Cartographic storytelling: reflecting on maps through an ethnographic application in Siberia

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In this paper, we explore the methodical, methodological, epistemological and outreach potential – and related challenges – of cartographic storytelling in ethnographic research, based on the online portal Life of BAM. Our extensive literature review highlights the need for deep self-reflection in the cartographic production of manifold realities and the way in which visualised stories can be co-produced by local people and researchers. It also describes cartography's conceptual turns and its role in anthropology and ethnography. As an outreach tool, the Life of BAM portal conveys knowledge about social and infrastructural configurations in the greater area of the Baikal-Amur Mainline (BAM) and Amur-Yakutsk Mainline (AYaM) railroads in Eastern Siberia, through a series of lay-language and visualised 'episodes' built into the ArcGIS StoryMaps online tool. Interlinking qualitative and quantitative data in the cartographic visualisation of manifold realities can trigger better comprehension of complex matters, through multimodal forms of representing stories in space. Cartographic storytelling, as a means of knowledge and science communication, supports – in our case – civil society, education, heritage work and policy making, and is a way of making local concerns more tangible for state officials and corporate actors. By engaging with cartographic storytelling and building the Life of BAM portal, we affirm that a reflective attitude towards the multiplicity of stories' ontologies in narration, collection, comprehension and representation is of key importance if we want to do justice to a decolonial approach towards Indigenous and non-Indigenous people and research partners in the field.

Keywords: Science communication, knowledge co-production, Geographical Information Systems (GIS), ArcGIS StoryMaps, Baikal-Amur Mainline (BAM), Amur-Yakutsk Mainline (AYaM)

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Telling stories is the way that people – individuals and collectives – transfer and communicate information to others. Stories "[draw] attention to the relationship between personal experience and expression, and the broader contexts within which such experiences are ordered, performed, interpreted, and disciplined. [They provide us with an] understanding [of] political, social, and cultural life" (Cameron 2012, 573). Stories can be passed on orally, in written form and in visualised forms. Maps can be used to tell and represent stories; this might be in the form of imperative and normative spatial fixations of positive content defined by the authority of the cartographer. Alternatively, and especially since the constructivist turn in critical geography around the 1990s, maps can be used to express in visual form a multitude of ontological positions on the way that the map makers (including collectives, for instance in participatory mapping) understand specific social-spatial phenomena.

In this paper, we reflect on our own experience of cartographic storytelling, based on our disciplinary embedding in geography and anthropology, employing cartography and ethnography as methods for understanding and communicating stories as part of our research in Siberia, along the Baikal-Amur Mainline (BAM) and the Amur-Yakutsk Mainline (AYaM). We begin by considering the range of potential ways that cartographic storytelling can be used not only to convey the observations and interpretations of data made by ethnographers, but also to convey memories and stories of lifeways and social phenomena that are of concern to local people in their everyday life, and their political practice and positionality. These also bring with them hopes, satisfaction, resistance, conflicts, hierarchies and power pressures, as well as their associated affects. We ask for whom and for what the different types of potential of cartographic storytelling are relevant, and thus how effective outreach through maps can be in supporting heritage work, education, civil society, state and corporate policy-making and decision-making, as well as in enabling a better sense of the region and its social configurations at large.

Cartographic storytelling is a great way of combining quantitative and qualitative data in fruitful ways. It is precisely this that motivated us to seek these technical and representational possibilities for communicating our Siberian research results to a wider public. In this way, we can capture and make sense of the stories narrated to us, as well as the experience indicated within the survey by people in our field sites. And we can thus enable the public to engage with our results in intuitive ways, to sense the relevance of ideas, visions, memories, concerns, problems, joy and hardship, and better understand the entanglement of local, micro-scale social realities with meta-scale political-economic structures.

Thus, our project team[1] created the Life of BAM online portal. This website has been conceptualised as a storytelling portal, where maps play a key role in narrating stories collected and synthesised by team members, building on interviews and conversations with local people and representatives of state institutions and corporations, as well as ethnographic observation and a quantitative survey. The portal was designed to convey ethnographic knowledge in a series of (lay language) narrative and illustrated 'episodes' (thematic areas),[2] linked to a dynamic map that takes the visitor through the studied locations along the Baikal-Amur Mainline (BAM) and its branch line, the Amur-Yakutsk Mainline (AYaM), and the surrounding areas. Users can trace research results in English and Russian.

Life of BAM shows how a region formerly inhabited primarily by the Indigenous Evenks and a moderate number of Russian (old) settlers, attracted the state (through its rich natural resources) to develop the region for industrial purposes by building the major BAM railroad in the 1980s, in the Brezhnev era. This resulted in a massive influx of so-called 'BAM builders' and their families, who built a new life in the many urban and semi-urban settlements that were established. Today, people and communities in the region are partly disappointed by the post-Soviet industrial decline, which brought about substantial outmigration, especially in the 1990s after the dissolution of the Soviet Union. Nevertheless, new regional development plans are now being used to attempt to re-boost the region. The BAM and AYaM are enjoying renewed attention as they experience large-scale expansion (Schweitzer *et al*. 2017; Povoroznyuk 2020). However, people and communities – be it Indigenous or non-Indigenous – are witnessing power struggles around infrastructural developments or their substantial delay, leaving them in a state of limbo between expectation, hope and disappointment (Wentzel 2020). The stories presented in Life of BAM show the people's pride (in particular BAM-builders in the Soviet past), but also how they speak up or give up in the face of neglect by the state and corporations in meeting their demands to maintain a good quality of life in the region (Saxinger *et al*. 2021).

In the following sections, we extensively review the state of the art in qualitative cartographic approaches and contemporary debates around them, while looking back in particular to the historical

evolution, relevance and ontological positioning of maps in anthropology – as it overlaps with geography –to understand that telling a story in maps is not a new phenomenon and, moreover, has always been political. This is followed by a description of the Life of BAM portal and the various means deployed for visualising stories from along and off the railroad. We then discuss the potential – and associated challenges – of visual and narrative knowledge production and outreach through cartographic storytelling, based on our own experience in the CoRe research project. We conclude that such outreach endeavours – translating research findings into lay language, pictures and maps – are of the utmost importance as a way to feed knowledge back to our respondents and local residents in a meaningful and accessible way. In such a way, users of the portal create their own forms of knowledge about the subject matter in multi-modal ways (by looking at photographs and diagrams, reading texts and scrolling through maps).

