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Infrastructural legacies and post-Soviet transformations in Northern Sakha (Yakutiya), Russia

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ABSTRACT

The town of Tiksi came into being in the 1930s, when the Soviet Union intensified its efforts to industrialize the Arctic. A critical element of that policy was to make the Northern Sea Route a viable Arctic shipping lane and Tiksi, located where the Lena River meets the Arctic Ocean, became an important transportation hub on that route. Post-Soviet transformations led to a rapid decline in population numbers and economic significance of the town, while climate change opened up new opportunities for shipping and mammoth tusk collecting. Today, the situation seems to have stabilized but the promises of a bright future pronounced in strategic papers by the government are yet to be realized. The article explores the socio-economic, infrastructural and environmental changes of recent decades in order to explore future development prospects for Tiksi. The infrastructural legacies of the Soviet past, combined with the environmental conditions of the region, result in the intertwined material dependencies of built and natural environments. Still, these material dependencies are neither straitjackets nor unchangeable. It is the interplay between global climate change, national policies, and local initiative that will challenge the material dependencies of the past and present.

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Introduction

The afterlives of Soviet industrialization of the Arctic provide interesting case studies regarding the material dependencies of societal transformations (Ssorin-Chaikov, 2016). While it might be difficult to argue that the post-Soviet built environments of northern Russia find themselves in the middle of a sustainability transition, the changes of the last thirty years, since the dissolution of the Soviet Union, deserve scholarly attention. While these changes can be characterized by the label 'transition from socialism to post-socialism', the actual transformations have been more complex.

The Arctic town of Tiksi, which has been called 'the Arctic sea-gate of Yakutiya', serves as our case study here. During late Soviet socialism, Tiksi found itself in a relatively privileged position regarding the transport of people and goods when compared with other northern communities, as goods from the European part of Russia arrived in Tiksi before they made their way to Yakutsk, the capital of the republic. In recent years, Tiksi has often served as an example of post-Soviet decay.[1] Today, the demographic decline seems to have stopped and the situation is more or less stabilized but the future is anything but certain, as promises of future development remain mostly on paper.

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The central aim of this article is to assess whether the material infrastructures put into place during Soviet times limit the present and future development options of Tiksi. In this work, we follow the classical definition of infrastructures as 'built networks that facilitate the flow of goods, people, or ideas and allow for the exchange over time' (Larkin, 2013, p. 328). At the same time, we highlight the political nature of infrastructures as a project that shapes modern nation-states and provides the material foundations of social life and the imaginative resources through which political participation is structured (Knox, 2017). These two qualities of infrastructure, as facilitators of flows and movement, on the one hand, and as material foundations that structure political actions, on the other hand, help exploring the social tensions under conditions of technological stress and rapid societal transformations. Collier (2011) using attempts at 'neoliberal' reform of the central heating system in a small industrial city in southern Russia as his case study, has argued that 'pipes matter' and announced the 'intransigence of things' amidst his Foucauldian analysis of post-Soviet transformations. Stefan Bouzarovski and his co-authors (2016) focused on the heating system in the Czech town of Liberec and found lock-ins stemming from socialist legacies and 'rolling path dependencies', which allow for new paths within existing material dependencies. Humphrey (2003) uses the example of the 'great freeze' of January 2001, when pipes and heating systems broke in a number of Siberian cities, including in Ulan-Ude, leaving its residents in the cold in the middle of winter. This example of an infrastructural failure demonstrates that the maintenance of urban infrastructures was left by the wayside when housing became privatized. In this case, attention to infrastructure can also be seen as an invitation to reconsider the relations of responsibility and trust between the post-socialist state and its citizens in the situation when taken-for-granted basic services earlier provided by the state institutions were not guaranteed anymore. Thus, the transition from Soviet to post-Soviet, or from socialist to post-socialist, has been based – contrary to naïve assumptions by so-called 'transitologists' – on the material legacies and the psychological predispositions of a previous era.

Our focus is not on the heating system of Tiksi but on the transport infrastructure, which is among the primary reasons that the town came into being in the first place. In addition, we will pay attention to the urban infrastructure – both currently abandoned, renovated and a few newly built apartments blocks and public buildings. Both types of infrastructures, their material condition and (mal)functioning, are indicators of the unfolding and socio-economic and environmental changes.

