

INFRASTRUCTURE IN THE ARCTIC (AND ELSEWHERE) AS A SOCIAL AND ECOLOGICAL CHALLENGE

VIENNA, JANUARY 15TH AND 16TH 2016

PROGRAM

ABSTRACTS



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Material infrastructure in the Arctic, including settlements, industry, and transportation, often results in serious impacts on the fragile ecosystems of the North. At the same time the social dynamics and effects of existing and planned infrastructure require better understanding. This workshop combines existing Arctic discourses and case studies with non-Arctic perspectives to better integrate social and ecological perspectives regarding the diverse and complex entanglements of humans, infrastructures and environments. Day 1 of the workshop will address these issues through a broad array of presentations based on a variety of case studies and disciplines, while day 2 will focus on discussing a recently funded research project in the light of the results of day 1.

Program

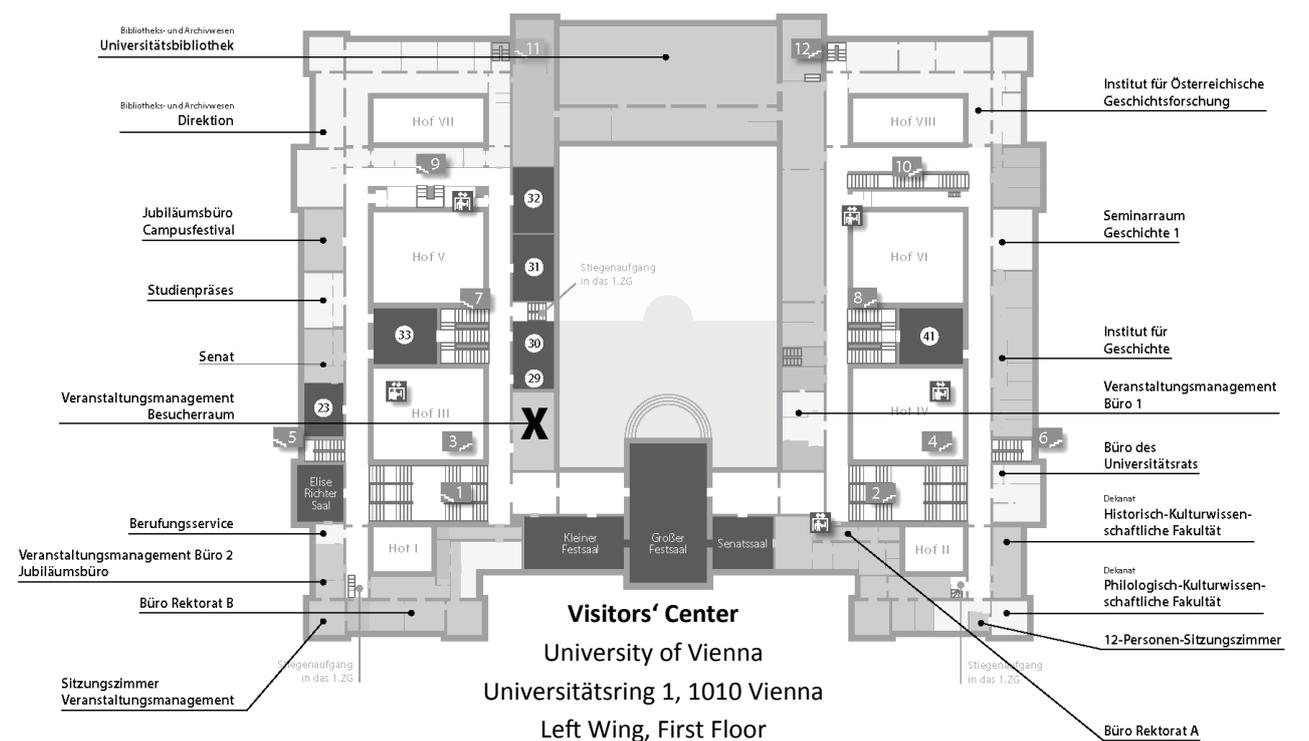
Day 1 (Friday, January 15, 2016)