Current debates in and around cartographic storytelling

Storytelling in anthropology and geography

As stated above, stories are expressed personal, ordered, performed, interpreted and disciplined experiences that allow us to understand political, social and cultural life (Cameron 2012). Maggio (2014) reminds us that anthropologists tell stories all the time – in the sense of representing the complexity of what is observed and told in the field and contextualising it within broader structures beyond the micro-scale field. Similarly, Cameron (2012) reflects on the engagement of geographers with stories, and additionally highlights the structural, ideological and political dimensions of feeling, which is also embedded in stories in ideological ways. A story must be listened to and experienced in order to understand the meaning of narration (cf. Tyler 1986; Jackson 2002). Hasson *et al*. (2004) observes a brain-to-brain coupling when the brains of the narrator and the listener start to synchronise. This is of crucial relevance when stories convey meanings and need to be mutually understood in order to interpret and order realities. Cameron (2012, 587) reminds us that the "capacity for stories to move, inspire, and evoke embodied experience is at play also in recent geographic writing, both as part of a politics of possibility, and as a style of geographic expression". In anthropology, the postmodern turn in the 1980s increasingly highlighted the nature of the deep entwinement of researchers with the field and pleads for a textual turn that embraces the personal involvement and subject position in understanding and representing what a fieldworker listens to and feels in the field (cf. Geertz 1988). This is illustrated by Maggio (2014, 41): "The existential solution to the methodological impossibility of ethnographic representation consists of being aware of the inter-subjective dimension of knowledge production. In other words, ethnography should be an autobiography about the other, the confession of a representation, the story written by an 'author', i.e. the story of a relationship". Similarly, through the 'cultural turn' in geography in the 1990s, "geographers were predominantly concerned with the ways in which story and storytelling were implicated in the production of cultural, economic, political, and social power. Today, this approach to story is being re-examined and new approaches to story are being explored" (Cameron 2012, 586).

Realities and the power of maps

The combination of mapping and ethnography has great potential to enhance our understanding of the complexity of social reality. We frame reality by recognizing that stories are always constructed realities, created through the recounting of memories or portrayals of the world in the specific context of socialisation or *zeitgeist* (cf. Halbwachs 1939; Assmann 1999). This is certainly true for maps that represent imagined realities, or selected components of such realities that are highlighted in maps (cf. Bravo 2018). Bittner and Michel (2018) consider maps as texts, as does Schlottmann (2005), who also frames cartographic expressions as speech acts. In addition to the Cartesian and objective dimension of maps, such as the geographical coordinates, Dieckmann (2021a, 17) reminds us that maps do not represent the real world, but they "convey certain information, knowledges, practises, experiences [...]". She argues that cartographers need to be aware of the power relations that are inherent in map-

making processes and should continuously reflect upon who makes what kind of map, why and for which purpose. Map-makers also need to bear in mind on whose knowledge a particular map is based, to whom it will be accessible and for whom it will be useful (Dieckmann 2021a).

For instance, maps have always been used by states and empires as very powerful tools to control, categorise and divide populations and to ascribe people to certain regions. The power of maps is particularly illustrated in the colonial appropriation of people and territories (Huggan 1989; Edney 1997; Pickles 2004; Akerman 2009; Brody 2021). Thus, "[f]or over five centuries, cartographic map-making has played a pivotal role as a political technology of empire-building, settler colonialism, and the dispossession of Indigenous lands" (Rose-Redwood *et al*. 2020, 151).

The danger of cartography, in our view, has always been the fixing of something and "creating one single, official version of reality" (McKinnon 2011, 456), while neglecting the dynamic and "flowing nature of existence" (*ibid*.). Maps express the authority of those who make them (Brody 2021). Rose-Redwood and colleagues (2020) call for the decolonization of the map, for instance the re-centering of indigenous mapping and indigenous geographical knowledge, respecting the full participation of indigenous rightsholders in map-making and indigenous communities' protocols on how to collaborate in a respectful way. This would also reflect the deep and rich history of Indigenous mapping involving ancestral, anticolonial and decolonial Indigenous cartographic traditions (Lucchesi 2018), a theme echoed repeatedly in other writing (Lewis 1998; Pearce & Louis 2008; Louis *et al*. 2012; Louis & Kahele 2017; Rose-Redwood *et al*. 2020).

Cartography's potential and turns

Cartography has traditionally made use of various forms of spatial data, resulting in different map forms. Strictly speaking, maps are intentional graphic representations of a given piece of land, allowing the inclusion of the spatial perspective: "the god-trick of seeing everything from nowhere" (Haraway 1988, 678, cited in McKinnon 2011, 454).

While the use of information and communication technologies to analyse large datasets has been common among geographers since the so-called quantitative revolution in the 1960s (Gregory *et al*. 2009) and the subsequent emergence and development of GIS in the 1990s, cartography has largely been neglected as an exploratory tool for qualitative social research, and in particular for ethnography (Rucks-Ahidiana & Bierbaum 2015). The current quantitative data boom in map-making goes hand in hand with the increasing availability of the so-called Volunteered Geographical Information,[3] big data and massive computing power. GIS can display flows and connections, boundaries and categories, and the impacts and influences of, for example, human-environmental relations (Robbins 2010). Moreover, cartographic analysis using geo-referencing and geo-coding has been used for purposes such as participatory planning (Verd & Porcel 2012) as well as in mapping place values (Brown *et al*. 2020) and emotions (Hauthal & Burghardt 2015). Bagheri (2014) highlights how difficult it can be to gather and represent data in a GIS, particularly in places where data might not be easy to obtain for social, cultural or political reasons.

Cartography is rapidly changing through cooperation with various social-science disciplines and the frequent integration of mapping practices across the social sciences as a result of the spatial turn in the late 1980s in geography and other social sciences and humanities disciplines (McKinnon 2011). However, this does not mean that these disciplines abandoned the universalism and positivism traditionally inherent in maps (*ibid*.). Hence, cartography (and social sciences and humanities) acknowledge that the production of a Cartesian map is no longer the only way of conveying knowledge. In the spirit of the above-mentioned spatial turn, critical cartography led to the scrutiny of Western ontological dominance in cartography over manifold world views, and a tendency to favour the process of mapping instead of the map as a representation (Dieckmann 2021a). The spatial turn in the humanities and social sciences has enabled an alternative understanding of cartography, and constructivist mapping has made its way on to the scientific agenda, while the power dimension in maps and map-making has been made explicit (McKinnon 2011). Ultimately, the criticism of a rigid vision of GIS as something exclusively embedded in positivist epistemologies has brought about the rise of qualitative GIS, which we explore more below (cf. Kwan 2008; Arpagian & Aitken 2018).

