Transmedia storytelling: ArtScience collaboration for studies and representation of social-ecological-technological systems

Vera Kuklina[1], Olga Zaslavskaya[2], Stanislav Podusenko[2], Irina Bilichenko[3], Viktor Bogdanov[3], Dmitry Kobylkin[3], Natalia Krasnoshtanova[3], Oleg Sizov[4], and Andrey Petrov[5]

[1]The George Washington University
[2]Virtual Laboratory of Contemporary Art "Cluster"
[3]V.B. Sochava Institute of Geography, SB RAS
[4]Oil and Gas Research Institute RAS
[5]University of Northern Iowa

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Abstract

Addressing the need for convergence of different sources of knowledge to deal with complex issues such as global change, this paper presents the results of collaboration between artists and scientists to study social-ecological-technological systems (SETS). We focus on informal roads as an example of SETS. In the absence of public roads local, mostly indigenous communities and others use these forestry roads, seismic line clearings and oil and gas service roads for mobility in Siberian taiga affected by extractive industry. In 2020, with COVID-19, we had to increase our emphasis on virtual forms of data gathering, interpretation, and representations of the results. Presented in this paper forms of transmedia storytelling are designed to allow audience and users as well as the local and indigenous communities to get familiar with the research results, give feedback, and provide their own perspectives, interrelations and interdependencies between different SETS components.

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The George Washington University; V.B. Sochava Institute of Geography, SB RAS; University of Northern Iowa; Virtual Laboratory of Contemporary Art "Cluster"; Oil and Gas Research Institute RAS

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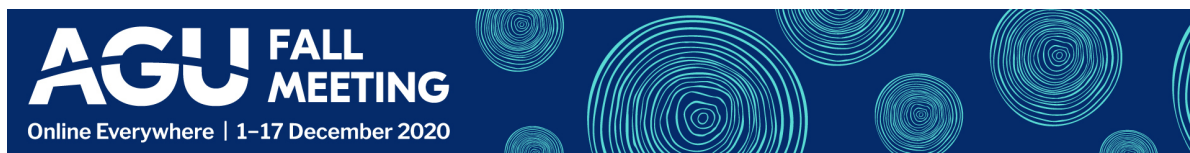
1. INTRODUCTION

Embracing complexity of human-nature interrelationships and interdependencies and the necessity of culturally appropriate and respectful engagement with local and indigenous perspectives, in the paper we offer transmedia storytelling as an effort to study and represent the preliminary results of collaboration between artists and the project "Informal Roads: The Impact of Unofficial Transportation Routes on Remote Arctic Communities" (Informal Roads) using ArtScience collaboration. In 2020, the COVID-19 pandemic made digital methods of communication and data interpretation the most relevant. Working mostly from homes, scholars and artists experience the same push for transdisciplinary creativity and critical analysis of knowledge production while being connected through global technological and digital networks.

Social-ecological-technological system (SETS) is a relatively new concept utilized by researchers for addressing the need to deal with complex issues humanity faces today. SETS are understood as integrated and dynamic systems that include social-cultural, environmental and technological-infrastructural domains (Markolf et al 2018). Understandings of SETS vary across different bodies of literature such as studies of social-ecological-infrastructural systems (Ramaswami et al 2012), socio-eco-technical systems (Grabowski et al 2017), and socio-technical-ecological systems (Ahlborg et al 2019). Most importantly, all these perspectives provide an emphasis of interconnectedness and interdependence of different agents involved in these systems. While the SETS approach has been highly instrumental for studies of resilience in cities (Depietri & McPhearson 2017), we find it also useful for studies of transportation infrastructure.

Recent research emphasizes complexity and hierarchical nature of transportation infrastructure (e.g. Pescaroli & Alexander, 2016; Yerra & Levinson, 2005). Important role roads play in changing social relations lead scholars to considering them as agents of change (Wilson, 2004; Dalakoglou & Harvey, 2012; Merriman, 2015; Harvey & Knox, 2015). Roads are the result of human mobility and planning efforts, technological and economic advances and environmental conditions, and the factor of social-ecological-technological change.

High interdependency and interrelations within this specific kind of SETS are especially visible in the example of informal roads. Under informal roads we understand "vehicular roadways beyond the current publicly governed road network constructed, maintained and/or used by various entities and individuals based on private, special purpose and/or informal practices and regulations" (Kuklina et al 2020, p. 3). Due to the informal nature of these unofficial transportation pathways, there is still a lack of knowledge of their role in human well-being, environmental impact and local economies and cultures.

