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Utilizing Extractive Transportation Infrastructures for Subsistence Livelihoods: Experience of Evenki Communities in Eastern Siberia

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Abstract: The availability of natural resources drives the exploration and transformation of remote regions in the Arctic and beyond. Extractive infrastructure is one of the major sources of industrial development and environmental impact on landscapes. For Indigenous people, these landscapes are homely environments full of sentient beings, and for other local communities, they provide a wide variety of subsistence and hunting resources. While extractive infrastructure violence is the evident issue for many Indigenous communities, there are more complicated situations where extractive infrastructure is adopted and utilized for the subsistence and support of other human and more-than-human relations in local and Indigenous communities. Based on materials from interviews and observations with Evenki communities in Eastern Siberia in 2013–2021, the authors discuss the complex relations and sustainability issues entangled around infrastructure objects' creation, use, maintenance, and transformations. The results demonstrate a wide variety of relations between *obshchinas* (non-governmental organizations of Indigenous peoples) and extractive companies constructed with infrastructure development of the latter. The paper discusses the shortcomings of the top-down approach in infrastructure planning and the need for contextualization and meaningful engagement with affected communities, some examples of which have already taken place in specific locales. The study concludes by calling for the support of environmentally and socially just infrastructure defined by Indigenous people and local communities as a way to increase sustainability.

Keywords: infrastructure; Indigenous communities; Evenki; Sakha; sustainability

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1. Introduction

Infrastructure as an important component connecting people and nature provokes heated debates on the impact of its development on humans and the environment. Virtually all our ways of life, moving around, and communicating depend on infrastructure. Infrastructure development projects are associated with an increase in speed, political integration, and economic connectivity [1]. Infrastructural justice is named as a pathway to a more just future [2]. Building resilient infrastructure is associated with promoting inclusive and sustainable industrialization and fostering innovation within the UN Sustainable

Development Goals. Moreover, investments in infrastructure are considered "crucial to achieving sustainable development and empowering communities" [3]. At the same time, infrastructure is one of the major sources of increased inequities [4], as well as environmental and cultural destruction. Disruptions of communities caused by new infrastructure development are conceptualized as "infrastructural violence" [5] and include examples such as Canadian Pacific Railway [6] and urban growth [7], which disproportionately affect marginalized and Indigenous communities.

Controversies related to infrastructure construction are particularly relevant to Indigenous peoples, who have often been displaced, marginalized, and assimilated as a result of infrastructure projects. Infrastructure development frequently acts as a vehicle for colonization, especially when external entities exploit resources without involving or gaining consent from the Indigenous communities [8] or when violence is perpetrated against Indigenous communities and their ways of life [9,10]. Unsurprisingly, there is growing resistance to infrastructure development in Indigenous communities. Pipeline blockades by Indigenous people have been conceptualized as both anti-capitalist resistance and anti-colonial struggle [11]. However, there are also instances of Indigenous support for infrastructure projects, such as the Inuvik–Tuktoyaktuk Highway [12].

Spice [9] gives an example of an Indigenous leader describing their tribal community's critical infrastructure as that which gives life and supports subsistence activities. Complexities of entanglements between objects, imaginaries, emotions, and expectations in understanding infrastructure from an Indigenous perspective require closer attention to traditions of more-than-human relations. There is a consensus that infrastructures are networks supporting the flow of people, objects, or ideas [13]. These networks engage not only humans but also other living beings and objects [14]. The defining characteristic of infrastructure is its use and movement [15,16]. Routes for subsistence purposes often follow animal trails and exhibit minimal, if any, human modification [17,18]. These routes have not been discussed in terms of infrastructure and are only reconceptualized as such when motorized vehicles are used for travel along them [19].

Meanwhile, nature as infrastructure is receiving increasing scholarly attention. In particular, there is growing recognition of blue and green infrastructure that reduces and mitigates the impacts of climate change and the Urban Heat Island effect by fostering biodiversity and air purity, enhancing living standards, health, and overall well-being, and providing recreational opportunities [20,21]. Moreover, the availability, accessibility, and attractiveness of urban green and blue spaces to city dwellers raise the issues of environmental justice [22]. Therefore, we agree with Anne Spice's statement about critical infrastructure that sustains Indigenous identity and ensures cultural preservation, particularly when discussing subsistence infrastructure.

The large infrastructure projects from the pre-Soviet and Soviet eras provide some of the most striking examples of infrastructure as significant agents of colonization [23]. Both Trans-Siberian and Baikal–Amur Mainline railroad constructions facilitated the migration of millions of settlers from western parts of Russia to Siberia [24]. As a result, large populations of Indigenous people were displaced from these lands and assimilated along the routes [18].

As demonstrated by the maps created by Ivan Sablin and Maria Savelieva [24], the Russian population predominantly occupies the southern regions, urban centers, and areas along major railroads, while rural areas remain traditionally inhabited by Indigenous peoples in Siberia. This highlights the increasing need for a more nuanced understanding of infrastructure as the materialization of complex arrangements between decision makers, extractive companies, and local and Indigenous communities and what this dynamic means for their sustainability.

In this paper, we aim to explore relationships between extractive and subsistence infrastructure, focusing on how the former is negotiated for subsistence purposes and cultural revitalization in local and Indigenous communities. To achieve this, we center our

research on extractive infrastructure within the traditional lands of Indigenous communities in Siberia, specifically in two major regions: the Irkutsk region and the Republic of Sakha (Yakutia).

First, we describe existing soft and hard infrastructure that supports subsistence and extractive activities, and then we examine how extractive activities impact subsistence practices. While this paper does not aim to provide a direct comparison, the description of the relationships entangled around pipelines in these culturally and politically distinct regions highlights the significance of place-specific arrangements for resource extraction and infrastructure development in Siberia, away from the federal and regional centers of decision-making.