Cartography in anthropology

Since GIS tools are particularly well-suited for visualisation, scholars have been combining ethnographic fieldwork and GIS mapping for around two decades (cf. Matthews *et al*. 2005; Kwan & Knigge 2006; Brennan-Horley *et al*. 2010). Ethnographic qualitative research, based on narrative accounts and observation, is often augmented through what Knigge and Cope (2006) call grounded visualisation, that is, an iterative visual data exploration that guides and supports qualitative research by mapping quantitative data using GIS (cf. Knigge & Cope 2006; McKinnon 2011).

The intertwining of cartography and ethnography has a technical-epistemological problem, namely 'the field'. Social anthropologists construct the field according to a range of social phenomena – not only geographical coordinates – so as to make sense of a snapshot of lifeworlds or reality. According to the debate on the nature of the field in anthropology (Gupta & Ferguson 1997), it is not conceived as an actual site, fixed in a physical location, but rather it is a construction, which is also subjugated by the transnational flows and increasing tendencies of de-territorialisation which characterise globalisation (Appadurai 2010). The problem with GIS is that a field must be defined according to geographical coordinates. When defining an exact place – using coordinates – where a social phenomenon is happening, a realist approach to an objectified reality necessarily seems to apply. Anthropologists, like storytellers, usually link socially constructed realities to different, non-spatial analytical scales. Integrating these two approaches by approximating both through numericizing and objectifying qualitative data is a truly subjective process, based on the human cognitive systematisation of space, which itself is socially constructed.

Cartographic storytelling is one of various ways of using maps in anthropology (and social sciences and the humanities in general). A story map has been defined as "any cartographic representation that exhibits narrative elements" (Roth 2020, 3). Treated as narrative objects, maps have been defined as something that can never be completed, but rather depicts a processual reality, in what has been called post-representational cartography (Kitchin & Dodge 2007). Cartography and cartographic storytelling not only enable the visualisation of data and results, they also constitute an analytical tool that can inform the conduct of fieldwork itself, as has been argued in the fields of archaeology and the digital humanities (Earley-Spadoni 2017). A number of anthropologists have exploited different methods that Peterle (2018) identifies as examples of carto-fiction, that is [a] "cartographic, fictional and autoethnographic practice to perform and [a] product to (re)present qualitative research" (Peterle 2018, 1073).

The discipline of anthropology (like ethnology) is tightly entangled with colonial map-making processes (Huggan 1989; Edney 1997; Akerman 2009; Pickles 2004). For example, Hirsch (2014) described how the young Soviet state sent out ethnographers to define and delineate territories and borders, which led to the creation of fictive territories and even fictive ethnic groups, and to the dispossession of land, ruined identities and ensuing ethnic conflict.

Friedrich Ratzel, who has been highly criticised for his racist theories, is nonetheless an influential personality in both cartography and ethnography. The trained geologist and zoologist studied human-environment relations and created maps which represented human migration and activities in different temporal phases. He intended to map the whole world population, but he was aware that his static map could not represent the dynamics of language, social life and migration. Ratzel, who founded the mixed discipline called anthropogeography (i.e. a project of a cartography of humanity (Santini 2018)), knew himself that his practice of classifying human populations on paper maps was a mere simplification (*ibid*.). Leo Frobenius, Ratzel's student, used maps to lay out the interconnections of different African societies by studying the occurrence of certain material elements by applying customary cartographic methods of that time (Striedter 1971).

Franz Boas, a geographer by training and anti-racist in his political stance, became one of the most influential anthropologists around the fin de siècle. Boas, German by origin, launched several expeditions to coastal regions of Alaska, northern Canada and north-eastern Russia, and combined cartography with ethnography. For example, he documented tidal movements and positions of the sun. His maps of Baffin Island are geodetically precise (Müller-Wille 2016). At the same time, he documented the Inuit´s ways of living off the land and perceiving the natural environment. Boas

wrote about his Inuit hosts producing more than forty maps for him (Brody 2021). He connected Inuit toponyms, knowledge, songs and stories with geodetic measurements (Müller-Wille 2016; Zumwalt 2019). Boas thus set a standard in the early 1900s that is very relevant for ethnographers and cartographers working with indigenous people and environments today. Yet this standard modality for ethnographic cartography has yet to be widely adopted in either of the two disciplines. Today, there are however a number of anthropologists who are contributing to the decolonization of mapping and a correction of unjust territorial border demarcations, as we discuss below.

Ontologies and decolonial mapping

Maps of Canada are full of names of places, lakes, rivers and mountain ranges reminiscent of the colonisation period (Brody 2021). The borders cutting through the landscapes rarely represent settlement patterns of the original owners of the land. In the context of sovereignty claims, Canadian indigenous people started developing rival maps which represented a "different way of knowing, using and laying claim to their lands" (*ibid*., 69). These rival maps are related to the concept of cultural mapping, as they are aimed at alternative methodologies and decolonization.[4] Brody compares two different cultural mapping approaches. In the Canadian Arctic, he could map the Inuit´s interrelatedness with the land, including place names, meaningful places, resource-rich sites and animal migration routes (Brody 2021). In Kalahari Gemsbok National Park, in the border zone of Botswana and Namibia, he mapped people's knowledge of the Khomani language. The latter was a map of expropriation of land, oppression and humiliation and extensive repudiation of identity (*ibid*.).

Rocheleau (2005) and Dieckmann (2021a) indicate that in interweaving indigenous worldviews and meanings into cartographic language and tools there is a serious danger of failing to capture their complexities. Dieckmann warns that during the process of transferring indigenous content into any kind of cartographic representation, indigenous meanings might be seriously undermined and misinterpreted. It seems that in many cases, indigenous concepts are rather bundled into a Western "conceptual framework" instead of seriously "merging different ontologies" (Dieckmann 2021b, 130). There is also a risk that maps with Indigenous content could be seen as a "deviation from the standard" (Dieckmann 2021b, 94). In order not to reproduce harmful and toxic colonial relationships and structures, she argues for permanent self-reflection on the researcher's "own ontological bias" as well as on the applied mapping practices (Dieckmann 2021b, 127). Dieckmann (2021a) refers to a number of recent mapping terms, such as community-based resource mapping, cultural mapping, counter-maps or indigenous mapping, all following a decolonial mapping approach.