- 9:00 **Wolfgang C. Müller**, Vice Dean for Research, Faculty of Social Sciences (University of Vienna): *Opening*
- 9:10 **Peter Schweitzer** (University of Vienna): *Introduction to Workshop*
- 9:30 **Penny Harvey** (University of Manchester): *Controversial Infrastructures: The Material Politics of Road Construction in Peru*
- 10:00 **J. Otto Habeck** (University of Hamburg): *The Anthropology of Waiting: A Siberian Perspective*
- 10:30 Coffee Break
- 11:00 **Mia Bennett** (University of California Los Angeles): *Geometries of an Arctic Highway: Transforming the Last Frontier into a Global Resource Frontier*
- 11:30 **Rasmus Dahlberg** (University of Copenhagen): *Building a Scalable Search and Rescue (SAR) Infrastructure in the Arctic*
- 12:00 **Rudy Riedlsperger** (Memorial University of Newfoundland): *Costing Adaptation for Community Housing and Infrastructure in Two Northern Communities*
- 12:30 Lunch
- 14:00 **Tatiana Argounova-Low** (University of Aberdeen): *Permafrost and Road Construction in Sakha (Yakutia)*
- 14:30 **Herta Nöbauer** (University of Vienna): *Troublesome Routes of Snow: Regimes and Practices of Snow Management on a Glacier Ski Resort in the Austrian Alps*
- 15:00 **Hendrik Wagenaar** (University of Sheffield): *Collaborative Governance as Collective Problem Solving: Principles and Possibilities*
- 15:30 Coffee Break

- 16:00 **Helmut Haberl** (University of Klagenfurt): *Biophysical Structures of Society: Conceptual Considerations on the Role of Infrastructures for Society's Use of Biophysical Resources (Materials, Energy, Land)*
- 16:30 **Timo Kumpula** (University of Eastern Finland, Joensuu): *Changing Pasture Land, Rapid Land Cover Changes and Their Impacts on Nenets Reindeer Herding on the Yamal Peninsula, Russia*
- 17:00 **Skip Walker** (University of Alaska Fairbanks): *Rapid Arctic Transitions Due to Infrastructure and Climate (RATIC) - via skype*
- 17:30 Discussion initiated and led by **Olga Povoroznyuk, Sigrid Schiesser** and **Peter Schweitzer** (all University of Vienna): *What Have We Learned by Talking About Infrastructure Across Disciplines?*
- 19:00 Dinner

Day 2 (Saturday, January 16, 2016)

- 9:30 **Peter Schweitzer, Sigrid Schiesser, Gertrude Saxinger** and **Olga Povoroznyuk** (all University of Vienna): *Summary of Day 1 and Presentation of the FWF-Funded Project "Configurations of Remoteness: Entanglement of Humans and Transport Infrastructures in the Baykal-Amur Mainline (BAM) Region"*
- 10:30 Coffee Break
- 11:00 **Tatiana Argounova-Low** (University of Aberdeen) and **J. Otto Habeck** (University of Hamburg) Discussants
- 11:30 General Discussion
- 12:30 End of Workshop



Abstracts

Geometries of an Arctic Highway: Transforming the Last Frontier into a Global Resource Frontier

Mia Bennett (*University of California Los Angeles*)

Nearly sixty years after Canadian Prime Minister John Diefenbaker announced his vision for opening Canada's "northland" via the development of transportation, resources, and communication, the Government of Canada and the Government of the Northwest Territories (NWT) are realizing an important part of his plan. They are spending over CAN \$299 million to build a 137-kilometer all-weather road, which will replace the winter road that seasonally links Inuvik and Tuktoyaktuk, on the Arctic Ocean and extend Canada's highway network to its northern coastline.

State discourses promote the all-weather road's benefits for Tuktoyaktuk's residents, but promises of permanent infrastructure stand on tenuous ground for two reasons. First, climate change is eroding Tuktoyaktuk's shoreline while melting the permafrost underlying the hamlet and the forthcoming road. These environmental transformations beg the question of how inhabitants and government officials perceive the temporalities, materialities, and spatialities of a "permanent all-weather road." Second, Tuktoyaktuk has been subject to boom and bust cycles associated with militarization and hydrocarbon exploration, with the government recently issuing offshore oil and gas leases nearby. Research is crucial to discern who will benefit from enhanced access to this corner of the Arctic: Tuktoyaktuk's inhabitants, foot-loose energy companies, or Canada as an "energy superpower" and "Arctic nation," to quote former Prime Minister Stephen Harper? In preparation for fieldwork in the NWT I am planning to conduct in March 2016, this paper reflects upon how this road project in the Canadian North signals the penetration of extractive capitalism into a new resource frontier, extending the literature that examines relations between the state, investors, and local peoples in remote extractive areas. Studies of transportation infrastructure, especially roads to resource frontiers, can also offer insight into the paradoxes of the hardwiring of globalizing, extractive capitalism. I hypothesize that it sublimely promises mobility and modernity to remote communities while peripheralizing them economically by creating improved access for extractive interests that export their commodities largely for consumption in more southern metropolises.