2. Regional Context

This paper is based on studies in communities in two regions of Russia: the southern Republic of Sakha (Yakutia) (RS(Y)) and the northern Irkutsk region (IR). The settlements included in the analysis are Khatystyr in the Belletsky *nasleg* (municipal unit) of the Aldanskiy district, Iengra (Neryungri district), and Tyanya (Olekminskiy district) in RS(Y), as well as Vershina Khandy and Magistralny in the Kazachinsko-Lenskiy district and Ust-Kut (Ust-Kutskiy district) in IR (Figure 1). This region has been traditionally inhabited by Evenki, an Indigenous Tungus-speaking people, and the Sakha, an Indigenous Turkic-speaking people. However, even within the Evenki communities, there are notable differences stemming from the varying levels of autonomy across different regions.

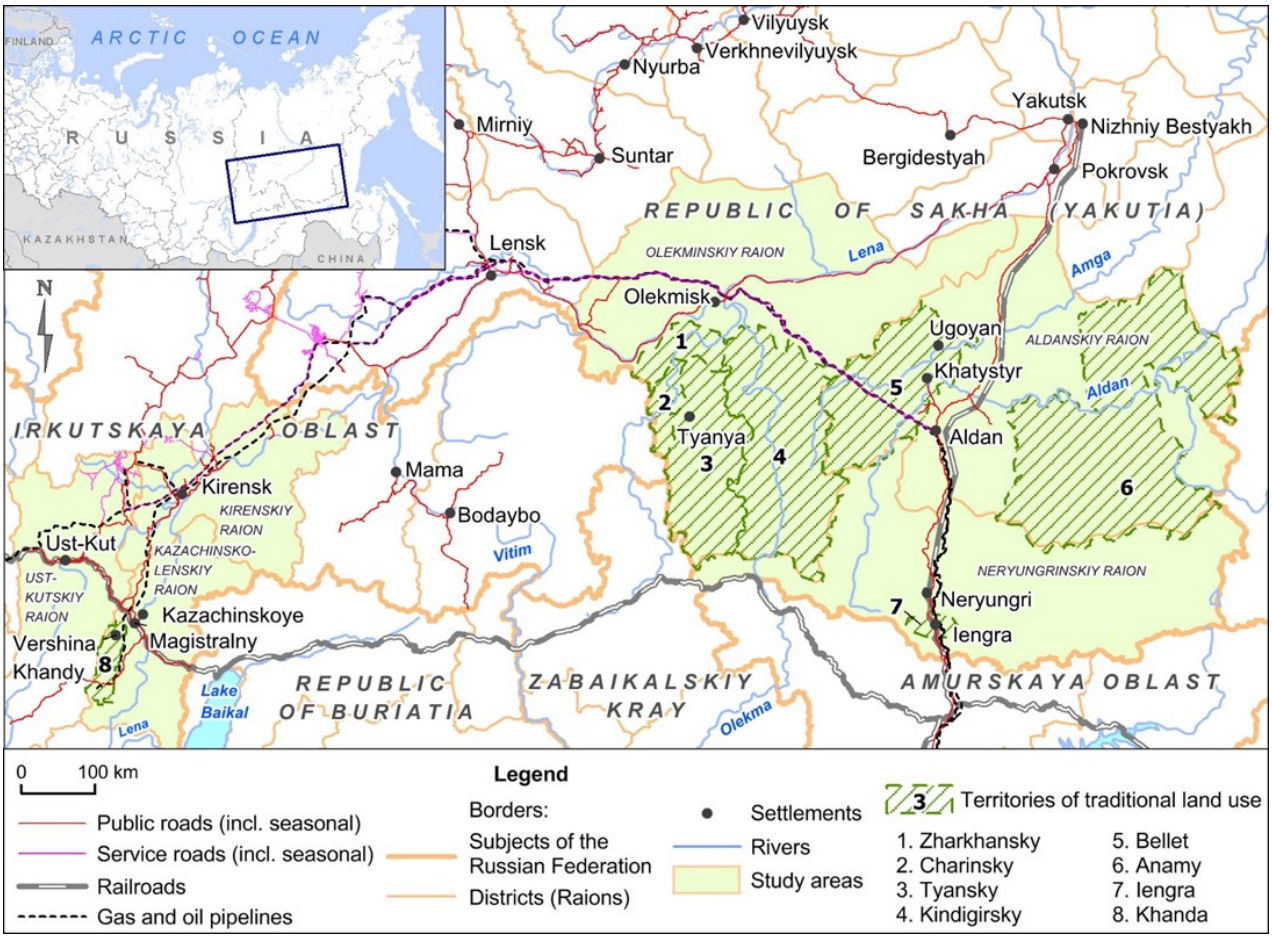

Figure 1. Study area.

The status of a republic provides a higher level of cultural autonomy to Indigenous peoples and, until recently, it allowed them to elect their own presidents and adopt their

own constitutions. The differentiation between republics and other regions was introduced by Bolsheviks in the 1920s to gain support from ethnic minorities in establishing the Soviet regime. Since then, large ethnic groups, whose regions are designated as republics, such as the Sakha people, with a population of about 478,000 [25], have been referred to as titular nations. Meanwhile, ethnic groups with populations under 50,000, such as the Evenki, who number about 38,000 people [26], have been recognized as requiring state protection to sustain their cultures and have been classified as Small-Numbered Indigenous Peoples of the North, Siberia, and the Far East [24]. The Sakha people constitute 49% of the total population of RS(Y), while Small-Numbered Indigenous Peoples of the North, Siberia, and the Far East make up 4% [25].

In RS(Y), *naslegs* represent the smallest territorial units with cultural autonomy. They accommodate both Evenki and Sakha nomadic communities and implement policies specifically aimed at supporting Indigenous people at the local level. In IR, all Indigenous peoples including both Small-Numbered and more numerous (e.g., Buryats, Tyvans, and Sakha), make up about 3.3% of the total population [25]. In this paper, both Evenki and Sakha people are considered Indigenous people, as they have inhabited the region before Russian colonization in the XVIIth century [26].