In this article, we aim to explore the role of Soviet era infrastructures for the post-Soviet present and future community development. In other words, we are interested in the role played by the built environment in enabling or disabling the potential futures of the community of Tiksi and its permanent residents in a wider historical and geographical perspective. If these material dependencies are relevant for the post-Soviet transition, we can assume that they will be important for future sustainability transitions as well.

The two authors conducted field research in the capital of the Sakha Republic, the city of Yakutsk, in Tiksi, as well as in the nearby indigenous village of Bykovskiy in July 2019. While part of the focus of our research, in the context of the H2020 project 'Nunataryuk', was on the impacts of climate change and permafrost thaw, another important dimension of our scholarly attention was on the state of infrastructures in the region, especially on transport infrastructures. Our fieldwork methods and approaches included community meetings and focus groups with local residents, expert interviews with the representatives of local administrations and organizations, biographical interviews with indigenous and long-term residents in the studied Arctic coastal communities. In total, we conducted 22 interviews and 3 focus groups with local residents of the Bulunskiy District. Our introduction into the community of Tiksi started with a round table at the administration of the Bulunskiy District, attended by the head of the administration and experts from various departments. The meeting was followed up by a few expert interviews and facilitated appointments at other organizations and contacts with the key local informants on our research topic. With assistance from indigenous organizations and the district administration, we were able to co-organize focus groups with the experts from the city administration of Tiksi, with the members of the regional branch of the Russian Association of Indigenous People (RAIPON), as well as with the captains and the administration of the seaport. Each of the groups included three to five informants representing different groups of the local population. Ten more in-depth interviews with representatives of indigenous NGOs and local enterprises, as well as with local residents working at the hospital, the library and local arts and history museums in Tiksi were helpful for getting insights into

the Soviet history and present-day issues of community development. Our informants included long-term community residents, both indigenous (Eveny, Sakha) and non-indigenous, experts as well as laypeople, and men and women in their 30s, 40s, 50s and 60s. In addition, statistical population data and information about development programs and plans were gathered in the district and city administrations in Tiksi (Investitsionnyy passport, 2017).

In the following, we will introduce the history of the Northern Sea Route and of the town of Tiksi as a first step to understanding more recent changes. This will be followed with sections on post-Soviet socio-economic transformations, infrastructural change, as well as environmental change. These processes can be seen in relation to each other, although they do not necessarily run in parallel. An analysis of past and present development will lead us to question about the future. Based on an understanding of the continuities and changes in the built and natural environments of the region – and the many hybrid forms constituted by them – infrastructural legacies and material dependencies will be explored (Van Assche et al., 2022). This will enable us to answer the questions raised above and address the broader issue of path dependence under conditions of post-Soviet transformations.

The Northern Sea Route and the Soviet past of Tiksi

In order to understand the historical and contemporary context of the town of Tiksi, one cannot but mention the Northern Sea Route (NSR), a maritime passage north of Russia connecting the Atlantic and Pacific oceans that used to be called Northeast Passage by western European mariners. Starting with the sixteenth century, English and Dutch seafarers had attempted to reach China via the elusive Northeast Passage (Barrow, 1818/1971; De Veer, 1964; Evans, 2013). It was not before 1878–1879, however, that the first traverse of this maritime passage in its entirety had been achieved by Adolf Erik Nordenskiöld on the *Vega* in the course of two seasons (Nordenskiöld, 1881). While the remaining decades of the Russian Empire saw a certain amount of exploration and scientific expeditions, especially in the western section of the passage (Armstrong, 1952), full-fledged economic exploitation had to wait till after the Russian Revolution.

In 1920, the Committee of the Northern Sea Route (*Komseveroput'*) was established to develop Arctic transport infrastructure and related tasks for the young regime. After successes and failures in Arctic marine shipping and polar aviation during the 1920s, the unfulfillable demands of the first Five-Year Plan led to the dissolution of *Komseveroput'* in 1933 (McCannon, 2007, p. 402). Its successor organization, the Main Administration of the Northern Sea Route (GUSMP or *Glavsevmorput'*) was a colossal organization that was in charge of 'the entire economy and all enterprises north of the 62nd parallel' and – at its height – employed over 100,000 people, controlled all icebreakers, ice-forcing vessels and mining operations along the sea route (McCannon, 2007, pp. 403–404). After a string of spectacular successes, accidents and natural disasters hit the agency in 1937 (McCannon, 2005, p. 181). The final end to the glory days of *Glavsevmorput'* came as a result of the Stalinist purges. In 1938, the Council of People's Commissars, the highest executive authority in the Soviet state, restructured the organization drastically, stripping it of all its 'continental duties' (McCannon, 2007, p. 416). The agency continued to exist into the 1960s as a transport-focused organization. When *Glavsevmorput'* lost many of its assets in 1938, the main beneficiary was *Dal'stroi*, the Main Administration for Construction in the Far North. While *Dal'stroi* is more or less synonymous with death camps along the Kolyma, both organizations were extremely powerful agents of forced development. As Yuri Slezkine has remarked, 'most … northerners became part of two quasi-independent fiefdoms bent on industrial development' (Slezkine, 1994, p. 276).