In anthropology, there is an increasing tendency to argue that the future of anthropological research is and should be collaborative and decolonial (cf. Armitage *et al*. 2011; Voorberg *et al*. 2014; Saxinger & First Nation of Na-Cho Nyäk Dun 2018). 'True' collaboration between academics and non-academics would be the best way to prevent ontologically one-sided research projects or perpetual colonial power relations when working with and in Indigenous contexts. This can be achieved through collaboration from the very emergence of a research idea and involving equally paid researchers from different backgrounds, that is, the co-design of research (Doering *et al*. in review). Thom, Colombi and Degai (2016) provide a notable example of collaborative mapping in the Russian Far East. The project was initiated by an Itelmen indigenous community on the Kamchatka peninsula. This community aims at preserving, documenting and transferring Indigenous knowledge, including the endangered Itelmen language. Together with anthropologists from the universities of Victoria and Arizona, a digital atlas of place names and particularly meaningful sites, stories, videos and photographs was produced. The intergenerational transfer of knowledge from the elders to the younger generation is intended to happen via the digital atlas, as the young are keenly interested in any digital media. Community scholars and members studied the Google Earth software and combined this with indigenous mapping methodologies in different places (Thom *et al*. 2016).

Decolonial mapping strives, and has the potential, to challenge neocolonial cartographies by reclaiming or reimagining worlds beyond the colonial frame of reference (Pearce 2010). Cheyenne cartographer Annita Hetoevėhotohke'e Lucchesi (2020) reminds us of self-determination, the data sovereignty of indigenous knowledge holders and the need for indigenous-led protocols on methods

and content to be followed by researchers and cartographers. Relationality, humility and generosity are key pillars of ethics in collaborative and decolonial mapping (and research in general) (cf. Lucchesi 2020). "Decolonizing the map is an affirmative practice that decenters the colonial geographical imagination by revalorizing indigenous world-making practices" (Rose-Redwood *et al*. 2020, 153). Not least, as Lucchesi (2018) states, mapping has been an Indigenous practice since long before the emergence of 'Western' cartography.

The making of the cartographic storytelling portal 'LifeofBAM.com'

Our main CoRe project team in Austria consisted of two geographers and five anthropologists across all career levels. The team also cooperated with two geographer colleagues in Russia. Beyond the technical hurdles associated with setting up the Life of BAM portal, not every member of the research team had an equal state of knowledge and understanding of cartographic storytelling at the beginning of the project. Some members of the team lacked a broad knowledge about the cartographic storytelling concept, while some did not consider the full potential of cartographic storytelling, particularly during the first fieldwork season. It is important that all team members share an understanding about pursuing ethnographic fieldwork using cartographic methods from the outset of a project such as this one, as well as considering the need to contribute to a shared product and to see its relevance. It has also been a gradual learning process of what we understand as 'decolonial' methodologies, and how and with what epistemological stance we want to create stories for the portal, based on our interlocutors' narratives and our own observations. However, such problems are not unique, but simply reflect the heterogeneity within a larger research project.

The creation of the Life of BAM portal and book is not a participatory project in the strictest sense, since it is reliant on the researchers interpreting people's stories for the portal, and thus it is based ultimately on their authority to map the 'realities'. In a broader sense, the participatory character of our research has been bolstered by iterative long-term field visits over the course of the whole project, allowing us to take our findings back to the communities and to our other respondents, and to discuss and refine the results and stories together. For the team, there was a constant need to reflect on what we wanted to and could achieve with the Life of BAM portal and how we could do it in the best way, being attentive to the needs and thinking of the people we worked with in the field. We have, therefore, been reflective regarding our responsibility.

The Life of BAM portal is structured around individual so-called 'episodes', or thematic areas, which are briefly described on the home page with a teaser. As of March 2022, twelve episodes have been published in English and Russian, with another one (related to the above-mentioned mobility survey (Sancho-Reinoso *et al*. 2022)) expected to be released later in Spring 2022.

While the homepage of LifeofBAM.com is hosted on the server of the University of Vienna, the individual episodes are hosted on the ArcGIS StoryMaps platform. ArcGIS StoryMaps is popular tool developed by ESRI® that offers users the possibility of enhancing the communicative potential of stories by integrating text, image, video and maps into a single interface. All Life of BAM episodes share a common project identity, including logos, background and text colours. They were all built with the first version of ArcGIS StoryMaps (which is known as 'classic StoryMaps'). Sometime after starting our project, ESRI launched a Beta version of the ArcGIS StoryMaps tool with multiple changes and improved functionalities, of which we were unable to take advantage for practical reasons related to the formal consistency of the portal and technical challenges regarding content transfer.

According to our experience, the most inconvenient issue with the 'classic StoryMaps' is web responsiveness, meaning the way contents are displayed according to the screen size and orientation and, therefore, the device used (see below for the impact of this on the end users). The Life of BAM episodes are great to read and interact with if the user is in front of a screen, including on a notebook or a tablet in landscape format. Also, the mobile phone works well in landscape position, however, when using it in portrait position, the design of the episodes is counter-intuitive and has much room for improvement. On certain mobile phones, the portal even cuts out titles (Fig. 1).

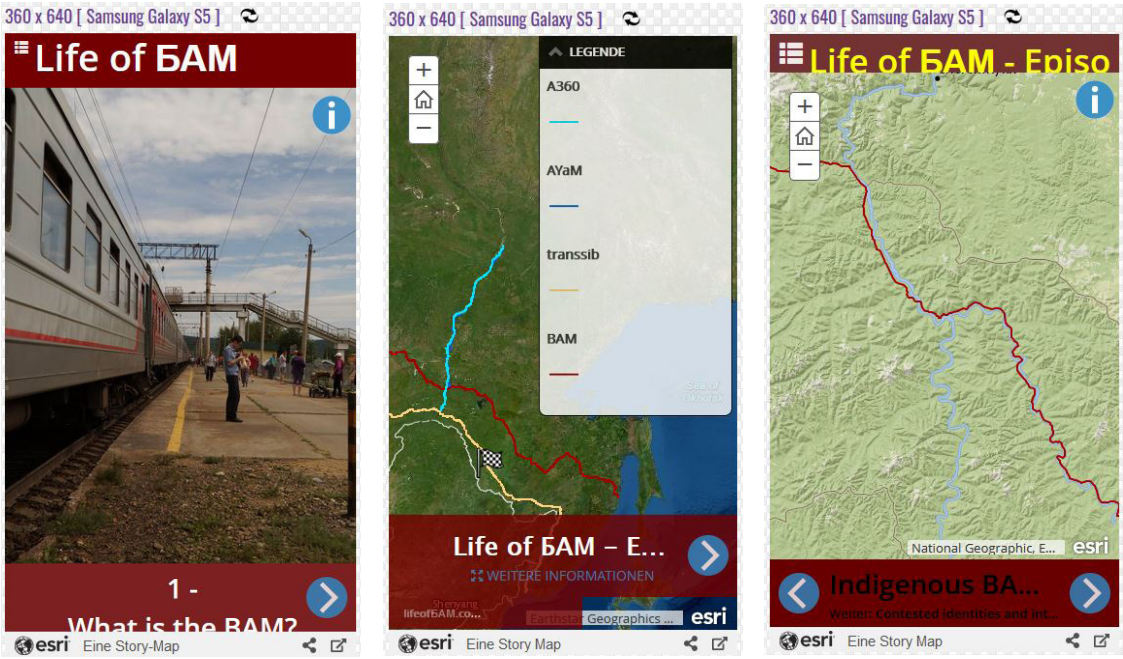

Fig. 1. Inconsistently displayed interface on the mobile phone. Screenshots by A. Sancho Reinoso[5].