In addition, system sciences have been criticized for diminishing sensitivity to culturally diverse notions of surrounding nonhuman agencies (Fitz-Henry, 2017). To develop such sensitivity, humanities research is increasingly taking into account animals, plants, ghosts, and the myriad of ways humans are connected to these entities (e.g. Latour, 2013; Lorimer, 2015; Tsin 2015). In the ethnographic inquiry on How Forests Think anthropologist Eduardo Kohn (2013) asks questions at the core of humanities research: what is morality, what are ethics, and what is the language of translation.

According to his conclusions, only the sense of morality distinguishes humans from non-humans. Within a variety of human perspectives, contested landscapes allow geohumanities scholars to observe and analyze the interaction of varying points of view and values and to benefit from a multiplicity of perspectives (McConnell & Saladyga, 2020).

The structure of the paper is as follows. First, we discuss data and methodology utilized by scholars and artists applied to the current study of informal roads. Second, we introduce the Indigenous and local communities interacting with the environment and infrastructure that altogether form SETS. Finally, we provide the preliminary results and work-in-progress of scholar and artists collaboration to frame transmedia storytelling based on the ArtScience approach.

2. DATA AND METHODOLOGY

In the paper we combine local and Indigenous knowledge and social and environmental scientific methods with ArtScience methodology (research-led artistic production). Based on SETS approach developed by Markolf et al (2018) we understand the environmental domain as providing ecosystem services to the social-cultural domain, while the latter exerting anthropogenic impact on the former. The technological-infrastructural domain affects the social-cultural domain by the use of technologies and infrastructure and local mobilities, while social perception and values are embedded in the creation and maintenance of infrastructure and technologies. Bearing capacity of infrastructure is significantly determined by environmental domain while transformations in technological-infrastructural domain cause changes in ecological flows (Figure 1).
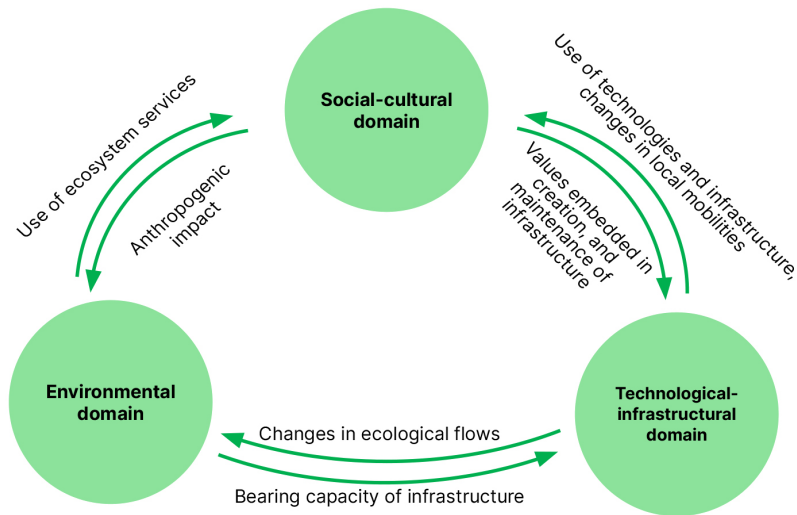
Figure 1. SETS model adapted from Markolf et al (2018)

To make an inventory map of the study area we used medium- and high-resolution satellite data such as Landsat and DigitalGlobe, multi-temporal topographic and historical maps, infrastructure development planning documents, interviews with local residents, and drone imagery (Table 1).

Study area	Data	Sources
Study area	road inventory, use, and related challenges	interviews with local residents (summer 2019; spring 2020)
	road inventory & landscapes	Landsat 8 (2017), GeoEye (2017), DigitalGlobe (2017), existing published materials (2002-2004)
	geomorphology, permafrost	topographic maps (1:100000); Shuttle radar topographic mission (SRTM); Landsat 8 (2019); geological map (scale of 1: 200000) (2009); hydrogeological map (Gidrogeologicheskaia 1990)
Roads Vershina Khandy - Magistralny, Ust-Kut-Tokma-Novaia Igirma	local road use	interviews while going-along, participant observation (summer 2019; spring 2020)
	road social and environmental impacts	interviews with local residents (summer 2019; spring 2020)
Road Vershina Khandy - Magistralny	road environmental impacts	biogeophysical field observations: measurements of soil erosion permafrost degradation, vegetation condition and drone imaging