At the beginning of what is the town of Tiksi today was the foundation of the polar station 'Bukhta Tiksi' in August 1932 (Gukov, 2013, pp. 361–367). It happened within the context of the Second International Polar Year and under the auspices of *Komseveroput'* that was in the final year of its existence. The town itself and the maritime port, located at a distance of a few kilometers from the polar station, came into being in 1933 already under the regime of *Glavsevmorput'* (Gukov, 2013, pp. 302–308) (Figure 1).

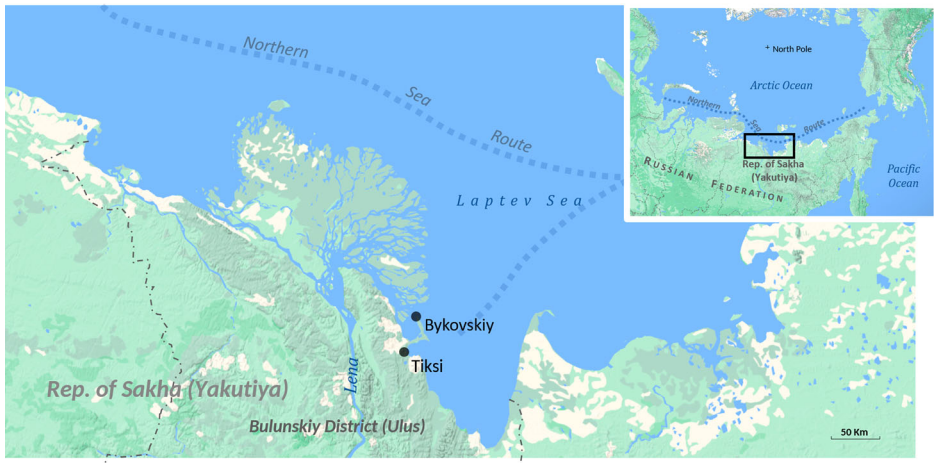

Figure 1 Map showing the location of the main field sites. Author of the map: Alexis Sancho-Reinoso.

The settlement of Tiksi was founded in 1932 as a port along the NSR in the process of Soviet exploration and colonization of the Arctic. In 1936 it was officially recognized as an NSR port and experienced rapid development between the 1930s and the 1950s when the community was fully supplied by sea. The significance of the port of Tiksi rose significantly during its first 20 years of operation, resulting in 25% of all freight destined for Yakutiya to go through Tiksi (Armstrong, 1980, p. 125). When the railroad line from Tayshet to Ust'-Kut was opened in 1954, it resulted in a shift from marine transport to railroad transport, leading to a loss of significance for Tiksi. In 1961, only 3% of incoming freight was via the Northern Sea Route (Armstrong, 1980, p. 125). As a bottleneck developed at the Ust'-Kut connection, further development of the Tiksi sea port – mainly through the construction of a deep-water pier begun in 1978 (Struchkov, 2005, p. 233) – became a necessity (Barr, 1982). This led to another development peak during the 1980s, which lasted till the dissolution of the Soviet Union.

Despite these changing economic fates, there was a steady increase in the population numbers of Tiksi, from several hundred during the 1930s to over 11,000 in 1989. As this population influx was primarily from the European part of Russia, the percentage of indigenous residents fell from 44.8% in 1959 to 27.9% in 1989 (Fedorova, 1998, p. 89). The 1990s saw a sharp population outflow, due to the closure of military bases, economic decline and the resulting outmigration of specialists. Today, the demographic situation seems to have stabilized as will be detailed in the next section.