Building a Scalable Search and Rescue (SAR) Infrastructure in the Arctic

Rasmus Dahlberg (*University of Copenhagen*)

Increased shipping and other maritime activities in the Arctic create new and enhanced risks that must be mitigated with new technologies, policies and infrastructures. Given the extreme distances and remote and sparsely populated areas there is a special need for establishing infrastructures that can quickly be scaled up in case of large emergencies. One suggestion is to develop parts of the former US Naval Air Station Keflavík in Iceland, which was abandoned by the Americans in 2006, into a flexible search and rescue (SAR) infrastructure. This mechanism should be able to allow for quick strategic deployment of rescue personnel and equipment, reloading/storage, tactical insertion, medical evacuation, command and coordination etc.

This research is carried out with funding from the Nordic Centre of Excellence on Resilience and Societal Security (NORDRESS) in co-operation with the Iceland Coast Guard.

The Anthropology of Waiting: A Siberian Perspective

Joachim Otto Habeck (*University of Hamburg*)

On the basis of ethnographic research in different parts of Russia and discussions with several colleagues (notably Ludek Broz, Dennis Zuev) I seek to describe the interrelation of waiting, sociability, infrastructure, predictability and planning. Waiting has multiple, peculiar facets in Siberia and the Far North of Russia. The time of the long queues in front of ticket boots may be over; yet nonetheless, there are numerous situations of waiting that create specific forms of togetherness – and competition. A further facet of waiting comes to the fore in the anticipation of arrival, of those travelling and also those at the destination, as exemplified by the notion of fore-shadowing in Ulturgasheva's ethnography. The improvement of infrastructure bears the promise of higher reliability and predictability of travel, and thus of less waiting (and less serendipity). Simultaneously, infrastructure development is often rendered as a grand narrative of progress; it thus engenders particular forms of collective anticipation, as illustrated by AyaM, and the dream-like potential it holds for the future.

Biophysical Structures of Society: Conceptual Considerations on the Role of Infrastructures for Society's Use of Biophysical Resources (Materials, Energy, Land)

Helmut Haberl (*IFF, University of Klagenfurt*)

The social metabolism approach is increasingly used in scientific communities such as Social Ecology, Human Ecology, Ecological Anthropology, Industrial Ecology, Ecological Economics, Long-Term Socio-Ecological Research and Integrated Land-System Science to analyse material and energy flows associated with economic activities and their sustainability implications. Its ability to link socioeconomic processes at various levels (individual, household, municipality, region, nation state, supranational entities) with biophysical processes (e.g., material and energy flows in ecosystems or the biosphere at large) at many spatial and temporal scales has proven to be useful for integrating social sciences with humanities and natural sciences in integrated analyses of society-nature interaction. It has hence gained importance for inter- and transdisciplinary sustainability sciences as a “bridging concept” with immense heuristic and analytical value.

So far, the socioeconomic metabolism approach has focused on (usually yearly) biophysical (materials, energy) flows but has largely neglected the importance of the biophysical structures supported by these flows, even though the notion of “biophysical structures of society” has been put forward in seminal conceptual statements of socioeconomic metabolism research, e.g. several publications by one of the founders of this strand of research, Marina Fischer-Kowalski.

At the same time, it is clear that socioeconomic resource flows depend strongly on the existing biophysical structures supported by these flows. For example, recent scenario analyses suggest that the GHG emissions resulting in the period 2010-2060 from fossil fuels required to use existing infrastructures until the end of their lifetime amount to approximately one-half of the remaining emission budget that would be consistent with a 50% chance of reaching the 2°C target. Moreover, existing biophysical structures are usually the result of far-reaching decisions that involve different societal decision-making processes, and often political processes, in which the long-term effects of these decisions on resource use are only sometimes considered at all, and if they are, often play only a subordinate role, as evident in much of the decision-making processes on transport infrastructures such as airports or roads.