Table 1. Data and methods

In summer 2019, we conducted field work: landscape studies, interviews-on-the move, and in settlements with local residents, and participated in daily activities. The residents shared their personal stories, concerns and emotions related to the existence and use of informal roads. Travelling together by these roads using different modes of transportation gave us a glance on sensory experiences of local mobility. However, we realized the lack of words and means to express the deepest concerns of the Evenki. Within Indigenous worldviews boundaries between humans and non-humans are blurred. This difference from the European perspective affects many aspects of everyday lives and decision making. Attribution of human characteristics to animals, trees, and inanimate objects through spirits eventually questions the ethics of killing or harvesting. For example, traditionally, Evenk hunters would try to avoid killing bears because they are considered sacred (Ragulina, 2000). During the ethnological expedition tasked with identifying sacred places to protect during pipeline construction, ethnographers met a lack of understanding among Evenki, who often were noting that everything is sacred and needs protection (Sirina, 2012). Unlike anthropologists or proponents of indigenous methodology, we were unable to spend months and years in the local communities. Shame, tension, illegal activities are among sensitive topics that are difficult to discuss directly. Therefore, our conventional scientific and social tools of inquiry were insufficient.

For creating a comprehensive picture of these complicated human-environment-technological relationships, we searched for various forms of interpretation and representation. We considered the possibility to frame dialogue with representatives of different disciplines including natural, social sciences and humanities within the art and science collaboration method, also known as ArtScience (Edwards, 2010; Kagan, 2011), which "involves understanding the human experience of nature through the synthesis of artistic and scientific modes of exploration and expression (Root-Bernstein et al., 2011: 192).

Currently, we see a growth of collaboration between artists and scientists. Also, there is demand for knowledge co-production between scholars and local and indigenous communities to create and highlight place-specific knowledge. Anthropological and ethnographic studies have been always looking for connections between arts and indigenous knowledge while folk arts and crafts play a crucial role in indigenous cultures (Laplantine, 2015). However, rarely all three perspectives intersect simultaneously. Meanwhile, combination of ArtScience methodology, local and Indigenous knowledge and social and environmental scientific methods open up a wide variety of perspectives in general, and for deepening the knowledge of SETS in particular.

ArtScience projects provide a novel approach and perspectives to deal with situations that require multi-faceted approaches, different research trajectories and methodologies (Malina, 2016). The main purpose of ArtScience projects in this respect is to work together to explore the creative possibilities of art and science and their capacities to envision the future at the fringe of these two cultural approaches. There are certain similarities between basic research methods of scientific research and art-driven approaches to real world problems. In our case we opted to blend art and science methods throughout several interconnected projects that we are currently working on (Figure 2).

Forest communities | **Untold Stories from the Taiga** | **Infrastructures as agents of change and power relations** | **History and rhythms of forest life**

Forest Crossroads: re-discovering Siberian forest communities narratives

Figure 2. Creative possibilities of ArtScience.

"As an artist, I find an endless source of inspiration in the ideas and form of trees. They are a variety of silhouettes and textures, smells and images. In the micro approximation, I am impressed by a huge number of different barks, tree structures, its properties, leaf veins and needle length. I am impressed with the water supply system inside the tree and its

ability to respond to changes. In the macro format, the scale of the plant itself and its root system are impressive. It is surprising how different internal systems compose different forests. How smart these forests are." (Kathe Shramko, artist's statement)

Facing challenges of COVID-19, we have reconsidered our forms of collaboration and chosen a transmedia storytelling method. Transmedia storytelling (TS) is a relatively new and elusive subject, its definition is still open (Gambarato, 2020). According to Henry Jenkins (2007), transmedia story elements systematically unfold across multiple media platforms, and each element makes its own unique contribution to the whole story. As a special kind of narrative structure, transmedia story expands through different languages (such as verbal, iconic, or visual) and different media (such as games, social media, or podcasts) (Scolari, 2009, p. 587) (Figure 3).
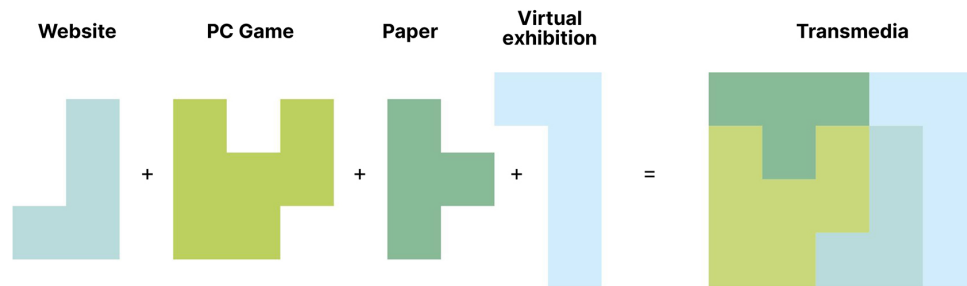
Figure 3. Transmedia storytelling model