Thus, the short history of Tiksi is intricately tied to the industrial development of the Soviet North, often referred to as the 'mastering of the North' (*osvoenie Severa*) (Slavin, 1982). The beginnings of this process of rapid development were during the Stalinist era, when forced labor – through the GULAG system – was a central part of labor recruitment for most large-scale projects. While it is unclear what role forced labor played in the establishment of Tiksi, the history of the nearby fishing village of Bykovskiy shows impacts of forced migration and resettlement (before and during the Stalin era) on the region (Stammler et al., 2017). It is generally assumed, however, that the *Glavsevmorput'* reign that facilitated the rise of Tiksi was based less on forced labor than the neighboring 'fiefdom' of *Dal'stroi*.

The developmentalist ideology behind these organizations, combined with their unrestricted authoritarian power, constitute what James Scott has called hyper-modernism (Scott, 1998), a regime that produced a series of large-scale infrastructure projects across the Soviet Union. Especially once the days of Stalinist terror were over, these projects – including the Northern Sea Route[2] – became promises of modernity, that is connectivity, speed and economic prosperity, like similar projects elsewhere (Harvey & Knox, 2012). The question now is how these infrastructures function after the ideological regime which produced them, Soviet state socialism, has vanished. Likewise, the question arises how the impacts of climate change, such as the melting of sea ice in

the Arctic Ocean, fuel public imagination and economic and political considerations of the potential of the Northern Sea Route to function as an alternative option to transport via the Suez Canal (Buixadé Farré et al., 2014; Melia et al., 2016).

Socio-economic transformations

In the 1990s and 2000s, most of Russia's Arctic regions were facing challenges of socio-economic transformations. The dissolution of the centralized system of provisioning, high inflation rates, and the commercialization of economic activities, negatively affected the NSR communities, including maritime and other transport operations, as well as urban infrastructures (Granberg & Peresypkin, 2006, p. 247). With the decreasing transport of cargo by sea, many of the NSR seaports that used to play a central role in shaping the communities around them started declining (Granberg & Peresypkin, 2006, p. 257). These radical changes also caused a mass population outflow from Arctic communities during the 1990s, primarily by former Soviet labor migrants (Heleniak, 1999). Tiksi as well as Igarka, Amderma and Dikson were among the NSR communities with the highest population losses (Ivanova & Potravnaya, 2020). The remaining local residents, and especially the indigenous ones, had to adapt to the reorganization of their subsistence activities and to face new social, economic and cultural challenges (Tishkov, 2004).

Today, Tiksi is the administrative center of the Bulunskiy District (Ulus) of the Republic of Sakha (Yakutiya), being the largest and only urban settlement in the district. The community consists of two parts: Tiksi-1 accommodates the majority of the overall population and its organizations, and Tiksi-3 is a semi-autonomous community consisting primarily of military personnel (and their families) doing their service in Tiksi on temporary contracts. In 2016, the population of the Bulunskiy District stood at 8366 residents, and the majority of the population (4555 residents) lived in Tiksi (Investitsionnyy passport, 2017, p. 4).

Post-Soviet transformations severely affected the population dynamics and socio-economic development of the community. Throughout the 1990s, the previously permanent population was out-migrating from town. The number of residents stabilized by the beginning of the 2000s. According to the Russian population census 2010, Tiksi had 5063 residents, but this number has been slowly declining. The continued outflow of residents from Tiksi to the 'big land'[3] is partially compensated by the inflow of new residents from neighboring villages. In 2016, the ethnic composition of the population of the Bulunskiy District consisted of 29% Russians, 25% Evenkis, 23.4% Sakha, and 14% Evens (Investitsionnyy passport, 2017, p. 4).

The temporary population of the military town of Tiksi-3 (and of Russian military personnel in general) is not been registered by the national census. Throughout the post-Soviet period, it has been considerably fluctuating: the closure of the military unit and the airport in 2012 caused the outflow of military officers. It's reopening in 2019 boosted the construction of new housing and buildings and symbolized the return of the military men to the Russian Arctic.

The extraction of resources (coal, gold and diamonds) and the production and distribution of electric energy are the most profitable industries in the Bulunskiy District. In 2013, the production of diamonds mined in the district by the Sakha company 'Almazy Anabara', yielded a profit in the amount of 39.1 million US dollars. In 2017, the large Russian corporation 'Alrosa' and two regional companies 'Nizhnelenskoe' and 'Yangeologiya' were licensed to exploit diamond, gold and silver deposits located within the district's boundaries (Investitsionnyy passport, 2017, pp. 7–9).