The purpose of this largely conceptual presentation will be to introduce the concept of social metabolism, explain its importance for sustainability analysis, and outline the concepts for defining “biophysical structures of society” that currently exist. Furthermore, ongoing research aiming to come to grips with stock-flow relations, e.g. dynamic stock models and attempts to quantify biophysical stocks, will be reviewed. Some preliminary conceptual considerations for possible future research into various dimensions of biophysical structures of society will also be presented as a basis for future discussions how to make this concept operational within sustainability analysis.

Controversial Infrastructures - The Material Politics of Road Construction in Peru

Penny Harvey (*University of Manchester*)

How might we approach the controversies of infrastructural development? In Peru many infrastructural projects are welcomed, even longed for. Mining companies are frequently required to deliver infrastructures as a mode of compensation, an expression of social responsibility, and a commitment to the development of local communities. At the same time environmental campaigners and critical social scientists show how these same infrastructural interventions are often destructive of local environments and of the ways of life that such environments support. My ethnographic research on road construction explores how diverse understandings of the political emerge in the course of infrastructural development projects. Such projects are designed to transform, but the objects and agents of transformation are contentious, ambiguous, and unsettling. Drawing on Latour’s notion of ‘object-oriented politics’, and Stengers’ concept of ‘cosmopolitics’, I focus on infrastructures as contentious, relational objects, whose complex political agency can take surprising forms.

Changing Pasture Land, Rapid Land Cover Changes and Their Impacts on Nenets Reindeer Herding on the Yamal Peninsula, Russia

Timo Kumpula (*University of Eastern Finland, Joensuu*)

Bruce Forbes (*University of Lapland*)

The traditional land use in the Yamal is reindeer herding practiced by nomadic Nenets herders. The hydrocarbon industry is presently the source of most ecological changes in the Yamal peninsula and of socio-economic impacts experienced by migratory Nenets herders who move annually between winter pastures at treeline and the coastal summer pastures by the Kara Sea.

In the central Yamal peninsula, a permafrost area, both natural and anthropogenic changes have occurred over the past 40 years. The mega-size Bovanenkovo Gas Field (BGF) was discovered in 1972. Large-scale building of infrastructure started already in the mid-1980s. The gas field was finally opened for production in October 2012. We have studied the gas field development and nature changes like increases in shrub growth, cryogenic landslides, drying lakes in the region and their impacts on Nenets reindeer herding.

Employing a variety of high- to very high-resolution aerial photographs and satellite-based sensors (Corona, KH-9, Landsat, SPOT, ASTER Terra VNIR, Quickbird-2, Worldview-2, MODIS), we have followed the establishment and spread of Bovanenkovo. Extensive onsite field observations and measurements of land use and land cover changes since 1985 have been combined with intensive participant observation in all seasons among indigenous Nenets reindeer herders and long-term gas field workers during 2004–2007 and 2010–2014.

Another focus of the study has been on cryogenic landslides. Reindeer tends to use fresh, barren landslides as an area of insect relief and after a few years landslides began to grow grasses that reindeer graze. Later landslides are occupied by willows (*Salix*) demonstrating an increase of shrub growth. Another important change in the landscape for reindeer herders is draining of lakes. Some larger lakes have drained and herders have lost important fishing lakes but on the other hand old lake bottoms have turned into good pasture land.

Nenets managing collective and privately owned herds of reindeer have proven adapt in responding to a broad range of intensifying industrial impacts at the same time as they have been dealing with symptoms of a warming climate and thawing permafrost phenomena. Here we detail both the spatial extent of gas field growth, landslides, drying lakes, shrub increase and the dynamic relationship between Nenets nomads and their rapidly evolving social-ecological system.