Another key issue is accessibility. While ESRI argues that this portal is open source (since it allows downloading of the source code, that is human-readable alphanumeric characters that compose a website text, and hosting on other servers (North 2019)), in fact ESRI acts like a major global corporation, providing cartographic products and offering proprietary software (Caquard & Dimitrovas 2017). Unlike other open geospatial software initiatives, such as Time Mapper or The Open Source Geospatial Foundation (see Coetzee *et al*. 2020 for an exhaustive review), the ArcGIS StoryMaps tool does not m*eet a*ll ten criteria of the Open Source Definition (OSD) by The Open Source Initiative. The OSD is based on the idea that "open source doesn't just mean access to the source code",[6] and thus indirectly supports the decolonial cartography movement.

Life of BAM is an effort to convey the project results to the reader using different visualisation tools, including GIS. However, the portal does not include all types of cartographic representation that we have produced in the course of the project: multiple location maps of the case study area were produced for research purposes only. However, thematic maps, some of them based on statistical data, such as demographic flows were included in Episode 2 (with both static and dynamic character, Fig. 2).

When building the episodes, the guiding principle was to integrate content, including text, graphs, maps, audio and video, into a cartographic base. The ArcGIS StoryMaps tool offers a series of layouts. The most interesting layout for our purposes is the so-called StoryMaps Journal, since it adapts to the idea of narrating a story by permanently combining the content elements as mentioned above. Episodes 3, 4 and 6 are the most representative examples in this regard. They were conceived as journey logs along a given route. Episode 4 (entitled 'Driving to Tokma'), for instance, recreates a journey across the frozen taiga to the tiny Siberian settlement of Tokma (in Irkutsk Oblast). Our colleague Gertraud Illmeier tells of her experience when accompanying a local resident driving his car on a winter ice road. The plot is structured in 13 short chapters consisting of text and pictures, while a dynamic map (on the right-hand side if one visualises the episode in a big screen format, Fig. 3) accompanies the story throughout.

Fig. 2. Map of demographic flows in Life of BAM's Episode 2. Map by Christoph Fink; screenshot by G. Saxinger.

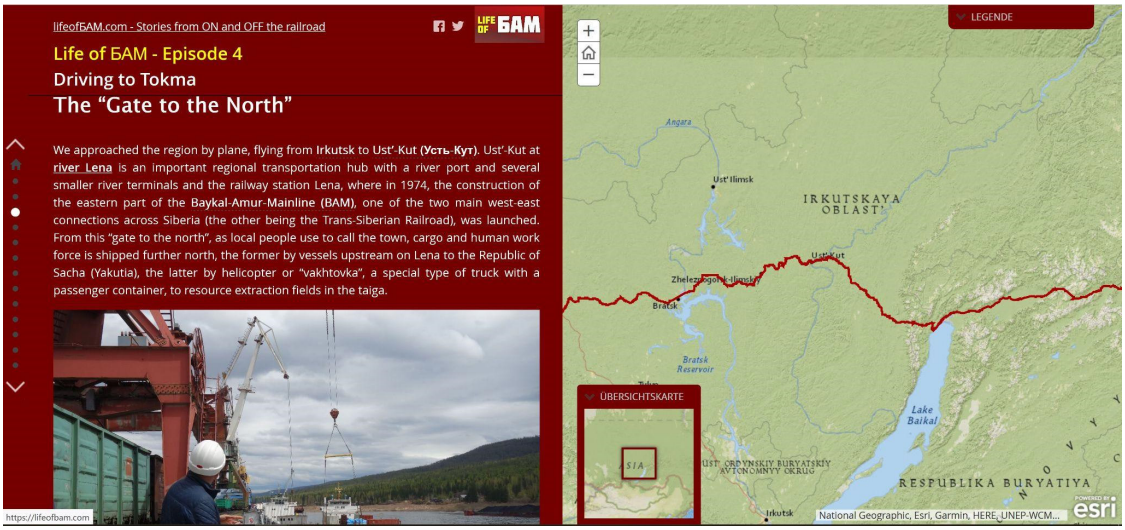

Fig. 3. An example of combining text, pictures and maps in Life of BAM's Episode 4. Screenshot by A. Sancho Reinoso.

In this episode, we tried to establish the maximum number of connections between the text, the photographs, graphs, audio/video and the map. First, place names appearing in the text are linked to the map, so that it automatically zooms to a place if someone clicks on the name of that place in the text. Second, map visualisations change as the reader scrolls down the text, for instance the map automatically zooms in or out, and its features change according to what is written in the text and/or shown in the pictures. Third, certain pictures shown in the text column are also located in bubbles in the map showing the same numeration. If someone clicks on the bubble, a thumbnail of the corresponding picture pops up (Fig. 4).

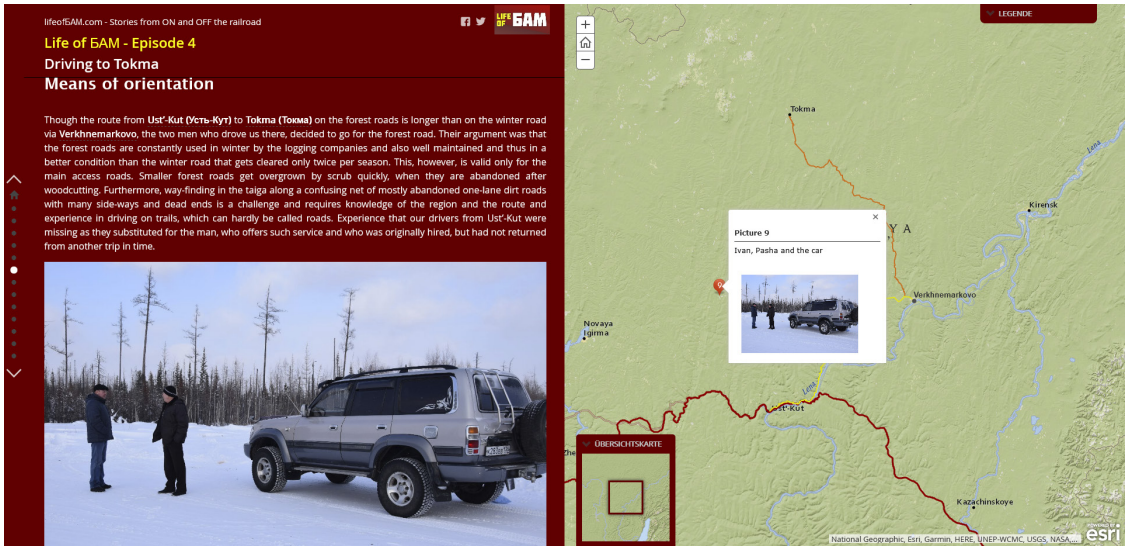

Fig. 4. Geotagged pictures in Life of BAM's Episode 4. Screenshot by A. Sancho Reinoso.