A growing type of extractive economy is the collection of mammoth tusks. This activity became possible thanks to environmental change as thawing permafrost unveils well-preserved mammoth skeletons and tusks. According to some estimates, the deposits of mammoth tusks identified primarily on the New Siberian Islands amount to 61 tons. The State Geological Committee of the Republic of Sakha (Yakutiya) issues a few licenses every year between May and November for the purpose of extraction of paleontological collections. For example, in 2011 it issued 58 licenses for collecting of up to 10 mammoth tusks per trip (Investitsionnyy passport, 2017, pp. 5–6). However, our field observations and informal interviews with residents of Tiksi show that tusk collection has turned into a profitable semi-legal business of large-scale extraction that supplies China and other external markets.

Fishing and fish processing traditionally have been the leading agricultural activity in the district. Currently, around two hundred thousand tons of fish products are being processed in Tiksi on an annual basis. Small-scale agriculture, including a cattle farm and a few greenhouses, used to provide the whole town with dairy products and meat; since their closure in the 1990s, most of the food products with the exception of fish and reindeer meat are supplied via seasonal routes from other parts of the republic. Local small-scale and medium-scale enterprises provide mostly fish and bakery products.

In 2017, 209 enterprises, including 154 large and medium ones, and 55 small enterprises, as well as 246 individual entrepreneurs, were registered in the Bulunskiy District. Among the 8366 residents of the district, only 3563 were officially employed. The majority of the civilian population of Tiksi is employed in local offices of Russian federal agencies (e.g. Federal Agency for Health and Consumer Rights, Federal Tax Service) and in banks ('Sberbank' and 'Almazkreditservis'). Public organizations, including nine educational institutions, employed 516 residents. Among other large employers were organizations in the spheres of healthcare (four hospitals and seven rural healthcare posts), culture and sports. Most of the above-mentioned organizations, as well as small trade enterprises, and the joint property companies servicing sea and river ports, are based in Tiksi.

The residents of the Bulunskiy District still have to cope with the repercussions of post-Soviet socio-economic transformations, such as unemployment, high consumer prices, and declining living standards. A survey conducted in the frameworks of a social assessment of a large diamond mining project in 2016 in Tiksi and neighboring communities showed that 22.1% of the respondents were concerned about high consumer prices, 14.5% with the lack of jobs, 14.4% with low incomes, 9.4% with alcoholism, and 9.4% with the lack of roads. Respondents from Tiksi prioritized the following tasks of socio-economic development: reconstruction of housing and public buildings (52%), support of traditional subsistence activities (51%), and improvement of employment policy (30%), among others (Ivanova & Potravnaya, 2020, p. 120). Our interviews with local residents of Tiksi show that the situation in the village has generally stabilized in the recent years after a long period of post-Soviet socio-economic decline. According to our informants, one of the reasons for improvement are socio-economic development and state support programs. Still, high consumer prices that are predetermined by complicated logistics of community supply, make living in Tiksi impossible on one salary only – in many cases, people are involved in subsistence activities (e.g. fishing) or work in more than one job.

Infrastructural change

Until the beginning of the 1990s, new housing was actively constructed in Tiksi. Most of the houses are municipal apartment blocks built in the 1960–1980s and require major renovation. The same is true for public buildings – a gymnasium and two secondary schools, a kindergarten, a youth's sports school, a musical school and a museum of fine arts and culture of the Arctic. Urban infrastructures, especially a few (semi)abandoned houses, have been declining without proper maintenance in the post-Soviet period. During our field study in 2019, we saw a few selected buildings in the central part that were re-painted. A new culture and sports center built in 2012 and an Orthodox chapel seem to be the only new buildings that appeared in Tiksi-1 in the post-Soviet period. At the same time, few new houses were built in 2019 in Tiksi-3, the military part of the town. The major issues of the urban planning in Tiksi are the lack of recreational areas (parks and squares), as well as the absence of asphalted roads and walkways. Because of the massive population outflow, there are 427 empty apartments in the town. The fact that most of them (74%) are in private properly doesn't allow the municipal authorities to regulate the resettlement of local residents in a way that would increase the cost-efficiency of communal services (especially, heating) (Ivanova & Potravnaya, 2020, p. 124). As a result, redundant housing infrastructure is a burden on the budgets of municipality and individual households.