There are two approaches concerning the starting point of transmedia projects: 1) proactive (the story is originally created for a transmedia project); 2) retroactive (the story is transformed and expanded at the later stages; usually this strategy is associated with the continuation of a successful project) (Gambarato et al., 2017). While Informal Roads project emerged primarily as a research endeavour, a new approach was developed in collaboration with the exhibition initiative entitled "Insiders/Outsiders/Others" (2019-2021). This collaboration allowed us to start working on several interconnected online/offline projects that we plan to present during 2021-2022.

As in other transmedia projects, in our collaborative efforts each medium does what it does best—so that a story might be introduced in various forms including publications, website, social media, video games, films, animation, podcast, virtual and onsite exhibition, Second Life museum expositions, screenlife films, and scrollytelling. This variety of media platforms generate the possibilities for the story to evolve with new and pertinent content.

3. NAVIGATING INFORMAL ROADS IN SIBERIA

The study area in Siberian taiga could serve as an excellent example of a SETS. It occupies over twelve hundred square kilometers and bears similarities with many other Arctic and Subarctic regions with harsh climatic conditions, presence of permafrost, traditional indigenous cultures, and high economic dependency on extractive industries (Figure 1).
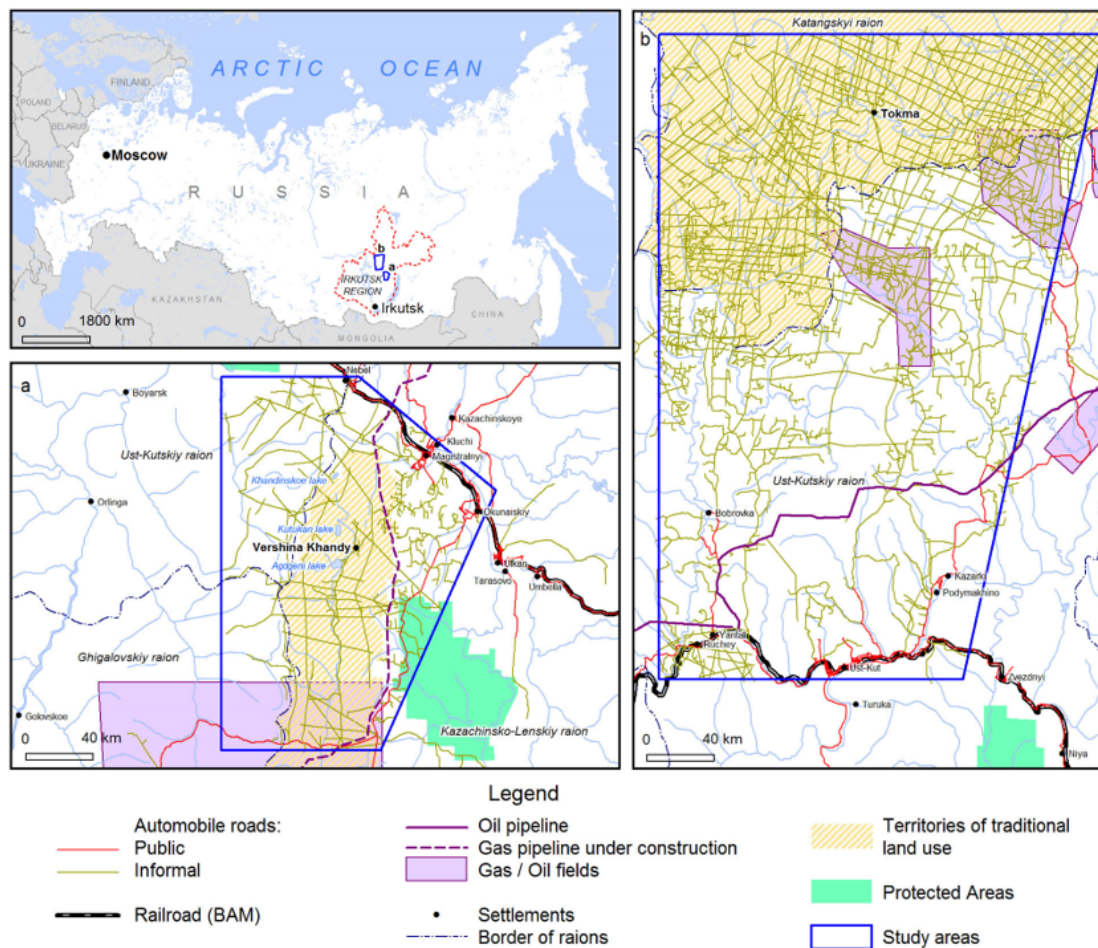

