With more than 45 peer reviewed papers, his main recent activity has been to gain an understanding of the sensitivity of the Arctic marine communities to the discharges of the oil and gas industry in the Arctic and associated response to mitigate the impact. His activities also include research on biosensors as early warning tools for biomonitoring in the Arctic, the development of new sensors for sensitive habitat mapping, coastal sensitivity mapping and more recently he lead a large project to study the impact of oil spill in tropical ecosystems. Lionel has been instrumental in developing an analytical laboratory (financed by the Troms county) to perform ecotoxicological analysis and he also built up an Arctic sea laboratory in Tromsø to perform ecotoxicological research with Arctic species (financed by the Ministry of Foreign affairs). Recently Lionel worked with online real time biosensors and coastal sensitivity mapping in the Arctic and was the lead author of the ecotoxicology chapter of the literature review on environmental impact of oil spill and associated response for the OGP in 2013.

Confirmed Speakers:

Joseph Nicolette, Principal, ENVIRON International Corporation
Lionel Camus (Framcentre – Akvaplan-niva: Tromsø, Norway)
Nina Mari Jørgensen/Kit Kovacs (Norwegian Polar Institute)
Per Fauchald, (Framcentre, Norwegian Institute of Nature Research (NINA))
Rolf Anker Ims, (University of Tromsø)
Kim Holmén, (Framcentre Norwegian Polar Institute)
Claire Armstrong, University of Tromsø
Satu Juntunen ENVIRON International Corporation, Finland
Mark Rockel, ENVIRON, PhD natural resource economist
Sue Ban/Jack Colonell, ENVIRON International Corporation, Alaska
Andrea Fogg, ENVIRON International Corporation, Maine

Invited Speakers:

Martin Fortier Arctic NET (Center of Excellence, Canada)

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