A particular feature of the transport networks of Bulunskiy District is the lack of all-year ground infrastructures. The community is supplied with goods, foods and fuels mostly from Yakutsk: in winter – with trucks and cars by seasonal winter roads, and in summer (in the navigation season) – with boats by Lena River (from Ust'-Kut) and, to a very limited extent, by sea. Aviation (flight to Yakutsk) and private cars and buses

(connection between different parts of the town and within the district) predominate in passenger transport. The seaport Tiksi, in the heyday of Arctic exploration in the 1980s, serviced over 900 thousand tons of cargo annually. In the post-Soviet period, the amount of transiting cargos has dropped dramatically. Nowadays, it is estimated that only up to 5% of its capacity is being used (Ivanova and Potravnaya, 2020, p. 122). The port is equipped with gantry cranes, repair facilities and bunkers, however, the signs of its decline are visible. In 2019, we conducted a group interview with the port's employees who confirmed that the seaport needs dredging and its infrastructures – reconstruction and technological modernization. Its prospects, however, remain vague as the ships following along the NSR pass by Tiksi and its role in internal community supply has been decreasing. An interview in Tiksi riverport, on the contrary, confirmed increasing business activities of the port operated by the company 'Lenskoe Rechnoe Parokhodstvo' (LORP), boosted by increased community supply by the river during the navigation season.

An international report on the state and future potential of the NSR conducted in the early post-Soviet period, assumed the important role of the route for domestic cargo flows and community development (Ragner, 2000). Some long-term assumptions, based on climate change scenarios with the prospects of retreating sea-ice even consider the NSR as a potential alternative to Suez Canal (Buixadé Farré et al., 2014). At the same time, more critical research points at a number of economic considerations and geopolitical constrains and indicates that more investments are needed in seaport infrastructure in order to increase the cargo capacity of the NSR and to meet to the heightened expectations of its increased international role (Brigham, 2020; Laruelle, 2016; Moe, 2020).

The Russian national strategy of the development of the Arctic zone (Strategiya razvitiya, 2020), as well as the regional concept of socio-economic development of Northern Yakutiya (Strategiya, 2020), foresee the increasing role of the route not only for its communities, but also for the transit of cargos to international markets. These and other policy documents and public speeches refer to Tiksi as a nodal point (*opornaya tochka*) along the NSR (Gavrilova et al., 2017) and rhetorically fuel public hopes for new community development. At the same time, real investments in socio-economic and infrastructural development of Tiksi lag far behind the plans on paper. Many residents of Tiksi and, especially, those belonging to the generation that had witnessed its boom in the late socialist period, associate not only the past, but, to a certain degree also the present and the future of Tiksi with the NSR. Tiksi remains a community with a stable permanent population as well as Russia's military outpost in the Arctic. Since recently it also houses a search and rescue operations base that is administered by the Ministry of emergency situations and is used to provide medical and rescue support to ships passing along the NSR. Among local residents, these facts leave no doubts about the future of the community as secured by the Soviet infrastructural legacy and the current national interests.

> You see, Tiksi stands here like a pillar. It will be supported in all respects, as the community and the seaport stand at the crossroads of riverine, maritime and air transportation … That is what already exists here makes it all easier: one doesn't have to build anything anew here … (LK, sea port captain, Tiksi, 2019)

At the same time, the location of Tiksi at quite a distance from the main shipping lane of the NSR makes the profits of transit shipping pass by the local seaport and the community itself. This makes relationship between these national infrastructure project and the community more distant and leaves very few hopes, if any, for direct profits from the NSR modernization program for local communities.

> Well, talking about the Northern Sea Route … It's good that it exists and if we will be able to integrate into it, I will be totally for it. It is relevant on the national scale, but we don't receive taxes to the local budget from it, we are not provided with jobs, we are not included into its system of energy resources and communication, etc. Therefore, as a Russian citizen I am glad for the country, but as a government officer I don't see its relevance. (IK, district administration officer, Tiksi, 2019)

Environmental change

If one wanders the streets of Tiksi today, one cannot but notice a multitude of buildings that seem uninhabited, dilapidated or ruined. As our fieldtrip to Tiksi was sponsored by a research project focused on permafrost thaw

and environmental change, we assumed to be facing the impacts of climate change. However, it turned out that urban infrastructures, such as houses and roads, have been declining because of the lack of proper maintenance and/or not being used and heated in post-Soviet times.