The study region spans over vast expanses of taiga, covering over 12.9% of the territory of RS(Y) and 14.7% of the IR (Figure 1). The predominantly mountainous terrain, discontinuous permafrost, and extreme continental climate present significant challenges to the development of extractive infrastructure. At the same time, these factors have helped shield local communities from assimilation processes and have preserved nomadic modes of life. Winter in the region lasts for 7 to 7.5 months and is characterized by extreme cold, with the average winter temperatures dropping below −32 ° C and minimal snowfall. Summers are short but can be hot, often causing floods due to the rapid melting of the snow and ice.

Resource extraction in the region has a long history, beginning with fur hunting in the XVIIth century and gold mining in the late XIXth century. Khatystyr, in particular, has been under industrial development for over a century, with gold mining commencing in the early 1920s, followed by forestry logging [27].

In the 1970s, the Soviet-driven infrastructure development reached its peak with the intensive construction of the Baikal–Amur Mainline (BAM). Millions of migrants from European parts of the Soviet Union settled in the region, building dozens of settlements, hundreds of bridges, and thousands of kilometers of railways [28]. The railroad construction facilitated geological exploration and forestry development, leading to the discovery of significant natural resources in the region: the Yaraktinskoie and Verkhnemarkovskoie oil deposits in the Ust-Kut district during the 1970s [29], rich coal mines in southern RS(Y), and, in 1987, the Kovyktinskoie gas condensate deposit, the largest known gas deposit in the Russian East [30].

Environmental issues, including disruptions of animal migrations, deforestation, and other ecological impacts, have been documented by researchers [31]. Some Evenki people and long-established settlers relocated to BAM settlements, finding employment outside traditional subsistence activities.

With the collapse of the subsidized Soviet system, transportation became less affordable for the local population. Beyond the settlements located immediately on the BAM, rural communities often lack official permanent roads, mobile phone connectivity, and power lines. Many local roads lack bridges over rivers, so ferries operate during the summer, while ice crossings are used in the winter. The Aldan, Olekma, and Lena rivers, along with their major tributaries, are used for local navigation. Additionally, the Lena River supports larger-scale navigation and the transportation of food and goods to settlements as far as the Arctic Ocean. Ice roads and river ferries have traditionally served as the primary routes connecting district centers to each other and to transportation hubs. However, the growing number of personal motorized vehicles and small private transport

companies servicing construction fields has contributed to traffic congestion and an increase in car accidents during the late winter season. Traffic becomes impossible on these routes in spring and fall when the ice is too unstable for driving and not yet completely gone to allow for driving. Low water levels during the navigation season further hinder accessibility. During these challenging periods, access to settlements is limited to air travel, which is partially subsidized by the regional government but remains unaffordable for many local residents.

Currently, an oil pipeline and a gas pipeline cross these territories, interspersing with other industrial activities. The "Eastern Siberia—the Pacific Ocean" (ESPO) pipeline construction was completed in 2012. Its scale is comparable to large Soviet-era projects as the largest pipeline in Siberia; its development included the construction of a high-quality service road with bridges over wide rivers for maintenance purposes.

In other regions of the country, where the transport networks are more developed, companies typically do not build such roads, as they can rely on existing public infrastructure. However, in Eastern Siberia, the company faced a significant lack of year-round roads spanning hundreds or even thousands of kilometers. Legally, the ESPO service road is not for public use. Nevertheless, it is the only road near the district centers (Aldan, Olekminsk, Lensk, Mirny, and Kirensk) that connects local roads to year-round traffic routes. On a smaller scale, near Vershina Khandy, a Gazprom subsidiary constructed 14 bridges and 80 km of gravel road to connect the Kovyktinskoie gas condensate deposit and its shift-worker camp to the BAM railway [30]. Unlike the ESPO road, this road was opened to public use and now connects the region to the regional center of Irkutsk.

3. Materials and Methods

We explore the utilization of infrastructure by Indigenous communities in the Siberian taiga, drawing on interviews and observations conducted in Evenki communities of various sizes and origins during expeditions. The research methods include semi-structured interviews with local residents, participant observations, expert interviews, statistical data analysis, and the review of municipal reports and archival materials. Field research was carried out in the Republic of Sakha (Yakutia), specifically in the Aldanskiy district (Belletsky *nasleg*), Neryungrinskiy district (Olekminskiy district), as well as in the Irkutsk region (IR), including the Kazachinsko-Lenskiy and Ust-Kutskiy districts (Table 1). The variety of social-economic activities and historic trajectories observed in these communities provides an opportunity to identify similarities and common threads that enable communities to survive—and even thrive—in such a remote region.

Table 1. General and Evenki population in the study settlements and number of interviews.

Study Settlement	Population, 2010	Evenki in 2010 (Census 2010)	# of Interviews
Khatystyr (Aldanskiy district, Belletsky *nasleg*)	1385	1067 (77%)	32 in 2014 and 2017
Iengra (Neryungrinskiy district)	1104	830 (75%)	37 in 2008, 2014, and 2017
Tyanya (Olekminskiy district)	499	406 (81%)	30 in 2016
Vershina Khandy (Kazachinsko-Lenskiy district)	6–20 (seasonally varied)	5 (83%)	5 in 2019
Magistralny (Kazachinsko-Lenskiy district)	7089	12 (0.17%)	5 in 2019 and 2021

Ust-Kut (Ust-Kutskiy district)	45,375	20 (0.04%)	12 in 2014, 2019, and 2021

Among the interviewees, we aimed to include a diverse range of knowledge and stakeholders, including hunters and fishermen, representatives of Indigenous communities, employees of municipalities and state organizations, and small business owners in the transport services sector, among others. While each expedition had its own agenda and specific areas of focus, local accounts of relationships with extractive infrastructure and its providers, as well as the impact on communities and the environment, constituted a significant portion of interviews. Since Russian is the primary language of daily communication in the region, the interviews were conducted in Russian. They were audio-recorded and subsequently transcribed for analysis.

