C06-O04

RAPID ARCTIC TRANSITIONS DUE TO INFRASTRUCTURE AND CLIMATE (RATIC): A COMPARISON OF CHANGES IN THE PRUDHOE BAY OILFIELD, ALASKA AND THE BOVANENKOVO GASFIELD, RUSSIA

D. A. Walker *(University of Alaska Fairbanks, Institute of Arctic Biology and Biology and Wildlife Department, USA)*
G. Kofinas *(University of Alaska Fairbanks, Department of Natural Resources and Institute of Arctic Biology, USA)*
B.C. Forbes *(Arctic Centre, Finland)*
T. Kumpula *(University of Eastern Finland, Department of Geographical and Historical Studies, Finland)*
M.O. Leibman *(Earth Cryosphere Laboratory, Russian Academy of Science, Russia)*
A. Khumotov *(Earth Cryosphere Laboratory, Russian Academy of Science, Russia)*
M.K. Raynolds *(University of Alaska Fairbanks, Institute of Arctic Biology and Biology and Wildlife Department, USA)*
T. Currie *(University of Alaska Fairbanks, Department of Natural Resources and Institute of Arctic Biology, USA)*
Y. Shur *(University of Alaska Fairbanks, Department of Civil & Environmental Engineering, USA)*
M. Kanevskiy *(University of Alaska Fairbanks, Department of Civil & Environmental Engineering, USA)*
V. Romanovsky *(University of Alaska Fairbanks, Geophysical Institute, USA)*
U.S. Bhatt *(University of Alaska Fairbanks, Geophysical Institute, USA)*
Marcel Buchhorn *(University of Alaska Fairbanks, Institute of Arctic Biology and Biology and Wildlife Department, USA / University of Alaska Fairbanks, Geophysical Institute, USA)*

dawalker@alaska.edu

Case studies of the Prudhoe Bay Oilfield (PBO) in Alaska, and the Bovanenkovo Gas Field (BGF) Russia, provide an overview of the baseline environmental conditions, rates of hydrocarbon development, contrasting systems of resource governance, and local people's perceptions of change in two remote Arctic areas. Differences in the underlying surficial geology (PBO: flat alluvial gravel overlaid by loess and peat; BGF: hilly, with mainly marine clays overlaid by alluvial sands and peat) have resulted in very different permafrost conditions and hazards (PBO: ice-rich loess with extensive thaw lakes, and ice-wedge polygons with extensive thermokarst; BGF: mainly tabular ground ice in the uplands, with extensive cryogenic landslides on slopes and sandy "blow-outs" on the uplands). Both fields were discovered at about the same time (PBO: 1968; BGF: 1972). The PBO infrastructure network developed rapidly and by 1977 was connected to the rest of Alaska by the Dalton Highway and the Trans-Alaska Pipeline, which permitted additional development of adjacent oilfields, and export of the oil to the ice-free port at Valdez. Bovanenkovo development proceeded much slower, until construction of the Obskaya-Bovanenkovo Railroad, which was finished in 2011 and now links the Yamal gas fields to the rest of Russia. Transport of gas out of the region still awaits construction of pipeline linkages to other gas fields on the Yamal and points further south in Russia and Europe. Up to now, oversight by government and nongovernmental agencies and evolution of construction methods by the industry have resulted in a generally well-planned, and well-maintained developments particularly in Alaska and increasingly so on the Yamal. The small populations of indigenous people in both areas have benefited economically from resource development, but with major implications to people's livelihoods. Most threatening to both groups is restricted free access by hunters and herders through their traditional lands (Kumpula *et al.*, 2011). Future mega-expansion of infrastructure in both areas, combined with climate-induced changes to local landscapes and permafrost (Raynolds *et al.*, 2014) and reductions to the extent of summer and fall sea ice (Bhatt *et al.*, 2014) present unprecedented challenges to local communities. The shear scale of the proposed hydrocarbon developments in the next few decades could overwhelm the ability of the local communities to adapt to the changing conditions. Successful adaptive management of change will require full engagement of local people and regional agencies with industry and national governments . A new initiative called Rapid Arctic Transitions due to Infrastructure and Climate (RATIC) is a forum for developing and sharing new ideas and methods to facilitate the best practices for assessing, responding to, and adaptively managing the cumulative effects of Arctic industrial infrastructure and climate change.

References:

Bhatt US, Walker DA, Walsh JE et al. (2014) Implications of Arctic sea ice decline for the Earth system. *Annual Review of Environment and Resources*, **39**, 57–89.

Kumpula T, Pajunen A, Kaarlejärvi E, Forbes BC, Stammler F (2011) Land use and land cover change in Arctic Russia: Ecological and social implications of industrial development. *Global Environmental Change*, 1–13.

Raynolds MK, Walker DA, Ambrosius KJ et al. (2014) Cumulative geoecological effects of 62 years of infrastructure and climate change in ice-rich permafrost landscapes, Prudhoe Bay Oilfield, Alaska. *Global Change Biology*, 1211–1224.