

While researchers of social-ecological systems acknowledge existence of formal and informal institutions affecting social-ecological governance, the role of informal sector in the land use change remains understudied. Moreover, existing studies of informal land use are focused mostly on urban areas, such as informal settlements. We argue that the remote regions would be another important area for inquiries. Informal, e.g. unobserved by official records, land use changes there are related to high-speed dynamics of resource extraction projects and location mostly in the regions of traditional land use practices of indigenous people. In particular, we focus on informal roads, which in the Arctic and Subarctic remote regions often remain understudied due to their small size, chaotic, temporal or even seasonal nature, private ownership or traditional subsistence functions. Despite their absence on official maps, they have significant social, economic and environmental impact on local, predominantly indigenous, communities. The study area: the north of Irkutsk region that the last decades has undergone rapid changes of traditional way of life of "old settlers", native Buryats and Evenks, collapse of the Soviet economy, development of oil and gas extractive industries and infrastructure, environmental regulations to protect the Lake Baikal and tourism development. The data was obtained in 2016-2018 at the municipal and local levels using interviews, observations, statistics and cartographic tools. As a result, we identified formal and informal elements of transportation infrastructure with common set of characteristics (e.g. time of development; purpose; present conditions; changes in location; use) and distinguished the specifics of their maintenance requirements, the forms of ownership, seasonality and local traditions. The future plans to use remotely-sensed data, coordinated visual mapping sessions, and field studies for understanding land use changes due to development of informal road networks will be discussed in the presentation.

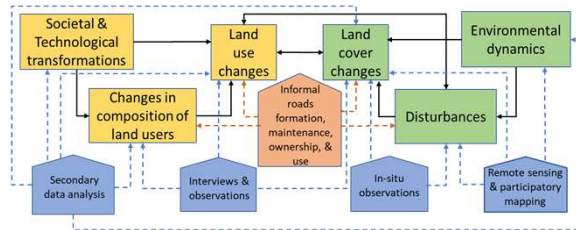
Key words:

Informal roads, land use changes, traditional land use, extractive industries, Siberia.

Research questions:

- What kinds of informal roads exist in study area?
- Who are the users of informal roads?
- Where are these informal roads located?
- What informal roads mean for local mobilities and environment?

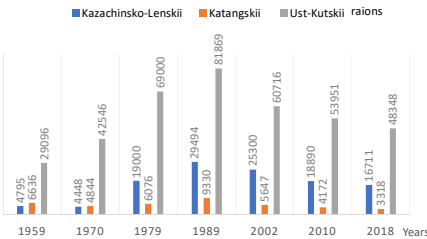
Theoretical considerations:



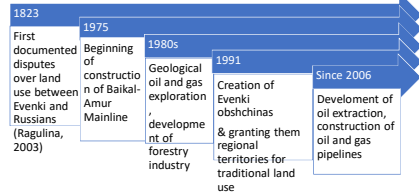
Data:

- 16 in-depth interviews with local hunters, community leaders, municipal authorities and company representatives in 2014, 2016 and 2019;
- Participant observations in 2019;
- Cartographic data: topographic maps, satellite images on SASPlanet, maps of ice roads, OpenStreetMap data, maps of the service roads of ESPO pipeline, oil and gas fields;
- Environmental impact assessment materials;
- Municipal reports;
- Results of previous studies in the region

DYNAMICS OF POPULATION IN THE STUDY AREA



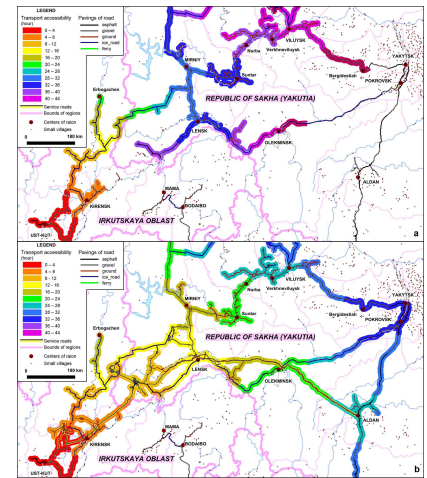
Changes in land use:



Categories of automobile roads in the study area

Types of road use	Formal	Formal roads with informal use	Informal
Common use	Roads of federal, regional, municipal significance and private roads	Winter roads used beyond the period of official use Public roads used by heavy machinery	Unofficial roads used for local transportation, Abandoned roads, Linear structures used for transportation purposes
Specific use	Public and private roads for specific kind of use	Used for purposes beyond specific use	Roads for specific use without proper maintenance or abandoned
Uncommon use	Roads with restricted access	Used beyond restrictions (bypassed barriers, informally negotiated)	Formed unofficially for uncommon use

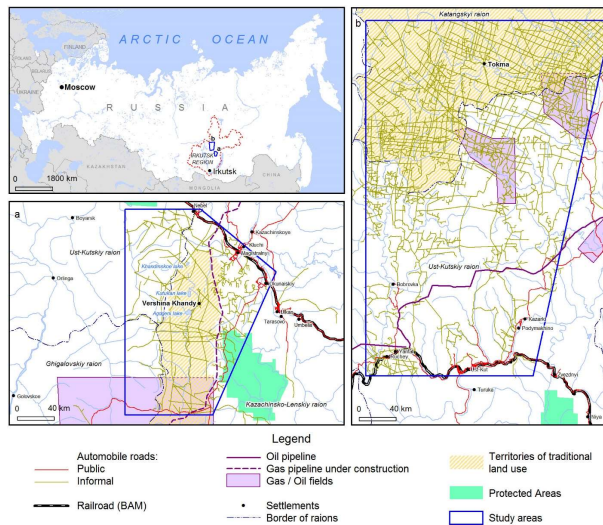
Private service roads used for local mobility:



Private forest roads used for local mobility:



Informal roads networks in the study area



Private service roads informally negotiated



Discussion & conclusions:

- Global level:
 - Demand for fossil fuel;
 - Climate change (dry roads);
 - Technological advancements (construction of off-road vehicles);
 - Development of communication technologies (abilities to purchase anything anywhere);
 - Lack of local power for negotiations with extractive companies;
 - Land use and road regulations

- Local level:
 - Increasing accessibility;
 - Deforestation;
 - Desires for vehicles
 - Changing local environment;
 - Changing social relations

- Social and environmental outcomes:
 - Uneven mobilities;
 - Changing role of roads as public commons;
 - Loss of local and indigenous knowledge and emotional attachments to the land;
 - Changes in human-environment relations;
 - Environmental instability

Acknowledgements

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- Informants and local partners

Public roads used by heavy machinery:



Unofficial roads used for local transportation:



Linear structures used for transportation purposes:

Geophysical line clearings ("Profil")