The key question guide, aligned with the study's objectives, was organized into four thematic blocks. The first block focused on the role of traditional subsistence activities in the local livelihoods and the types of infrastructure that support these activities. The second block addressed the impact of contemporary natural and anthropogenic changes on the land-use practices of the local communities. The third block explored practices of communities' interactions with industrial companies operating in the area. The fourth block examined transport communications and the mobility of local residents, identifying the role of extractive infrastructure in their daily lives. Each block encompassed its own network of interacting elements (actors), which informed the perspectives of both interviewers and respondents. Respondents at the research sites were selected using the snowball sampling method, leveraging the potential of existing social networks.

The duration of the interviews ranged from twenty-five to ninety minutes. A total of 121 individuals, aged 18 to 84, were interviewed (Table 1). Recordings were made only with the respondents' consent. We ensured participants that all names in the study would be anonymized (coded), that the recordings would not be shared with any third party, and that the anonymity and confidentiality of the data would be fully guaranteed.

4. Results

4.1. Infrastructure for Indigenous Livelihoods

Both the Evenki and Sakha have traditionally lived off the land, hunting ungulates, fishing, gathering Siberian pine nuts, berries, and herbs for food, and hunting for sables and gathering pine nuts for cash income. In addition, Evenki traditionally led a nomadic lifestyle tied to reindeer herding, with seasonal migrations. The Sakha people's traditional lifestyle has been based on cattle and horse breeding. In winter, they resided in winter tracts, and in summer, they moved closer to the hayfields. These nomadic and semi-nomadic lifestyles were significantly disrupted by the establishment of permanent settlements and forced sedentarization in many parts of Siberia in the 1930s.

Infrastructure supporting traditional activities of the Sakha and Evenki includes both soft (e.g., institutions and regulations) and hard elements. Strong connections to the land, central to Indigenous cultures and identities, are maintained not only through subsistence activities but also spiritual rituals and moral obligations [32]. Some of these relationships are recognized by the state and supported through documents and regulations.

Several state regulations aim to protect the ways of life of the Small-Numbered Indigenous Peoples of the North, Siberia, and the Far East. In particular, the Federal Law on Territories of Traditional Nature Management (TTNM) was adopted in Russia to protect the traditional lands of Indigenous peoples by establishing a special regime for the traditional use of natural resources and the preservation of biodiversity maintained by Indigenous peoples [33]. *Obshchina* is another key entity created by federal law, acting as a specific form of non-commercial organization aimed at supporting and promoting Indigenous cultures. An *Obshchina* has the right to lease land from the Russian Forestry Fund for

hunting purposes for 25 or 49 years. These leased lands may coincide with or extend beyond the boundaries of the TTNM. Beyond hunting, these lands are also used for reindeer herding, fishing, and other traditional activities [34].

At the regional level, both Sakha and Evenki traditional households in the RS(Y) receive support from the regional Ministry of Agriculture in the form of subsidies and salaries for reindeer herders. *Nasleg* are listed in the Ministry's registry as agricultural organizations. RS(Y) has allocated 60% of its territory to TTNM. Moreover, when developing regional law for TTNM, the RS(Y) specified that easements for pipelines and other infrastructure projects must be discussed with communities during public hearings and receive consent from the TTNM users before construction. There are over 200 *obshchinas* in the RS(Y), while the IR has only 40 [35]. In contrast, the IR allocated only 1% of its territory to the TTNM, only for five *obshchinas*, including the one in the study area. The IR has only one regional law dedicated to Small-Numbered Indigenous Peoples: "On certain issues of organizing and ensuring the protection of the original habitat and traditional way of life of the Indigenous peoples of the Russian Federation in the Irkutsk region" [36].

Initially, the Evenki were able to access their TTNM for free, but since 2009, they must lease the land from the Forest Service, similar to other land users. Specific hunting permits are issued to representatives of *obshchinas* through inserts in their general hunting licenses. The latter is important because commercial hunting provides cash income for many male Evenki. There is also a difference between the two regions about the spatial extent of TTNM. In RS(Y), in addition to granting TTNM status to traditionally used lands of *obshchinas*, TTNM status has been assigned to some large municipalities.

For example, 37 *obshchinas* were registered in Khatystyr only, while in Kazachinsko-Lenskiy district Evenki, not only from Vershina Khandy and Magistralny but also from other villages of the district, are members of one *obshchina* and share one TTNM.

Another specific regional law adopted by the RS(Y) is the low on Ethnological Expertise (socio-cultural impact assessment), which must be conducted within TTNM areas before any industrial activity, including infrastructure development, and allows impacted communities to receive compensation for damage. However, there are still no established methods on how to adequately count losses incurred by industrial activities [37]. Usually, large extractive companies conclude agreements on social and economic cooperation directly with the region or municipalities and are not required to work with *naslegs* and individual settlements. The introduction of ethnological expertise allowed for the assessment of industrial impact on *naslegs*. To date, 10 out of 48 of them in RS(Y) have been carried out on the territory of the Belletsky *nasleg*.

Hard elements of traditional infrastructure can be demonstrated in the example of one Evenki family. These include hunting and reindeer herding trails, fishing grounds, a dwelling hut, a storehouse (a building for storing food), a summer kitchen, and a bathhouse (Figure 2).