Figure 1. Study area

Indigenous cultures in the area are represented by Evenki, indigenous Tungus-speaking people. Traditionally, they have strong attachment to land not only through subsistence activities, but also spiritual rituals and moral obligations. Their subsistence activities include hunting for ungulates, fishing, gathering Siberian pine nuts, berries and herbs that provide them with food and hunting on sables and gathering Siberian pine nuts for cash income. Arguish - a network of reindeer trails created and used by Evenki (Kopylov, Pogudin & Romanov, 2009), has yet to be mapped. The role of such trail networks and the characteristics of highly mobile traditional cultures, is the subject of numerous anthropological works. Previous Siberian researchers have marveled at the ability of reindeer to traverse areas unnavigable by other modes of transportation in swampy taiga (Landerer, 2009: 53). Evenki accommodate the needs of reindeer in nomadic mobile dwellings by setting up camps near reindeer pastures. Reading these tracks and using multi-sense awareness is a confirmed way to connect with landscapes and its entities (Brandišauskas, 2019).

In the eighteenth century, with colonization of Siberia, Cossacks settled in the area. Among the settlements formed during that time is the village Kazachinskoie, founded in 1776 on the Kirenga river by Cossacks and peasants, a few dozens of kilometers from local Evenki. Relationships between these two groups were not always peaceful: in 1823 first disputes over land use between Evenki and Russians were documented (Ragulina, 2000). However, there were also a lot of inter-ethnic marriages that led to migrations of some Evenki to Kazachinskoie and usage of territories of traditional land use by these mixed families.

In 1802, Russians founded a hamlet that eventually grew into the village of Tokma (Utkin, 2009). Its active development began after the establishment of the Tokma Native Council by the Kirenskii raion Council in 1928 (Kopylov, Pogudin & Romanov, 2009). On the territory of the Native Council, there were 2 settlements with a mixed Russian-Evenki population (Tokma and Volokon), and others with the Evenki population. All settlements were connected by taiga paths and in the

summer part of the paths could be overcome along the rivers. Tokma was located in a relatively central place among these settlements, with developing trade of food and hunting. The first hunting organizations were formed here in the 1930s. In the 1960s they were transformed into a cooperative hunting farm. Commercial hunting remains the settlement-forming activity. In the 20th century, the hunting industry was identified as the leading branch of the Katangskii Rayon economy, and this branch was maintained and developed at all administration levels (Utkin, 2009).

A sparse network of settlements persisted until the middle of XX century. Most of the transportation and communication in the region was by the rivers and using traditional ways, which for Evenki was by reindeer trails. Gradually, with the reorganization of state management of economic and traditional activities in these territories, the population was moved to larger settlements. Especially after 1975, when with construction of Baikal-Amur Mainline, millions of migrants settled in more northern regions and built dozens of settlements, hundreds of bridges and thousands of kilometers of railways. Some of the Evenki and old settlers moved to the BAM settlements and found employment beyond traditional subsistence activities, such as Magistralny (in 2018 population 6296) (39 km from Vershina Khandy). The railroad construction was accompanied by development of the forestry industry and geological exploration, both near the villages of Vershina Khanda and Tokma.

In the 1970s near the territory of traditional land use of Tokma residents, geologists discovered Yaraktinskoie oil deposit (Irkutskoil 2020). The Irkutsk Oil Company (INK) started oil exploration near the Tokma obshchina, after the East Siberia – Pacific Ocean oil pipeline (ESPO) construction started in 2006. Yaraktinskoie (40 kilometers from the village) has been the main and biggest oil exploration site of the company. In the last decade, a couple of oil and gas deposits have been discovered near Tokma, which nowadays are beginning to be actively developed by INK.

