

## NNA Track 2: Collaborative Research: Interactions of Environmental and Land Surface Change, Animals, Infrastructure, and Peoples of the Arctic

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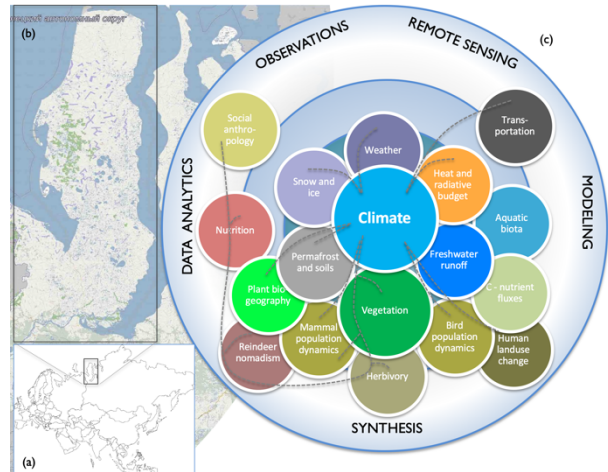
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The study region of Yamal, Russia (a, b) and an overview of *land* Arctic system elements (c) specific to this region. The innermost circle (Level 1): connection between climate and geophysical processes. The second circle (Level 2): biological elements that respond to abiotic drivers with feedback mechanisms. The outer circle (Level 3): the elements of social system and built environment that interact with the abiotic and biotic constituents.

**Project Objectives:** Briefly explain the overall goals of the project, specific aims, methods, and broader impacts. The project aims at developing a Track 1 proposal for the study of the Yamal region of northern Russia as an ideal natural laboratory for transdisciplinary work to understand the complexity and adaptation of Arctic biotic and abiotic systems to climate change, and the feed-forward and feedback mechanisms modulating the co-evolution of human society and natural systems. The participants focus on developing research ideas and approaches for testing the hypothesis that displacing Arctic systems from their historic state of dynamic equilibrium under changing environment stimulates further changes to abiotic, biotic, and socio-cultural elements, particularly when combined with the spread of industry infrastructure, to increase the role of feed-forward and feedback mechanisms. Planned activities include two workshops, monthly virtual conferences, international capacity building, a synthesis paper, and the submission of Track 1 proposal in 2021. Broader impacts of this project. *Scientific community:* This project has strong international collaboration, engaging scientists representing various disciplines from USA, Europe, and Russia. *Education and outreach:* Our planned, on-site workshop will include outreach and educational programs for the public in Salekhard, Russia. We are developing curricula for a collaborative, transdisciplinary online inter-institutional course emphasizing a transdisciplinary view of Arctic science. The course will be team-taught by PI Ivanov and co-PIs Ungar and Ziker along with academic collaborators in the US, Europe, and Russia and having both classroom and online components. Registration for the Fall of 2020 has begun and the course is open to students at the University of Michigan, University of Arkansas, and Boise State University. *Community engagement:* this project will engage stakeholders, those representing government and industry in Yamal and the indigenous Nenets people of the region.

**Keywords:** Arctic, Yamal, reindeer, snow, permafrost, vegetation

**Progress To Date/Future Plans:** Provide a brief research update describing progress to date or future plans. The team has been meeting virtually on a monthly basis between September 2019 and March 2020. We have developed comprehensive disciplinary summaries from numerous fields of expertise that are part of this planning project representing nearly 30 people (of which 22 are senior personnel). We have held a virtual 5-day project in late March synthesizing knowledge and crystallizing ideas and research threads for the Track 1 proposal. We will continue with monthly virtual meetings before a Workshop in Labytnangi, Russia, in October 2020.

**Highlights or Expected Outcomes:** Provide a brief overview of any noteworthy deliverables or expected outcomes related to research or broader impacts.

This planning project is developing ideas allowing the integration of earth system sciences, biological sciences, engineering, and social sciences within two outlined transdisciplinary “transects” of Arctic dynamics in the context of Yamal region: (1) gradual warming, and (2) extreme weather events. This project focuses on developing approaches related to feed-forward dependencies and feedbacks between 1) vegetation, snow, and the permafrost, 2) plant biogeography and changes in mammal – bird populations, including predator – prey relationships, 3) reindeer nomadism and nutritional status and livelihoods of indigenous communities and 4) their interactions with built environments.

We will continue with integration activities as planned, actively engaging students at peer institutions in synthesis and preliminary work. We are developing curricula for a collaborative, transdisciplinary online inter-institutional undergraduate and graduate course that will be administered at the University of Arkansas and co-taught at partner institutions.

**NNA Community Collaboration and Research Coordination:** What would you like to get from the NNA Community? Is there anything you would like to offer? Is your project working in any specific communities or geographic areas? When will you be there? What kind of resource sharing or project coordination opportunities would you like to explore?

- Best strategies for integration of social system, natural environment, and built-in environment components.
- Definition of “convergence research” in the context of NNA
- Definition of “built environment” – can reindeer economy represent this?
- What are priority funding areas for NNA (either geographically or topically)? In other words, are we better focusing on a confined set of questions/themes or trying to do it all in a circumscribed area?
- How can we best integrate international participants into the project in terms of funding? Work in the Russian Arctic requires logistics only possible with a large international team and formal partnerships with the Russian Academy of Sciences (Urals Branch, Arctic Research Station). Will substantive international participation put us at a competitive [dis]advantage?

**Advice for Overcoming NNA Project Challenges:** Are there any unique challenges that your project has had to overcome or is facing now? Are there any lessons learned or things you would suggest others do/do differently?

COVID-19 situation obviously has changed the landscape of project activities. We would like to learn how other groups are adjusting to the constraints.