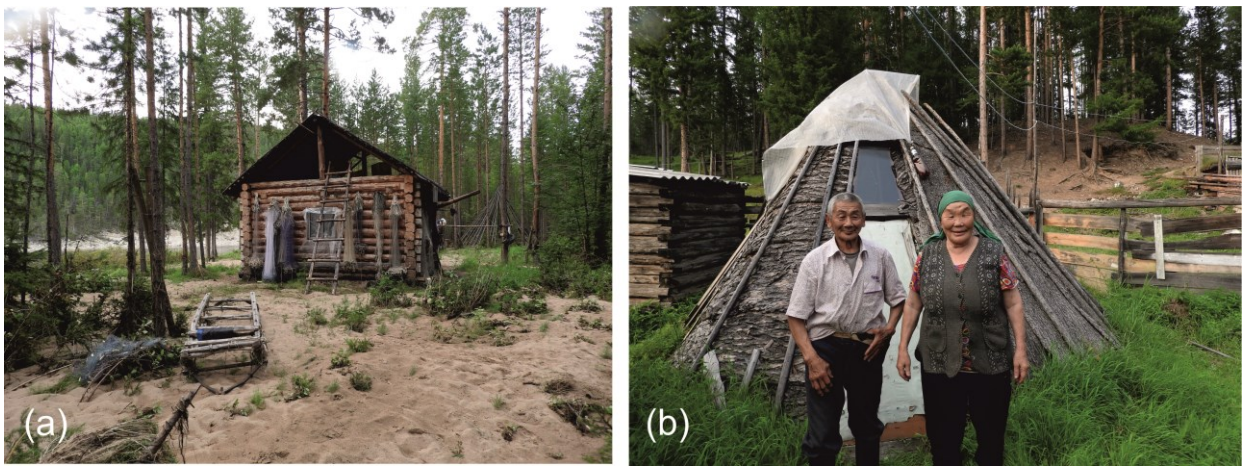

Figure 2. (**a**) Hunting hut in the northern IR. Photo by V. Kuklina, July 2016. (**b**) Retired couple in the village of Tyanya near their traditional summertime house chum. Similar structures are used for seasonal hunting and fishing camps. Photo by A. Savvinova, August 2016.

The reindeer herders have huts at their winter camps and live in tents for the rest of the year. The Evenki of RS(Y) also traditionally use summer dwellings made of tree (spruce) bark, which stay cool in the heat, at their village yards and in hunting and fishing areas. Storehouses are another element of infrastructure, typically placed at certain distances between places available for parking motorized vehicles and storing food supplies.

4.2. Extractive Infrastructure Development

While traditional transportation infrastructures, such as hunting and reindeer herding trails, have been rather slightly modified in parts of the landscape, during the XX century, their appearance has changed significantly under the extractive industrial development. First, settlements were connected by the system of heavily subsidized air transportation, which not only provided access to local and regional centers but was also used for transportation of hunters, many of whom were Indigenous people, to their hunting grounds in the taiga [38]. Then the practice of patronage of industrial enterprises over collective farms and state farms was established. In interviews, residents fondly recalled the former heads of industrial companies. As part of the practice of patronage, goldsmiths and geological parties built roads for the reindeer herders, drove reindeer herders in their transport, and delivered goods to reindeer herders' camps.

Currently, various actors involved in resource extraction in the region, including mining, oil and gas companies, forestry, and geological exploration (Table 2). Extractive companies facilitate local mobility by providing transport services, maintaining roads, and supplying oil and gas, increasing human and non-human mobilities that change traditional human–environment relations [33]. National regulations allow forestry activities on traditional land-use territories. The availability of good roads has also attracted a large number of recreational hunters and anglers from urban areas. Locals note an increase in the number of outsiders in the area, poaching, fire risks in the forest, traffic, etc. [33].

Table 2. Major actors in the study area.

Characteristics	Southern Yakutia	Northern Irkutsk
Districts (raions)	Aldanskiy, Neryungrinskiy, Olekminskiy	Ust-Kutskiy, Kirenskiy, Kazachinsko-Lenskiy
Study area (thousand square kilometers)	400	114
Population (thousand people) as of 1 January 2021	138.1	79.7
Territories of Evenki traditional land use (TTNM) (thousand hectares)	6829.1	299.1
Mining companies	Neryungri-Metallic, public joint stock companies Seligdar, Gold Pole, Mechel, Kolmar, and small gold-mining enterprises	
Oil and gas service roads	Transneft, Gasprom Transgas Tomsk	Transneft, Irkutsk Oil Company (INK), Gasprom
Forestry	Aldanskii & Olekminskii forestries, Angara Ltd.,	Transsiberian Forest Company (TSLK),

	WoodLand Ltd., Yakutlesresource	RusForest, Kirenskles, "Eurasia"
Geological exploration, Seismic line clearings	Progress Ltd., Seligdar Gold Joint-stock Company, Timpton Gold Ltd., public joint stock company GeoTek	Public joint stock company GeoTek, Gasprom, sub-contractors

Quite often, the pipeline road itself causes a host of problems, including accessibility issues by damaging existing road infrastructure, cutting trees to waste, and even blocking some river flows.

"That's how they cut down, dug up. And they laid these pipes there, filled up with clay and soil from above. They crossed our road and blocked it back with stones, such as boulders. Once they scattered it a little, scattered everything, and that's how it stands. I asked the boss who was involved in this: "At least level the road a little, because it's impossible to drive at all." There were such blocks, they scattered them somehow. Well, our people have already adapted to ride on it so that it is already somehow compacted, but still we don't drive well there, we always drive quietly there, through this place. It's standing there, I didn't see people working there, because that's where our road goes—they always have a tractor, a bulldozer and trees felled in heaps there. They, as if cut down, stored it all. And ours look at the logs, to take some to the village for construction. I called this boss, whether it will be possible to take it, choose it for the locals?" He says: "All sawn wood belongs to the Russian Federation. It will be put up for auction and sold." It will be wasted there. They completely filled over this road, no pipes for creeks—they didn't lay anything, they just fell asleep, and the stream went into this here. I don't know how it will go on. Water will still find its way. Where it will go—who the hell knows." (Magistralny, 2021, female, 55, head of the community).

Before the construction of the pipeline, the company management and local municipalities signed agreements guaranteeing unimpeded access to service roads for local residents and municipal services in exchange for their assistance in preparing for construction. For the transportation of commercial goods, payment and compliance requirements were established. With the ESPO access road construction, travel time has decreased several times for trips from Ust-Kut to RS(Y) (Figure 3c,d) [33]. As a result, local and non-local drivers, as well as transport companies, have found new ways to offer transportation services. Some residents have opened roadside cafes and repair stations along these roads.