In 1987, geologists discovered Kovyktinskoie gas condensate deposit known as the biggest gas deposit in the Russian East (Kovyktinskoie, n.d.). The area of the deposit partly overlaps with the territory of traditional land use of Vershina Khanda Evenki. To extract its resources, in 1992 TNC-British Petroleum, Interros and Irkutsk region founded the collaborative Rusia Petroleum enterprise. They started permanent road construction to the deposit. In 2014, agreement about Strength of Siberia pipeline construction was signed between leaders of Russia and China and in 2018 Gasprom started re-construction of the road Zhigalovo - Kovyktinskoie as part of their major infrastructure. The pipeline will cross traditional Evenki lands and the informal road between the indigenous village of Vershina Khandy and major settlements (Figure 5).

Figure 5. Inter-settlement informal road Vershina Khandy - Magistralny

Both forestry and gas extractive companies in the area developed policies for compensating the Evenki community for the environmental impact (Kuklina et al., 2020). However, beyond environmental impact, the disturbances of extractive industry significantly affected local cultures and well-being. Despite being in the epicenters of rapid extractive industrial development local communities of Vershina Khandy and Tokma are lacking official permanent roads, mobile phone connectivity, and power lines. Tokma has seasonal access by an official 100-kilometer long municipal winter road connecting the village with the federal winter road "Mirninskaya trassa".

4. TRANSMEDIA STORYTELLING WORK-IN-PROGRESS

Based on the transmedia storytelling approach we have developed several forms of ArtScience collaboration: game, virtual exhibition, website, and video installation.

Forest Crossroads Game

The Forest Crossroads project supports a transdisciplinary approach to creating digital transmedia storytelling that can be told on multiple platforms. Considering methods of data visualization we take into account both the latest technological developments and user-driven approaches/preferences for data sharing and digital communication. The project team includes Indigenous and non-Indigenous artists who use different artistic approaches and media to capture humanities themes proposed for this project. These artists will share their experiences of ArtScience collaboration and visions of their involvement. Artistic work on the topic will involve conceptual links to forests, plants, and the health of Indigenous cultures that depend on the natural environment. Engaging with animals, landscapes, and other entities, artists will use multiple media including photography and video to convey the deep and intrinsic ties between humans and other living things. As these interrelationships underlie environmental science, they create visual entry points for people to approach science through a visceral experience. Artists will also immerse themselves in the Taiga to find correspondence between emotional states and entities. The large forest and trees allow artists to build engaging associations that later transform into artistic practices and works. Different perspectives will converge to result in creative collaboration that will be incorporated into the digital platform with the four main interweaving thematic modules: Boreal Forest and Its Informal Roads, Cultural History of Forest Colonization, ArtScience, and Forest Spaces (Figure 6).
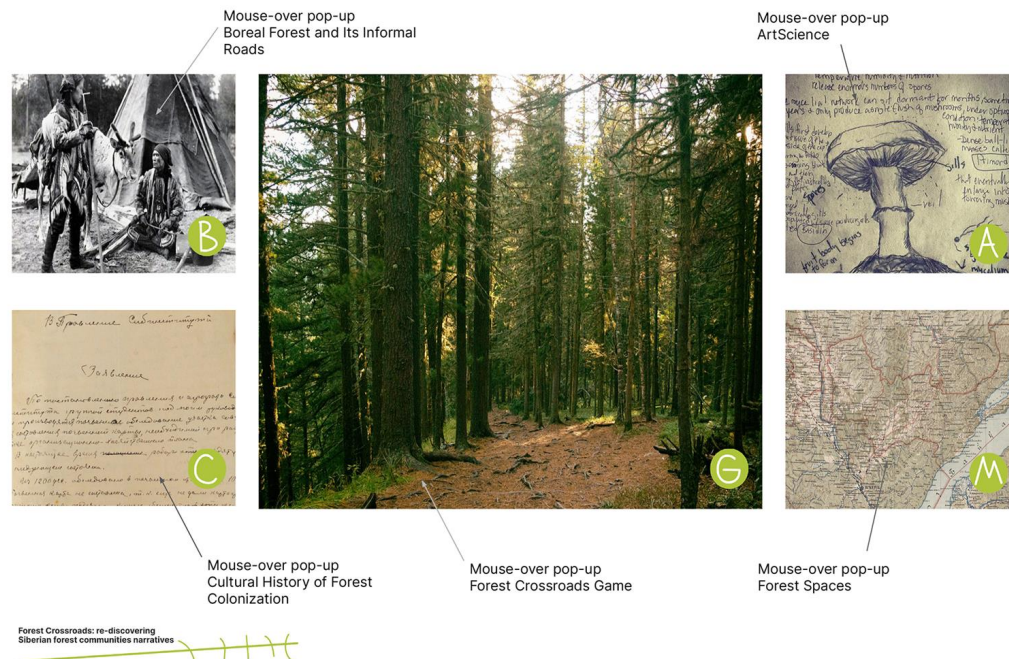