The climatic conditions of the Arctic coast have always been very challenging for human-built infrastructures in Tiksi, and only since the effects of anthropogenic climate change are being felt. Thus, the construction of houses and other building in Yakutiya and other parts of the Russian Arctic has long been achieved by putting these infrastructures on piles to prevent the negative consequences of the unavoidable warming of permafrost under a building. Lately, this building method seems to have (see, e.g. Gertcyk, 2020) run into problems, while it remains to a certain degree unclear whether extreme weather events, the lack of proper maintenance, climate change, or a combination of these factors are to blame. In any case, according to some prognoses, up to 70% of Arctic infrastructures will be affected by permafrost thaw by 2050 (Hjort et al., 2018).

While the current impacts of climate change on the urban infrastructure of Tiksi remain somewhat unclear, the ice roads that connect the town with the rest of the Republic of Sakha during the winter show clear signs of climate change-related impacts. As ice roads become unstable, less predictable and shorter in use duration, the supply with goods is heavily affected and becomes more irregular. Air transport, the only alternative during the winter months, is of course too expensive, especially for bulky goods. Other impacts outside of town that are being noticed by its residents are the retreat of sea ice, which leads to the loss of biodiversity and habitats, for example, polar bears. The increased turbidity of river water, on the other hand, directly impacts fishing. At the same time, environmental change, especially permafrost thaw, opens new economic opportunities, such as mentioned above collecting of mammoth tusks. The latter occupation only became possible because of environmental change, as the thawing permafrost unveils well-preserved mammoth skeletons and tusks. While the 'hunt' for these skeletons and tusks provides income for some local residents, it also leads to the destruction of landscapes and cultural heritage.

The impacts of climate and other forms of environmental change in the town of Tiksi itself might not yet be as visible as elsewhere in the Sakha Republic (see, e.g. Crate, 2008) or the Russian Arctic (see, e.g. Orttung, 2017). If we look at the fishing village of Bykovskiy, located 80 kilometers north of Tiksi in the Lena delta, however, coastal erosion and permafrost thaw become noticeable at first glance. In both studied communities, people are very conscientious of the changes in their environments, such as unusually mild winters that are accompanied by strong snow blizzards (Doloisio & Vanderlinden, 2020). Still, in Bykovskiy as in Tiksi, residents seem to be preoccupied with the repercussions of post-Soviet socio-economic transformations – such as unemployment, high consumer prices, and low standards of living that overshadow the long-term effects of environmental change. The majority of our interlocutors showed little concern for the impacts of climate change they were clearly aware of. Instead, it was the more immediate socio-economic challenges they are facing – including local specifics such as the distribution of fishing quotas – that they wanted to highlight in our conversations.

In order to explain this somewhat paradoxical situation, we need to understand that the Soviet modernization ideologies that had led to the rapid industrialization of the Arctic and the establishment of the Northern Sea Route have not remained limited to politicians and decision-makers. Instead, 70+ years of putting technological progress and economic (socialist) development at the heart of the ideology of 'scientific communism' helped spread this technocratic reliance on outside experts to every remote corner of the country. Notwithstanding, radically different indigenous ontologies, these attitudes have informed the environmental ethics and practical interactions between humans and nature in the Russian North to a large degree. Climate change, thus, has to be left to the scientists, while locals need to care about economic survival and to address the challenges of everyday life on their own.

Conclusions: material dependencies of the built and natural environments

The town of Tiksi is encountering a multitude of material dependencies in its way forward as the preceding sections have shown. Built as a single-purpose settlement (to serve the NSR and the transshipment of resources

and goods) during a time of totalitarian state power, Tiksi received additional tasks during late socialism (as a military base and an air transport hub). Most of these earlier developments continue to cast their infrastructural legacies into the post-Soviet period, albeit sometimes in the form of disrepair (Schweitzer et al., 2017). Still, it seems that Tiksi is afforded a rather narrow selection of future options. This is not just due to the legacies of the built environment but due to natural environmental conditions as well. Situated along the shores of the Arctic Ocean, the climatic conditions of Tiksi severely limit agricultural activities and make it difficult to attract inhabitants from elsewhere and to retain those who already live there. The spatial remoteness and the scarcity of transport options of Tiksi further contribute to the challenges it faces. Using the terminology of the framing essay of this special issue (Van Assche et al., 2022), we can speak of natural, human-made and hybrid material dependencies that Tiksi is facing. Some of them are enabling (e.g. the presence of a port), while others disabling (e.g. climatic conditions). As Van Assche et al. point out correctly, the values of these dependencies are relational and contextual.