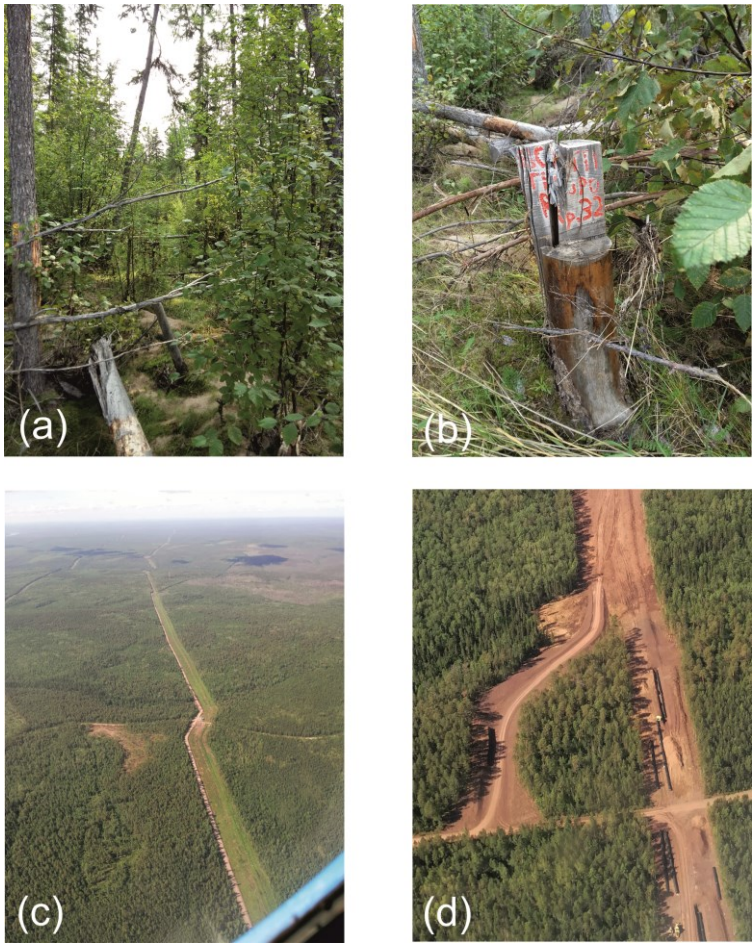

Figure 3. (**a**,**b**) The clearing line laid along the second option for the passage of the Power of Siberia gas pipeline near the village of Tyanya, Olekminskiy district. Photo by A.N. Savvinova, August 2016. (**c**) View on ESPO from a helicopter. Photo by N. Krasnoshtanova, 2021. (**d**) View on Power of Siberia pipeline construction from a helicopter. Photo by N. Krasnoshtanova, 2021.

However, the conditions for local access have changed over time. Right after the ESPO construction, residents could freely use the road and only needed their passports for confirmation of their local residence. Later, the company required *obshchinas* to submit requests in advance for permission to use the road freely throughout the year. Currently, both Ust-Kut and Khatystyr interviewees mentioned the need to obtain permission three days in advance for free access to the ESPO service road. In interviews, they express ambivalence about this situation:

"We used to have unhindered travel to our lands, but on reindeer. When the ESPO road was built, we began to travel by car. This is good because we can carry more goods and travel more often. On the one hand, it's good that an alternative road has appeared, but on the other hand, it turns out that we need permission to get to our own lands. In the first years of the ESPO, to travel to the hunting grounds and reindeer pastures, we were issued a pass that was valid for one year. Now you need a pass for every entry. To do this, we send an application to the company and in three days we receive a pass. This is very inconvenient if you need to go urgently. We need to plan in advance, while we are used to traveling when we want. It's always been that way" (woman, 57, head of the Indigenous Community, Khatystyr) [39] (p. 39).

Meanwhile, the Evenki residents of the village of Iengra, Neryungri District, have been able to use the ESPO and Power of Siberia service roads without restrictions. The source of discontent for them was the small gold mining enterprises that had restricted trespassing through their mining sites. Currently, the roads to mining sites are privatized,

and their use depends on the relationship with the companies. If the roads that enterprises built and maintain at their own expense do not have any public alternatives, residents can use them free of charge. However, this created dependency on these roads also leads to power imbalances: granting access to the road is framed as a favor from the companies' perspective. At the same time, companies may need support from communities in their own daily activities. As the interview below demonstrates, communities may form collaborations with enterprises located within *naslegs* based on personal relationships:

"Relations with industrial enterprises that come to our region, as a rule, are built on agreements. The human factor plays an important role here. It all depends on the dialogue that the leaders (both from the local municipality and the mining company) will build. We managed to conclude an agreement directly with the management of Neryungri-Metallic, but the management of GROSS (another company) avoided us, slips away. The agreement with Neryungri-Metallic was signed 6 years ago (in 2010—the authors). Here the role of the heads of enterprises was great. Thus, the head of Neryungri-Metallic knows very well the life and way of life of the Evenki, he knows how much jobs are needed, that we need to sell reindeer meat somewhere. Therefore, according to this Agreement, many of us worked for several seasons as guides in the exploration of deposits, they buy meat from us for their workers, etc. They hire our people to work there. Our reindeer herders who live near their camp take food from them, as it is much closer than if they came to the village for food. We have no complaints about this company yet. They also participate in improvement activities in the settlements within the framework of this Agreement. For example, this year they made a playground" (Male, 59 years old, administration worker in Tyanya).

Under an unofficial agreement, the reindeer herders of the "Tyanya" community make purchases from the "Neryungri-Metallik" company's store, as it is much closer to their camp than the village of Tyanya. The Tyanya reindeer herders can freely use the company's technological road to travel to the BAM Ikabya and Chara stations to visit their relatives.