The screenshot below shows a handwritten map that our colleague was given by a local resident to find her way on the winter road to remote Tokma by car (Fig. 5). This example of a mind-map highlights the ways in which people organise their vernacular spatial knowledge and the importance of being able to navigate along a seasonal transport route (i.e. the winter road) that has little formal infrastructure such as road signs.

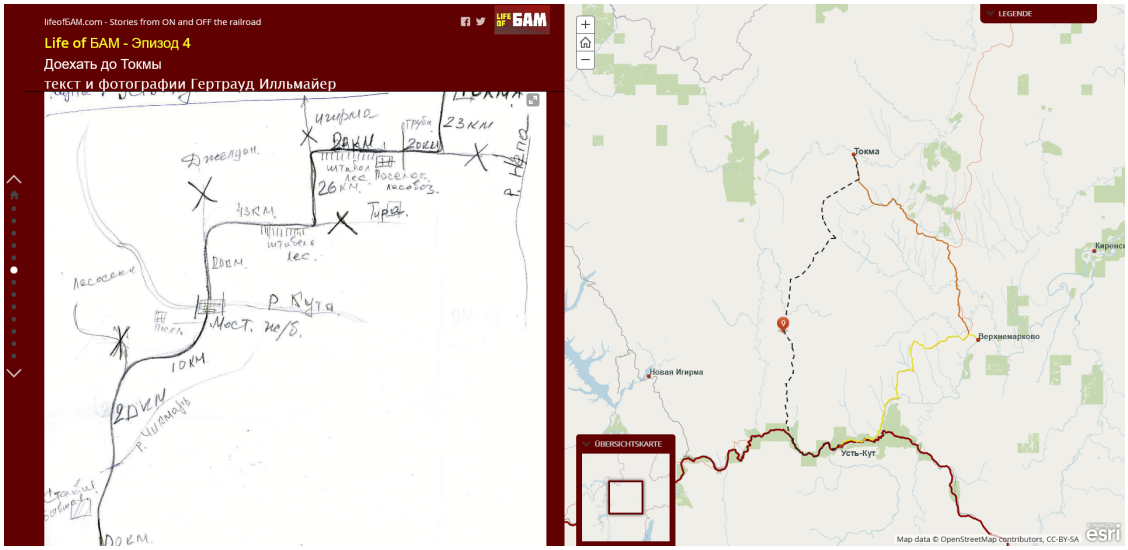

Fig. 5. Combining mental and web maps in Life of BAM's Episode 4. Screenshot by A. Sancho Reinoso.

The CoRe team members carrying out ethnographic fieldwork in Siberia faced challenges related to the need to learn how to collect material that would be technically suitable for cartographic storytelling. The process of georeferencing pictures revealed a series of human and technical limitations that are worth bringing into the discussion. Very often, it was technically impossible to obtain geographic coordinates from the camera. As we experienced, device sensitivity is a problem, especially indoors in

multistorey buildings and on trains. Therefore, the picture's location is usually exclusively based on the episode author's individual knowledge. This shows how important spatially referenced fieldnotes and printed or hand-drawn maps are for reconstructing spatial configurations. Our experience reveals that locating pictures on maps is definitely easier in urban environments, as Episodes 5 and 6 demonstrate (Fig. 6). By contrast, in rural environments such as in the middle of the taiga, finding the correct geographical location to match a certain picture can become an insurmountable challenge. This is what happened in Episode 4 (see above).

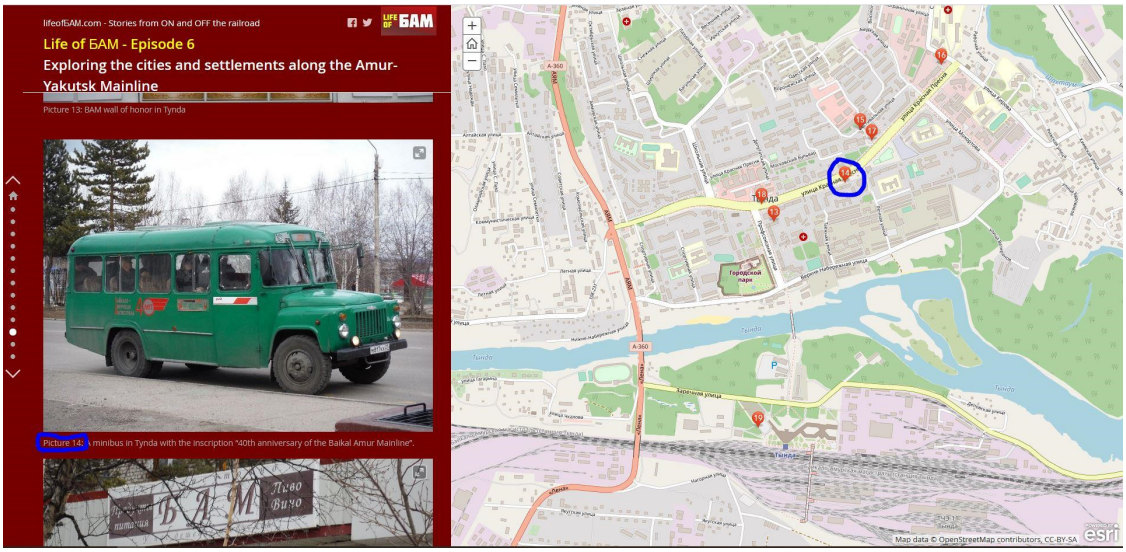

Fig. 6. The picture on the left is manually georeferenced on the web map on the right in Life of BAM's Episode 6. Screenshot and editing by A. Sancho Reinoso.