If we allow ourselves a thought experiment for a moment, we could try to guess whether Tiksi would have ever come into existence without the Stalinist forced industrialization plans of the Arctic as implemented by *Glavsevmorput'*. The answer most likely depends on whether the NSR would have come into being in such a hypothetical situation. Clearly, there would have never been a Tiksi without an NSR. The next question would be, which NSR? The NSR of the Soviet period was primarily an internal transport artery, which had the provisioning of Arctic Siberia as one of its main tasks. At the same time, it was also a state-directed megaproject of exploration, resource exploitation and urbanization of the Arctic. Given that Tiksi is located near the mouth of the Lena River, the 'old NSR' almost necessitated a settlement like Tiksi, as it provides the critical link between sea and river transport. The post-Soviet NSR, however, seems to focus on the transport of resources from Arctic Siberia to external markets and the transshipment of goods from East Asia and Europe. Ships that want to get through the NSR as fast and fuel-efficient as possible, and have no business to visit the mouth of the Lena River, pass by Tiksi at a distance of several hundred kilometers. Thus, while the importance of Tiksi hinges on the NSR, it is only a particular kind of NSR that seems to require a settlement like Tiksi. The 'new NSR' could function perfectly well without Tiksi.[4]

So, what does this mean for the future of Tiksi? First of all, while we have come to understand the importance of infrastructural legacies (and the intertwined material dependencies of built and natural environments), it is political decisions that play another critical role here. Had the neoliberal laissez-faire policies of the 1990s continued, the population of Tiksi might have further decreased, although, most likely, it would not have disappeared entirely, as a number of residents would have insisted on their right to be there no matter how dire the circumstances. An actual closure of Tiksi after 1991 would have required a kind of centralized and authoritarian state that had abandoned any plans for Arctic development and the NSR. Instead, Russian policies of the last 20 years, albeit by an increasingly centralized and authoritarian state, have gone in the opposite direction: a focus on the economic and strategic potential of the Arctic for Russia. Such a development agenda will have to focus on the infrastructural legacies of the past and might make use of Soviet development rhetoric as well (see Povoroznyuk, 2020).

Soviet ideology, with its underlying idea of mastery over harsh natural environments of the North, seemed to downplay or ignore environmental processes and material dependencies that they engendered. The collapse of the Soviet regime followed by a socio-economic decline revealed a number of critical material dependencies of Arctic communities on infrastructures. Withdrawal of state investments and centralized maintenance, as well shrinking human resources, made critical infrastructures more vulnerable to environmental change than ever. As a result, such Arctic communities like Tiksi were reconfigured from the outposts of Soviet development to the margins of the postsocialist state with limited prospects for investments in the near future. In these conditions, the remaining but increasingly abandoned infrastructures symbolize material dependencies as well as ruins of a Soviet past.

While a 'sustainability transition' in the western sense of the word might be of rather limited relevance for the residents of Tiksi, 'sustainability' in the sense of 'continuity' and 'survival' is a major concern for the people living there. This might also explain the local support for developments that evoke the Soviet past, including the renewed increase in military personnel and closing the town to outsiders (and making it part of a border

zone regime). At the same time, many development ideas remain on the level of promises as was detailed above. In addition, new economic possibilities (from mining to mammoth tusk collecting) arise from a combination of environmental change and technological development. It will be interesting to see to which extent the future of Tiksi will remain within the 'rails of the past' and to which extent emerging new economic, ecological and political conditions will clear new paths. In any case, the material dependencies identified above will be part of Tiksi's future making.

Notes

1. Among others, see the work of the photographer Evgeniya Arbugaeva, who grew up in Tiksi and provides stark documentary evidence of the remnants of a more glorious past. Her work has been featured in a variety of publications, most recently in an article by Brian Dillon 'Four Stories from the Russian Arctic' in *The New Yorker* from June 22, 2021; see also Arbugaeva (2013/2014), Reyes (2014).
2. Another transport infrastructure that continues to be important in the Republic of Sakha (Yakutiya) is the Lena Road. Argounova-Low and Prisyazhnyi (2015) draw our attention to the individual biographies and memories connected with the road, which had been overwritten by the master narrative of a totalitarian regime.
3. 'Big land' (*bol'shaya zemlya* in Russian) is a colloquial term often used by residents of northern remote regions to refer to the central regions of Russia.
4. This is not intended to be the kind of paternalistic and neoliberal advice that Fiona Hill and Clifford Gaddy in their book 'The Siberian Curse' (Hill & Gaddy, 2003) provided. The book has been heavily criticized for looking at the Russian settlement of the North from a one-dimensional economic perspective.

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