Troublesome Routes of Snow: Regimes and Practices of Snow Management in a Glacier Ski Resort in the Austrian Alps

Herta Nöbauer (*Department of Social and Cultural Anthropology, University of Vienna*)

In my presentation, I will discuss issues of infrastructure on a glacier ski resort in the Austrian Alps. A glacier ski resort provides a good entry point for discussing multiple dimensions of how infrastructure, the social, and the environment are impacting on each other. This place located in an environmentally and climatically highly sensitive and rapidly changing high-altitude area is made of several intersecting systems, in which humans as well as visible and invisible matters must be transported in fully reliable and secure manners, in order to keep tourism running. Among others, thousands of visitors/tourists, hundreds of professional skiers, and an important number of personnel working in the ski resort, a huge amount of diverse (security) equipment, construction materials, diesel fuel and explosives to set off avalanches, as well as tons of food and waste, electronic data, and, most importantly, basic resources such as snow, water and energy are being circulated in specific and often challenging and troublesome ways in this locality. Moreover, these distinct systems of movement are profoundly shaped by a broad range of laws and security regulations, which generally count as a precondition for establishing and maintaining a glacier ski resort in Austria.

Based on my anthropological fieldwork on a glacier ski resort in the province of Tyrol my talk will focus on the regimes and practices of snow management (including snow making, and its storing, distribution and compression) and glacier maintenance and protection; I will explore how these regimes and practices are affecting and affected by each other, by environmental phenomena and the use of resources such as water and energy, on the one hand, and social, economic, and political forces, expectations and ideas, on the other hand. I argue that vulnerability, security, and the belief in technological solutions are essential and ambivalent features for comprehending the mutual impacts of infrastructure, the social/human, and the environment in the context of a glacier ski resort.

Living Along the Railroad: Resources, Migrations and Technosocial Meshworks of the BAM Region

Olga Povoroznyuk (*Department of Social and Cultural Anthropology, University of Vienna, Institute of Ethnology and Anthropology, Russian Academy of Sciences, Moscow*)

This presentation focuses on the history and the present of the Baikal-Amur Mainline as a major infrastructural and social engineering project in East Siberia and Russian Far East, drawing on field data from northern Zabaikal'skiy Kray (Novaya Chara, Chapo-Ologo) and Amurskaya Oblast' (Tynda, Pervomayskoe). The BAM infrastructure, originally designed to serve the resource extraction industry, has also become an agent of social and environmental change. Processes triggered by railroad construction and operation include pollution and reshaping of taiga landscapes, altering traditional land use practices, multi-directional migrations, urbanization of indigenous Evenki people, increased competition for resources between local and newcomer population, etc.

While analysing the meaning of the railroad for local communities along the BAM, I will ask the following questions: What has been the social dynamics of local communities along the BAM? How has the entanglement of local population with the railroad changed their land use practices and mobility regimes? Which networks currently connect taiga reindeer herders' camps and villages with BAM hub towns? How to different groups and stakeholders related to each other in the context of resource and identity politics? What are the visions and projects of sustainable development in local communities dependent on resource extraction and functioning of the railroad?

Costing adaptation for community housing and infrastructure in two northern communities

R. Riedlsperger (*Department of Geography, Memorial University of Newfoundland, St. John's, NL*)
A. Perrin (*Northern Climate ExChange, Yukon Research Centre, Yukon College, Whitehorse, Yukon*)
T. Bell (*Department of Geography, Memorial University of Newfoundland, St. John's, NL*)
J. Dion (*International Institute for Sustainable Development, Ottawa office*)

Permafrost thaw threatens community infrastructure and is already affecting buildings and houses across the north. Memorial University, the Northern Climate ExChange, and the International Institute for Sustainable Development are studying the impacts of permafrost thaw on housing and community infrastructure in Arviat, Nunavut and Old Crow, Yukon. We are conducting an economic analysis to reveal the financial costs and benefits of infrastructure adaptation choices in communities. This work builds on the hazard mapping that has been extensively undertaken for communities across the North. Hazard maps portray the relative risk to infrastructure of individual (e.g. coastal erosion, slope movement, permafrost thaw) or composite landscape processes that affect terrain stability. These maps are challenging, however, for community decision makers to use, primarily because they tend to portray the bulk of community lands as vulnerable to some degree (red/orange or "stop/caution" in the traffic light classification scheme) and only minor areas as safe for development (mapped as green or "go" areas). The premise of our research project is that hazard maps can more fully enable community planning by conveying that most community lands are available for development if adaptation actions are taken. The key challenge is to identify the adaptation costs related to addressing those vulnerabilities. Our overall goal therefore is to provide maps that help community decision-makers in Old Crow and Arviat, and ultimately across the Arctic and sub-Arctic, in making effective and sustainable infrastructure choices in the face of climate change.