Figure 6. Thematic modules for Forest Crossroads initiative

The core of the transmedia storytelling will be the role-playing game entitled Forest Crossroads. It is a multi-optional quest where a player learns and gets experience on the mentioned above themes in the game format (Figure 7). Forest Crossroads tells the story of human-forest relations from different perspectives, using role-playing elements and a three-dimensional game environment to take a visitor to real and imaginary worlds based on optimistic and pessimistic scenarios of the local industrial development and global environmental changes. Navigating the landscapes "in person" while hearing their stories and interacting with their "inhabitants" is meant to introduce the elements of emotional attachment and encourage an exploratory approach to storytelling that is enhanced by the reader's curiosity and perception of agency.
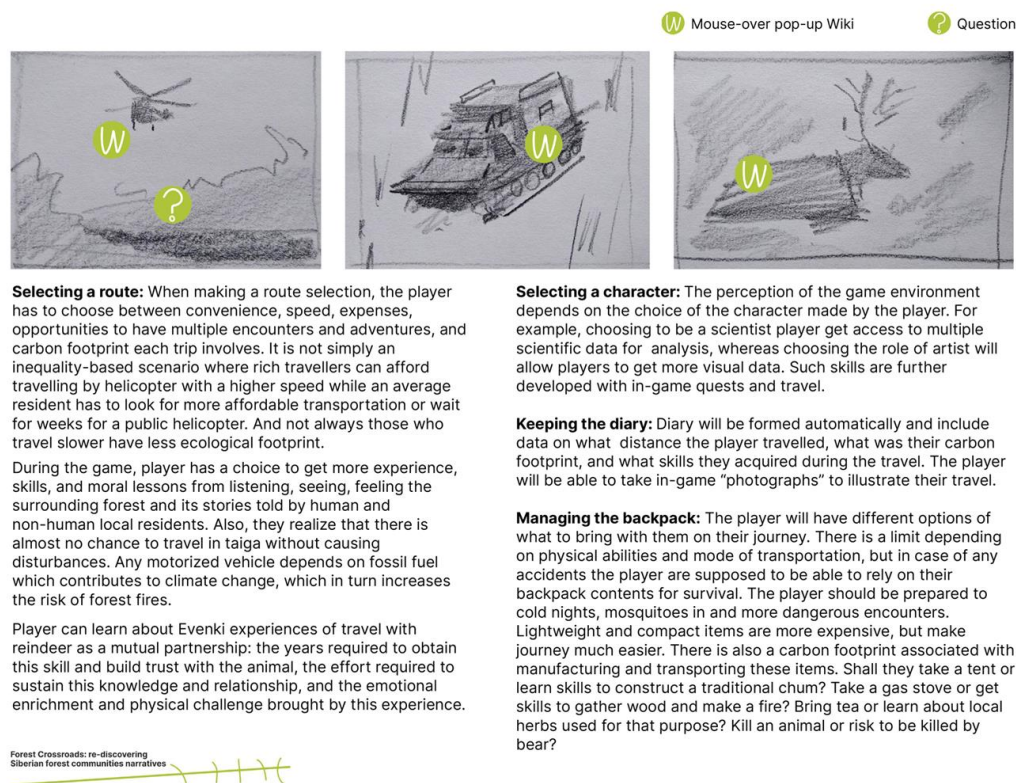
Figure 7. Forest Crossroads game: Core game mechanics

Virtual exhibition using AR-posters

At the Annual Meeting of the American Association of Geographers (New York, 2022) we are organizing a session Art and Geography Confluences: Perspectives on Collaboration and Future Imaginaries, where we use new methods of poster making for enhancing dialog between scholars and artists (Gates-Stuart, 2013; Elkins, 2017). This poster session aims to demonstrate possibilities of transdisciplinary collaboration between scientists and artists to mutually reinforce both research and creative process through application of different methods of knowledge production. For viewers such types of works can become a bridge between emotionally-driven art and structured scientific knowledge in order to reach a new level of involvement.