4.3. Interactions Between Indigenous and Extractive Infrastructure

The status of TTNM sometimes protects obschinas from extractive infrastructure. For example, negotiations by the *obshchina* members of Vershina Khandy regarding the construction of the Power of Siberia pipeline over their lands led to compensation from Gazprom to pay rent for TTNM and buy transportation vehicles [34]. In RS(Y), in 2011–2012, design and survey work was conducted on two potential routes for the passage of the Power of Siberia gas pipeline (Figure 3a,b). The first route, within a single corridor of the already existing ESPO pipeline, is convenient because infrastructure already exists in the places where it passes. The second option involved laying the gas pipeline along a shorter route through the territory of the Tyanya Evenki TTNM. The estimated savings would amount to 49 billion rubles [40]. Local people were hired to clear the land, but beyond employment, no additional benefits were offered to them. In response to local and environmental concerns, the regional government chose the route in parallel with ESPO. Although it was more expensive, less destruction to the environment occurred, and Evenki territories of traditional land use in Olekminskiy district remained undisturbed. However, the status of TTNM did not provide in Aldan and Neryungri districts, where both ESPO and Power of Siberia pipelines cut through the land of local Evenki territories of traditional land use, including communities of Khatystyr and Iengra.

There are several cases where extractive infrastructure has been used to support subsistence purposes and local cultures. Roads based on existing seismic lines, forestry roads, and oil and gas service roads became major ways of transportation and organized local mobility. While hunting huts are traditionally built along the rivers due to reliance on river navigation, snowmobiles and off-road vehicles are increasingly being used as infrastructure development. Forest clearings were successfully included in the hunting infrastructure by local hunters for snowmobile driving [41]. Since areas of traditional land use

and geological and extractive exploration extent over large areas, quite often the signs serve as the way of communication between *obshchinas* and extractive companies (Figure 4). Members of *obshchinas* set up signs to inform newcomers that they are entering their territories. Many in interviews report that the presence of such signs deters recreational hunters and fishermen from trespassing:

"Earlier, after all, everyone knew who and where roams. Who has how many reindeer, when they will be in a particular area. And now few people know, except us. Here the industrialists arrived and began to put up their signs everywhere that it was not prohibited to go, for example, on sections of the ESPO pipeline. Everyone came to our *obshchina* sites, which are closer to the city of Olekminsk. And we, following industrialists, began to install information boards that the territory of traditional nature management begins from here. (After that) people who come to our *nasleg* for fishing stopped entering our fishing areas. I don't know, maybe they were scared by the ESPO that they went to the wrong site, but there are much fewer strangers on our territory now" (FMA, Tyanya, 2016, man, 53, head of the community).

Figure 4. Information plate about *obshchina* hunting grounds in the Olekminskiy district. Photo by V. Filippova, August 2016.

5. Discussion

Based on the analysis of interviews and the gray literature, the following infrastructure connectivities were mapped between companies, *obshchinas*, and settlements (Figure 5). While oil and gas service roads are the major connecting infrastructure objects for both study areas, there are several other companies that have created their own transportation infrastructure. These infrastructures sometimes facilitate local connectivity or sometimes disrupt local landscapes and ways of life.

A comparison of these two regions shows that seismic roads and forest roads created by private companies are more prevalent in the Irkutsk region, while in communities of the Republic of Sakha, roads built by mining companies and state-owned forestry agencies are more represented. While there were no negotiations between extractive companies and communities, consultations took place in the Irkutsk region. The decision to use the same route for the gas pipeline as for the oil pipeline in the Republic of Sakha (Yakutia) minimized the impact on subsistence resources.