We are using existing hazard maps, vulnerability assessments, permafrost studies, climate projections and other information to understand current and potential terrain instability in the study communities. With community infrastructure managers, we are identifying the repair, maintenance and replacement costs of infrastructure under baseline climate conditions. This provides the current economic value at risk without adaptation. With the support of a geotechnical engineer, we are identifying and costing potential adaptations based on projected permafrost changes in the communities. Comparing the adaptation scenarios with the baseline scenario will generate financial information that shows the benefits and costs of various adaptation options. With this information, we will generate Cost-of-Adaptation maps and related products that can be used by community planners and decision makers to guide future infrastructure decisions. The maps and products that are generated will be tested and validated with community members and decision makers to ensure that they are accessible and user-friendly.

Mobility Infrastructure and Participation in the Extractive Industry

Gertrude Saxinger (*Department for Social and Cultural Anthropology, University of Vienna, Austrian Polar Research Institute, Yukon Research Centre/Yukon College, Whitehorse*)

This component of the research project “Configurations of ‘Remoteness’ (CoRe): Entanglements of Humans and Transportation Infrastructure in the Baykal-Amur Mainline (BAM) Region” studies inclusion and exclusion of local population into and from extractive industry projects; based on the transport infrastructure that moves the workforce to and from oil extraction sites. Transportation infrastructure, such as the BAM, was put into place in order to enable the build-up of such industries. Although transport corridors are becoming more sophisticated, access to them is limited from remote small towns and villages. It seems critical to investigate whether spatial mobility will enable participation in these industries and thus, social mobility in the context. The field sites are located in the greater area of Ust’-Kut in Irkutsk Province comprising small villages such as Tokma and Verkhnemarkovo and the oil fields in the region, such as Yarakinskoe and Markovskoe.

And what comes next? Perceiving and negotiating the materialization of infrastructure in a Siberian village

Sigrid Irene Schiesser (*Department for Social and Cultural Anthropology, University of Vienna*)

The implementation of the railroad line and the related transformation of the village Nizhniy Bestyakh in the Sakha Republic (Yakutiya) are omnipresent topics in everyday discourses as well as in public regional media. The passenger connection as well as the urbanization of the village has been promised and planned for a long time by the authorities, but the railroad does not yet transport people and the village remains a village. However, the railroad has a great impact on the village already. By focusing on the interface of the actual materialization of infrastructure and the expectations as well as promised changes in the village, I will explore how change is being perceived and negotiated by the local community. This is exemplified by the analysis of the perception of two recently established institutions: The first, the transportation college, has gained significance for the whole community by providing the first indoor fitness room as well as a space for holidays and public presentations. The second, the Sakha cultural center, offers space for cultural activities and intends to educate the village’s multi-cultural community in Sakha traditions. Ethnography, including participant observation and conversations, enables a zoom-in picture into a small community, where the condition and pace of transformation due to the realization of a railroad is being negotiated and perceived in manifold ways.

Configurations of 'Remoteness' (CoRe): Entanglements of Humans and Transportation Infrastructure in the Baykal-Amur Mainline (BAM) Region

Peter Schweitzer (*Department for Social and Cultural Anthropology, University of Vienna, Austrian Polar Research Institute*)

The vast expanses of the globe's Arctic and Subarctic are difficult to traverse – enormous boreal forests, swamps and mountain ranges severely inhibit travel across these landscapes. Existing transportation networks – from footpaths, roads, river and aviation routes to railway lines – are few and far apart, thereby creating tracks of heightened human and non-human activity and mobility criss-crossing the land. Our starting assumption is that changes in transportation networks under “northern” conditions – that is, physical remoteness, a harsh climate, low population density, paucity of tracks – have tremendous consequences for human lives. We will concentrate on two dimensions of the interaction between humans and infrastructure: the social and the spatial. The latter dimension includes different forms of mobility, from short-term work-related commutes to permanent migrations. The social dimension includes the composition of human collectives, as well as the aspirations and practices of individuals.