A last, but important, issue is the accessibility of the Life of BAM portal for end-users in some of the more remote fieldwork locations. The availability of a reliable Internet connection is highly variable in Siberia. While larger cities and towns are very well equipped, small settlements rely on outdated digital infrastructure. Since the heavy visual content of Life of BAM requires loading substantial data, the transfer speed is too slow in some villages for people to use the portal reliably. Nonetheless, mobile phones are widespread, and small villages near large-scale oil extraction sites benefit from transmission towers provided by the major telecommunication operators primarily for the industry. However, access to the Life of BAM portal is less convenient on a mobile phone, as discussed above.

To extend the outreach as far as possible, we resorted to a classic format: the team published in print in Russian. The book is largely based on the portal's contents (Povoroznyuk & Krylov 2020). The stories and photography already published online on the Life of BAM platform were redesigned for the analogue version. This process required a return to a static form of expression and visualisation, as the reader can no longer click on the maps and benefit from the dynamic interconnections of topography, narratives and photography. As not every person involved in the whole research process accessed and used the Life of BAM portal, its printed, yet static, counterpart informed those people about the research process and outcomes. Thus, we consider the book to be a valuable element of knowledge transfer. The book was sent to the Russian Federation to research partners in universities and colleges, libraries, museums, schools and other organisations and corporations as well as to individuals who had contributed to the success of fieldwork and the research in general. Another no less valuable dimension of the book is the fact that the postal delivery of the book, including personal dedications and notes of thanks, was a great way to express gratitude to all the individuals and institutions that enabled us to pursue our field research.

Potential of cartographic storytelling through outreach and knowledge co-production

In our project, we collected narratives, observed the spatial, temporal and structural contexts of the stories told and, in conversations in the field, jointly discussed our own interpretations of them. In that way, we co-produced the findings together with the interlocutors. We condensed the findings into lay-language episodes for the Life of BAM portal and the book with the same name.

In our analysis of the state of the art of cartographic storytelling, we looked back in particular to the historical evolution, relevance and ontological positioning of maps in anthropology and where it overlaps with geography, to understand that telling a story in maps is not a new phenomenon and, moreover, has always been political.

We have highlighted above the way that the two disciplines can fruitfully work together, and have been doing so for over a hundred years. This was the case especially in the aftermath of critical and constructivist turns in geography and anthropology, when it became common to understand realities as manifold ontologies. Cartographic storytelling can support this. In many ways, ethnography has great potential for co-producing knowledge in the field and advancing the Cartesian map with multiple ontologies. Storytelling and stories are profound ancient and ongoing ways of passing on knowledge. These 'knowledges' embedded in stories are multiple, overlapping as well as contradictory in their nature. As ethnographers, we need the long-term fieldwork to navigate through these ontologies and we must always be aware of our own ontological layers that we bring into a story and its representation.

GIS technology provides tools to enhance information by deepening geo-references with multi-layered qualitative depth, and thus to go beyond the flat map. In epistemological and methodological terms, we strive to shed light on how to fruitfully integrate qualitative data (ethnographers' observations and people's stories told in interviews) and quantitative data (geo-spatial locators and survey results) through the visualisation of manifold realities in ideal and spatial terms. We position ourselves within the constructivist stance in science and thus aim to highlight the relevance of cartographic visualisation of ethnographic data in critical engagement with social processes, highlighting in these expressions the 'fuzziness' of power relations and making them more tangible for diverse audiences.

We inscribe ourselves in debates around the multiplicity of realities and how map-making and ethnography can mobilise the potential to showcase contradicting, overlapping and contested meanings of presumably the same social and discursive matters which are at stake for people and institutions. We see the similar concerns that cartographers and social anthropologists have today: the subject position of the producer of reality, and the need for awareness and self-reflection, since the map can only represent a snapshot of a processual reality in times of post-representational cartography (cf. Kitchin & Dodge 2007). Thus, we can clearly see the linkages between the power of storytellers and that of mapmakers, maps themselves and the underlying understandings and politics of reality.

Life of BAM content and challenges

Within the ArcGIS StoryMaps tool, we assembled a whole set of means to pass on stories, ranging from various types of maps and statistical graphs, to sound and video files, and photographs and texts. We did not include audio or video files of individual narrations for privacy reasons. Cartographic storytelling, thus, allows an armchair observer to be taken through a whole region, virtually 'meeting' and learning about other people. It allows for multimodal experiences from afar. A next step could be the inclusion of augmented reality tools and connection with virtual reality glasses. The analogue map on paper is linear, while the digital map has the potential to synchronize multiple layers. Not surprisingly, we faced the technical-epistemic limits of combining geo-referenced markers with non-numeric qualitative data. We were clearly also limited by our own initial knowledge of GIS (at the start of the project, we were a bunch of enthusiastic beginners in the cartographic field) and by the technical limitations of the ArcGIS tool that we chose to develop the online portal. Today, a much larger number of digital cartography tools are available to choose from. We were also limited by the environment: conducting research in remote Siberia meant coping with a series of constraints,

for instance related to Internet access or to existing physical maps for specific regions, that turned routine tasks into challenges. In narrative cartography, we experienced difficulties in capturing spatial discontinuities (cf. Caquard & Cartwright 2014), and we found it challenging to bring the bird's eye perspective of a map into a highly subjective human perspective (cf. Buckle 2020). The research design and the specific heuristic goal need to explicate the ontological and methodological tightrope walk between and along qualitative and quantitative data triangulation that is needed to convey stories in maps.

Research conditions in Russia – building trust

Another aspect of feeding back knowledge to the region through Life of BAM is associated with the very specific research conditions in Russia, and in Siberia in particular. There is a high level of suspicion towards (especially foreign) researchers on part of people in general and state organs (such as the police and the secret service) in particular, which requires constant justification and explanation of our very presence in the region and of why we are interested – in our case – in mobility, roads and railways, extractive industry operations, architecture, migration and ethnic configurations. These topics also appear to be of strategic interest to Russia, and therefore a security issue. This was partly alleviated by cooperating with regional scientific institutions and researchers who accompanied us in some of our fieldwork. Sadly, this possibility has simply vanished after the reconfiguration of Russia in the world after Russia's invasion into the Ukraine in February 2022.

By delivering the research findings to the region in accessible forms, including in the Russian language, and not only publishing in English language journals within the academic ivory tower, we could gain a certain legitimacy for our presence and activities in the field and could refute the serious or jocular accusations of being involved in espionage. Providing lay-language forms of the findings was a way to enhance the trust that we built in the course of time during the long-term field visits.