We will present four AR-posters (AR - augmented reality) created in collaboration between scholars, artists and IT specialists. They will be based on the assembly principle, when a flat poster contains several layers of information that viewers can interact with using a special open-source computer tracking library, such as ARToolKit. Therefore, the AR technology will help to visualize scientific data and simulate three-dimensional objects both on the poster and beyond. In addition, the AR-posters will offer interactive tools: viewers will be able to change and modify images on the poster (Figure 8).
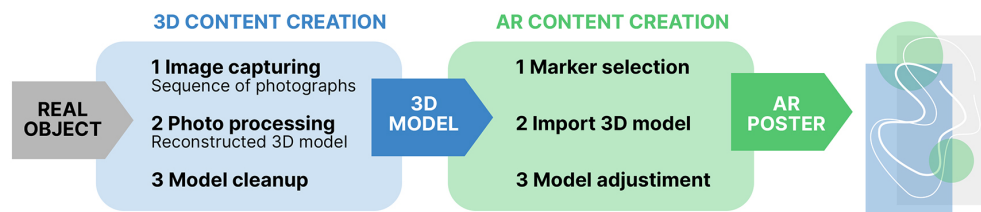

Figure 8. AR-poster creation steps

Website & video installation

Presentation of the digital ArtScience website prototype in the form of video installation is scheduled for the session "Domesticating landscapes: Re-considering settlers perspectives on the Arctic cities through ArtScience collaboration" at the International Congress of Arctic Social Sciences (ICASS) (Arkhangelsk, 2021). The project is dedicated to exploration of diverse human ways of landscape domestication. We aim to move beyond using traditional research methods for

describing this kind of relationship between humans and landscapes. Using artistic methods we plan to highlight constellations of materials, emotions, values, and desires embedded in the urban landscape. Reaction of the visitors to the installation will form an additional tool for understanding human existence in the Arctic which is the focus of the ICASS (Figure 9).
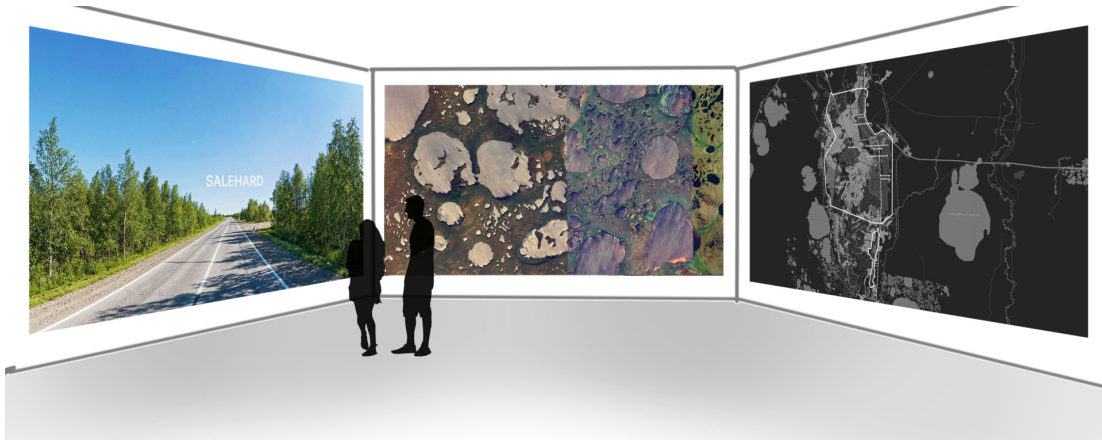

Figure 9. Design of the video installation

5. CONCLUSIONS

Forest Crossroads: re-discovering narratives of the Siberian forest communities

Challenges of the Informal Roads project development demanded to look for interdisciplinarity and new forms of cooperation. Our experience of ArtScience collaboration proved to be useful for studies, interpretation, and representation of informal roads and their users within SETS. It integrates digital content gathered and produced from various resources including artistic works and scholarly research. While within dominating discourse arts usually serve mostly for the purposes of communicating and disseminating the results of scientific inquiries, our project contributes to understanding that cooperation between artists, scientists, local and indigenous communities offers much wider perspectives. Presented in this paper such forms of storytelling as game, virtual exhibition, website, and video installation are designed in a manner to allow audience and users as well as the local and indigenous communities to get familiar with the presented narratives, give feedback and provide their own perspectives interrelations and interdependencies between different SETS components.

[VIDEO] https://www.youtube.com/embed/z87V6g1yoUI?rel=0&start=1&fs=1&modestbranding=1&rel=0&showinfo=0

DISCLOSURES

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