CoRe is the acronym for a recently awarded research grant by the Austrian Science Fund. Our case study is situated in eastern Siberia, a 'remote' region characterized by (still largely) untapped natural resources, which fuel the economic ambitions of its distant political center. The Baykal-Amur Mainline (BAM) and the Amur-Yakutsk Mainline (AYaM) define our broader study area. The BAM and AYaM are part of a railroad cluster constructed during the Brezhnev era, and about to be further expanded under Putin's second presidency. Our overarching research question – given the technosocial entanglement of people and infrastructure, how do changes in remote transportation systems affect human sociality and mobility? – is being addressed by research teams consisting of Austrian and Russian scholars from anthropology and geography. Our mixed methods array encompasses qualitative and quantitative components, including GIS mapping. This presentation will serve as an introduction to those by Povoroznyuk, Saxinger and Schiesser.

Rapid Arctic Transitions due to Infrastructure and Climate (RATIC):

A forum for issues related to interactions between Arctic infrastructure, people, ecosystems, and climate change

D.A. Walker¹, J.L. Peirce¹, T. Kumpula², M.O. Leibman³, G. Matyshak⁴, D. Streletskiy⁵, M.K. Reynolds¹, Y.S. Shur¹, M. Kanevskiy¹, M. Buchhorn¹, G. Kofinas¹, K. Ambrosius⁶, H.E. Epstein⁷, V. Romanovsky¹, B.C. Forbes¹⁹, A. Khumotov³, O. Khitun⁹, N. Shiklomnanov⁵, V. Grebenets⁵, M. Lemay¹⁰, M. Allard¹⁰, W. Vincent¹⁰, S. Lamoureux¹¹, T. Bell¹², D. Forbes¹³, G. Fondahl¹⁴, E. Kuznetsova¹⁵, L-P Roy¹⁶, A. Petrov¹⁷, P. Schweitzer¹⁸

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The Rapid Arctic Transitions due to Infrastructure and Climate (RATIC) initiative 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 infrastructure and climate change. An IASC white paper summarizes the activities of two RATIC workshops at the Arctic Change 2014 Conference in Ottawa, Canada and the 2015 Third International Conference on Arctic Research Planning (ICARP III) meeting in Toyama, Japan. Here we present an overview of five case studies with conclusions and recommendations presented at these conferences. The main conclusions from the study are:

There is a pressing need to examine the cumulative effects of infrastructure in the context of Arctic social-ecological systems. Each area studied has a unique set of social, economic, political, ecological, technological, and climatic “drivers of change” that require regionally appropriate adaptive management approaches to mitigate adverse changes.

Permafrost thawing and its associated impacts on natural and built environments were clearly identified as priority issues at all locations. The specific issues related to permafrost differed in each region and require detailed ground-level knowledge for predicting change and planning purposes.

The indirect effects of infrastructure exceed the direct effects of the planned footprints. Fragmentation of large intact ecosystems is a major impact that is inadequately addressed in Russia, Canada, or North America. Assessments of infrastructure must address effects on the adjacent ecosystems, local communities, regions, and areas outside the Arctic.

New GIS and remote-sensing tools are needed to assess regional changes over large areas now affected by infrastructure and climate change. The resolution of current global scale remote-sensing databases is inadequate to detect changes to fine-scale patterned ground features and to monitor details of infrastructure change. High-resolution imagery is great but is costly and not available for all areas, but can be used for hierarchical analysis of smaller regions.

The cumulative interactions between infrastructure and climate change are not adequately addressed by any national or international-level Arctic science plan. NASA LCLUC is providing examples of scientific approaches to the issue of cumulative effects of infrastructure development in Russia and North America. Other examples are available from industry and other Arctic governments.

Collaborative Governance as Collective Problem Solving: Principles and Possibilities.

Hendrik Wagenaar (*Department of Urban Studies and Planning, University of Sheffield*)

In this presentation I explore to what extent collaborative governance that includes different stakeholders is possible in infrastructure planning. The term ‘governance’ refers to a process of collective decision-making in which government and non-government actors are involved. ‘Collaborative’ refers to a process of governance that is guided by collaborative rationality (not all governance processes are, thus, collaborative). A process is ‘collaboratively rational’ when it entails a form of face-to-face dialogue, that is accessible to all affected parties, and that is governed by principles of openness, reciprocity, factual accuracy, mutual listening, and sincerity. I will unpack and explain these principles. I will argue why collaboration with stakeholders is important, if not essential, in a policy domain such as large-scale infrastructure planning where so many different and seemingly conflicting interests collide. I will conclude with exploring some constraints on collaborative governance.



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