Potential for outreach through cartographic storytelling

We are convinced that outreach endeavours, to 'translate' research findings into lay-language and visual representations are of utmost importance to feed back knowledge in a meaningful and accessible way. This can support policy making, political activism and lobbying, heritage work, including school education, and – not least – awareness-raising among state and corporate actors to sense the actual life realities and concerns of people on the ground who are affected by top-down regional development imperatives – and to make this knowledge more tangible for them. Users of the Life of BAM portal create their own forms of knowledge about a given matter in multisensory ways (seeing images, reading texts, scrolling through maps).

The combining of the portal with a print book allows for multiple modes of access to information, including by non-tech-savvy users and those without sufficient Internet infrastructure, as is the case in some regions of Siberia. The stories are not necessarily only representing the people's emic perspective, but – through our 'translation' work – also our etic understanding and interpretation, which has the potential to highlight even more frictions and inequality structures, as well as power configurations and the actual matters at stake in this specific spatial setting. This etic interpretation can have different meanings and potential for different stakeholders. Subsequently, we are necessarily called to critically reflect on our positionality and authority as the authors of the maps and stories. This is of relevance not only in relation to interpretative ambiguities, but also the fuzzy – and to a large extent scary – political context in Russia, where we are doing research with and for people. This also includes considering the tense atmosphere in contemporary Russia where many people fear to express critique on politics or to highlight social problems in public (as we have seen starkly demonstrated by those Russians opposing or not opposing Putin's 2022 invasion of Ukraine). It is for us researchers our utmost responsibility not to expose people to risk, while at the same time enabling them to voice their concerns through science and through our various modes of outreach, and critically portraying what is in people's hearts.

Touching people and advancing knowledge

The multidimensional shape of the Life of BAM portal has the potential to address human cognition in time and space and to trigger people's own interpretation and understanding, thus creating new knowledge and connecting it with existing knowledge. Our book and the portal are also in use in libraries, schools and colleges. They have the potential to be part of the local collection of heritage in times when the BAM and AYaM railroads have massively reshaped the environment, local social and economic configurations, and society in general. Our forms of outreach locate the stories in the places where they have been told and heard. Also, for many users, from abroad and other Russian regions, the BAM and AYaM region in Siberia is relatively unknown, so the combination of maps, stories and images is particularly powerful.

Representing qualitative data in a map can trigger interpretation, hermeneutic processes and new ways of seeing information and data. The visualisation of data in the form of a map may help us to see more, or at least differently, than just looking at text. It can trigger other parts of our brain and senses. Our research shows that people are nowadays highly familiar with web mapping services in the context of navigation systems. However, part of storytelling lies beyond the map; it involves using photographs or audio-visual materials and written texts in the classic sense. Cartographic storytelling as outreach, and for the purpose of feeding back knowledge to people who are part of a study, must keep in mind the necessity of using an easily accessible language and avoiding scientific jargon, in order to engage most effectively with people less interested in text formats alone.

Conclusion

By engaging with cartographic storytelling and building the Life of BAM portal and book, we affirm that a reflective attitude towards the multiplicity of stories' ontologies in narration, collection, comprehension and representation is of key importance if we want to do justice to a decolonial approach towards Indigenous and non-Indigenous interlocutors in the field. The digital nature of Life of BAM, which comprises a multitude of media content, has allowed us to create several layers of one and the same episode or thematic area in the portal. Stories are imagined realities that convey knowledge(s), ideas and social and cultural contexts; they illustrate, and are a product of, the dynamic and flowing nature of existence. This is always a tightrope walk, considering the authority of those who ultimately write up the stories and make the maps. We have been aware of the power relations in map making.

We must also consider, in the Russian context, the fear that people have to speak up in public and criticise leaders and state power: a big responsibility lies on the shoulders of the cartographers and fieldworkers not to expose individuals and whole communities to threat and gossip. At the same time, many interlocutors are also loyal to the state and this aspect also needs to be reflected in the stories.

Not least, cartographic storytelling can fruitfully tackle the problem of constructing the field: cartography is dependent on geo-references in a Cartesian map, while social sciences' (including anthropology's) understanding of the field goes beyond these and includes multiples scales of phenomena in the political economy, while also taking transregional flows into consideration. Thus, the multimodal content of a dynamic digital map can remind the user of this social and epistemological complexity. The interlinking of qualitative and quantitative data in a cartographic visualisation of such manifold realities can trigger better comprehension among users; likewise, among the researchers themselves, who get a new sense of the material through its different form, instead of working only with text and observation. Therefore, the users will intuitively create new knowledge based on knowledge co-created by interlocutors and fieldworkers.

In general, cartographic storytelling can be an efficient way to transfer knowledge in accessible form to the general public, who tend not to read journal publications in scientific language and jargon. In our case, this form of knowledge and science communication can be deemed supportive of civil society, education, heritage work and policy making. Life of BAM might also contribute to making the concerns of people more tangible for state institutional and corporate actors.

Notes

[1] The authors of this paper were members of the research team working on the project 'CoRe', which stands for 'Configurations of "Remoteness": Entanglements of Humans and Transportation Infrastructure in the Baikal-Amur Mainline (BAM) Region' in East Siberia and the Russian Far East. The project ran between 2015 and 2020 and was structured around four components. Three of them (A, B and C) had a specific thematic focus: (A) demographic dynamics and identity building (Schweitzer *et al*. 2017; Povoroznyuk 2021); (B) disparities in terms of mobility and corporate social responsibility of oil firms (Krasnoshtanova *et al*. 2021; Saxinger 2021; Saxinger *et al*. 2021, forthcoming; Illmeier & Krasnoshtanova forthcoming); and (C) expectation and disappointment linked to (new) infrastructure projects (Wentzel 2020). The fourth component ('Component X: the view from above') brought together the research outcomes of the thematic components A, B and C into cartographic and statistical representation. Besides building the Life of BAM portal, another main research outcome from Component X was the analysis of a mobility survey that captured the needs, complaints and expectations from residents in the study region and integrated them into a GIS (geographical information system) (Sancho-Reinoso *et al*. 2022).
[2] Life of BAM's target groups are our interview partners of indigenous and non-indigenous background, civil society actors, school and university teachers, experts and representatives from local museums, cultural centres, social, political and administrative institutions, and corporate actors (especially from oil companies), as well as the international and local public.
[3] According to the USGS, this is "geospatial content generated by non-professionals using mapping systems available on the Internet" (Center of Excellence for Geospatial Information Science (CEGIS), n.a.).
[4] See also the Border Atlas by the Indigenous Borderlands and Border Rites project.
[5] Copyright note: All Life of BAM screenshots in this paper are the intellectual property of ESRI and its licensors and are used under licence. Copyright © ESRI and its licensors. All rights reserved.
6 Open Source Initiative.

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