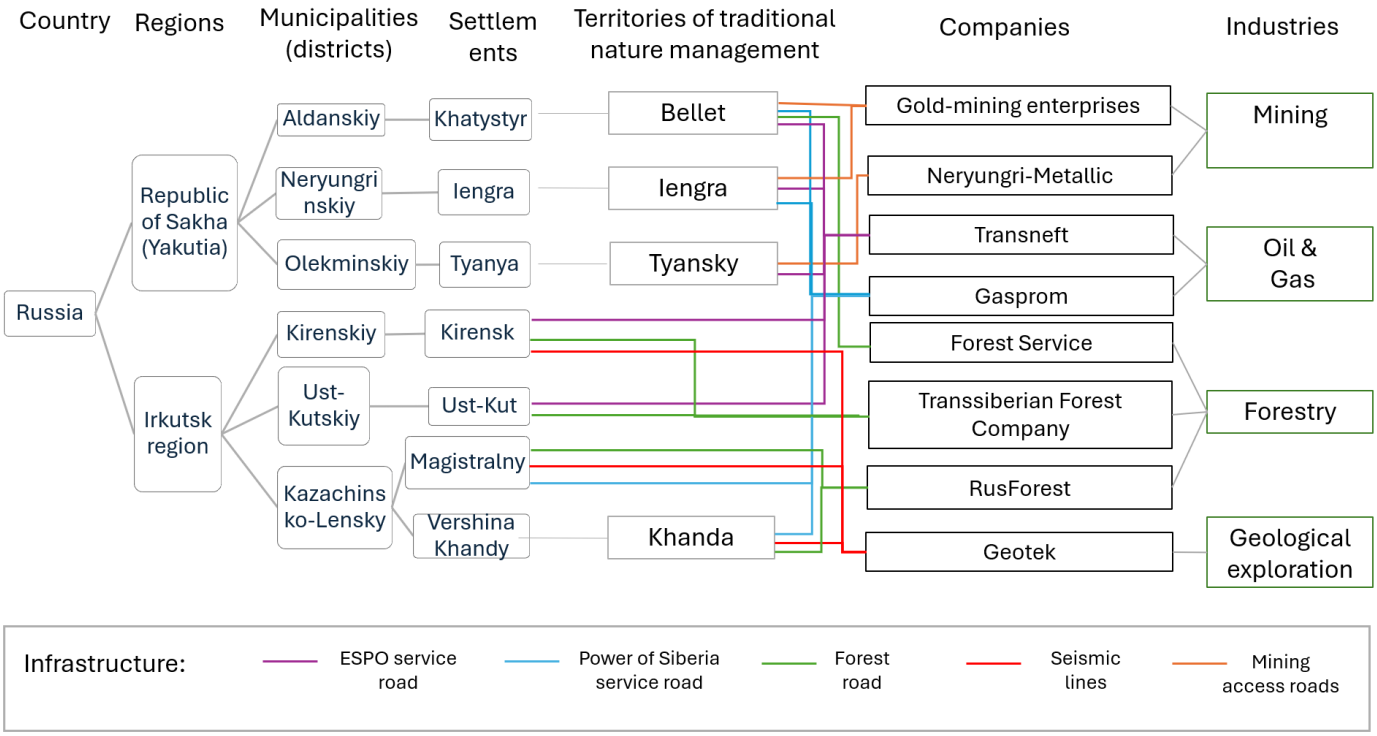

Figure 5. Companies' infrastructure connected to settlements and territories of traditional nature management.

Yet, despite the long history of the largest infrastructure projects occurring on the Indigenous lands in Siberia, we witness traditional relations with land preserved in some communities. We find it safe to say that this preservation is based on both formal and informal as well as soft and hard elements of infrastructure. Among formal elements, we can note the level of political autonomy and the protection of Indigenous rights in the regional legislature, as well as specific "soft" infrastructure in place, such as the status of TTNM, *nasleg*, and *obshchinas*. At the same time, each community utilizes different strategies and tactics for engaging and building relationships with companies. In fact, even parts of the same company in different locales build relations with communities based more on personalities and informal relations than on formalized procedures. Proximity to some extractive companies, where successful dialogue has occurred, can play a positive role in providing food and commodities for reindeer herders. However, more often, extractive industries create disruptions to traditional ways of life.

Here we can also highlight the differences in the policies of state corporations and small/private industrial companies. A state corporation adheres to rights and laws, caring about their reputation. Representatives of state corporations can be found in offices, and their contact information and visitor hours are publicly available. *Obshchina* members can send them letters or visit their offices. Problems with access to land and permits can also be solved through the government. Another matter is small private companies such as gold miners. Informal negotiations can lead to mutually beneficial arrangements, and even informal signs can be utilized to mark the Indigenous lands if the relationships remain respectful. Conflict situations arise when owners and management change at sites and the new management does not honor previous arrangements. Since these arrangements are often made unofficially, no legal mechanisms or government intervention are available for communities to protest and protect their lands.

Since construction of extractive infrastructure is planned based on top-down decision-making, when free and prior informed consent is not required, consultations or negotiations with local and Indigenous communities may initially appear as a goodwill gesture by companies. However, these practices often continue a colonial approach to the land and its people, as seen in other regions of the world [5–8,14]. We suggest, however, that another important factor should be taken into account. What Spice discussed as "tribal infrastructure" [9] and what LaDuke and Cowen called "alimentary infrastructure" [10] in our case refers to large distances and harsh climatic conditions that reinforce place-based norms and expectations more than officially established rules and regulations. In a context where state support, such as search and rescue or other emergency services, is not readily available, maintaining good relations with neighbors becomes a matter of survival for all actors involved. These norms and expectations shape relations between humans and non-humans and, as such, can be considered in the context of conceptualizing nature as infrastructure [20]. These human–infrastructure entanglements of land, water, humans, and non-humans connected through multiple reciprocal, respectful, and responsible relations co-evolved over millennia, as noted by many anthropologists [17; 18]. We add that they form specific foundations for Indigenous self-determination, human-environment relations, and cultural revitalization.

6. Conclusions

In conclusion, the comparison between the Irkutsk region and the Republic of Sakha (Yakutia) highlights differing approaches to infrastructure development and Indigenous relations. While there are limitations to our research, which focused on a relatively small region, its lessons are important in drawing attention to the specificities of human–environment relations, which are dependent on both "soft" and "hard" infrastructure. Despite the pervasive influence of extractive industries, traditional land relations remain resilient, supported by both formal structures (such as Indigenous rights and political autonomy) and informal community practices.

Our examination of two regions shows that infrastructure that was built for extraction can be repurposed to meet the needs of local and Indigenous communities. The economic viability of pipelines is premised on disregards or disruptions of subsistence infrastructures. However, the development and maintenance of extractive infrastructure in such remote conditions also depends on collaborative relations with communities that observe changes, provide informational and provisional support, and are the only ones available to help in case of an emergency. By collaboratively defining and utilizing infrastructure for both extractive and subsistence purposes, companies and communities can create some forms of co-existence.

Therefore, recognizing the rights of Indigenous peoples and engaging Indigenous peoples in decision-making would lead to more sustainable solutions for infrastructure development. In particular, bottom-up approaches in regional development play a crucial role in ensuring that local objectives are prioritized alongside national sustainability targets [42]. The principles of community sovereignty and Free, Prior, and Informed Consent (FPIC) are fundamental in acknowledging the rights of community stakeholders affected by large-scale infrastructure projects. These principles are instrumental in guaranteeing that the resulting infrastructure serves the communities effectively and/or that the negative impacts of such projects are adequately addressed. Identifying together with Indigenous people and local communities what the planning, development, and maintenance of such infrastructure could look like is the question for future research.

Adopting this perspective can potentially lead to a more balanced approach to improving well-being, promoting justice, and enhancing sustainability. However, this necessitates a significant shift in the power dynamics between national governments, extractive companies, and community stakeholders [43]. Such a transformation is essential for fostering a more equitable and sustainable development process that genuinely reflects the

needs and aspirations of local and Indigenous communities, promotes cultural revitalization, and challenges colonial approaches to resource extraction and land use.

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