Reindeer Herders Without Reindeer. The Challenges of Joint Knowledge Production on Kolguev Island in the Russian Arctic

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ABSTRACT
Kolguev Island in the Russian Arctic has a unique tundra ecosystem and an indigenous Nenets population whose livelihood is traditionally based on reindeer herding. The Nenets faced a major crisis in 2013–2014 when the reindeer population collapsed. Widely different explanations for this collapse were put forward. This lack of a shared perspective at the failure of genuine joint knowledge production (JKP) in the island’s UNEP–GEF’s ECORA project (2004–2009). The ECORA project aimed to achieve integrated ecosystem management by stimulating dialog and mutual learning among indigenous people, state agencies, and scientists. This paper analyses the failure of ECORA’s JKP, using a recently developed framework of conditions for successful JKP. The results suggest that ECORA met none of these conditions. It failed at bringing the scientific and indigenous knowledge systems together, and the produced knowledge did not resonate with indigenous people’s perception of living in Kolguev.

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Introduction

Kolguev is an island in the Russian Barents Sea (see Figure 1), famous for its unique wetlands-rich tundra ecosystems, waterfowl and indigenous Nenets people (Mooij et al. 2011; Rouillard 2013). In 2013 and 2014 the island experienced a dramatic collapse of the reindeer population, which left the Nenets without their main source of income and put the future of Kolguev’s indigenous people and culture in peril.

Even though the collapse was unprecedented, large fluctuations in reindeer population size had frequently occurred before. Over time, these fluctuations had been attributed to a wide variety of factors. Reindeer overpopulation and oil exploration had been recognized as key drivers of degradation and loss of pastures (Kurvits, Kuznetsov, and Larsen 2009). Ecologists had repeatedly advised to respect the carrying capacity of the
island’s ecosystem, which was estimated at 4000–6000 reindeer (Lavrinenko and Lavrinenko 2014). The fluctuations in reindeer population had also been attributed to periodic freeze–thaw events (Krupnik 1993, 140) that result in the formation of ice crusts on vegetation, which severely affect forage availability for Arctic land animals (Forbes et al. 2016). Other explanations were linked to the profound post-Soviet market transitions, including the privatization of the Kolguev state collective farm (sovkhоз) in the late 1980s (Romanenko et al. 2014). Despite the multitude of explanations, or perhaps because of them, insufficient action was undertaken to reduce fluctuations and avert collapse.

The same factors that were used to explain the recurring swings in population were put forward to explain the 2013/2014 collapse. The various groups of stakeholders clearly had no shared perspective on the dramatic events. This was striking as a high-profile project aimed at integrated ecosystem management through joint knowledge production had been completed on Kolguev just a few years earlier. Joint knowledge production has been praised in the literature for its potential to enhance environmental management and policies (Cash et al. 2003; Meek et al. 2011; van Buuren and Edelenbos 2004; Edelenbos, van Buuren, and van Schie 2011). Its application to ecosystem-based management is explored in several studies (Giebels, van Buuren, and Edelenbos 2015, 2016; Cowell and Lennon 2014). The project on Kolguev was the first joint knowledge production project in the Russian Arctic.

This project, called ECOlogy of the Russian Arctic (ECORA), ran from 2004 to 2009 and was sponsored by the United Nations Environment Programme (UNEP) Global Environment Facility. The ECORA project aimed to conserve biodiversity in the
Russian Arctic by harmonizing the relationships between environmental protection, industrial activities, and the livelihood of indigenous populations through the implementation of the ecosystem approach. Kolguev Island was one of three ECORA’s demonstration areas to test this approach in practice. Kolguev’s ECORA project addressed reindeer herding in conjunction with other issues and developments, including oil extraction on the island, the protection of migratory birds, and the prospects for establishing alternative economic activities like fishing, crafting, and tourism.

A steering committee led the ECORA project and comprised of the representatives from the co-executing agencies, namely the Russian Ministry of Natural Resources, the Ministry of Economic Development, and Trade, the Arctic Council Working Group on the Conservation of Arctic Flora and Fauna (CAFF), and UNEP-GRID-Arendal in Norway. The project team included Russian and foreign experts, indigenous people representatives, the Kolguev cooperative’s director and regional environmental authorities. Joint production and integration of indigenous and scientific knowledge next to strengthening legislation, administrative, and institutional frameworks were the project’s main ambitions. The project was expected to facilitate an effective transfer of project results into practices on the ground, including reindeer herding, oil exploration, and nature conservation.

The ECORA project introduced a collaborative management method to promote dialog and mutual learning among indigenous Nenets people, state agencies, and scientists. The collapse of the reindeer population in 2013/2014 showed that this method of joint knowledge production had not contributed to action. Understanding the reasons is important for current and future joint knowledge production projects in the Arctic and beyond.

This paper analyses the failure of joint knowledge production in the ECORA project. To this end, it uses the framework developed by Hegger et al. (2012; 2014), which discerns seven factors that can determine the success or failure of joint knowledge production projects in integrated ecosystem management. Hegger et al.’s (2012; 2014) framework builds on the more general attributes of scientific information formulated by Cash et al. (2003): credibility, legitimacy, and salience. The paper aims to ascertain which of these concepts can best explain the failure of joint knowledge production in the ECORA project. We also aim to contribute to the growing body of literature on joint knowledge production by illustrating the challenges of joint knowledge production among stakeholders belonging to different knowledge systems, as scientific knowledge and indigenous knowledge intrinsically are.

Section “Joint Knowledge Production and the Conditions for its Success” introduces the joint knowledge production framework, followed by the “Methodology” in the next section. Section “Joint Knowledge Production in the ECORA Project” presents the findings, which are discussed in section “Discussion”. “Conclusions” is the final section.

**Joint Knowledge Production and the Conditions for its Success**

Joint knowledge production (JKP) occurs at the “science-policy interface” (van den Hove 2007) and comprises “social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making” (van
The rise of JKP follows the emergence of ‘post-normal’ (Funtowicz and Ravetz 1993) and “Mode 2” science (Hessels and van Lente 2008): research that is organized around addressing (often complex) real-world problems rather than around creating scientific knowledge in various disciplines as in “Mode 1” science (Gibbons et al. 1994). Further, a broad agreement exists on the importance of inclusive stakeholder processes and diversity of knowledge (scientific and indigenous) to ensure that policy outcomes enhance social, economic and environmental objectives (Röckmann et al. 2015; DeReynier, Levin, and Shoji 2010). In other words, addressing complex real-world problems requires collaboration between researchers from a variety of scientific backgrounds, policy-makers and societal actors.

Scholarship on translating knowledge into actions has grown substantially in the last decade (Hegger et al. 2012; Ruckelshaus et al. 2015). A central theme in this literature has been how to deal with the divergent values and worldviews, and contradictory conclusions that often result from the complexity of the issues at stake and the diversity of actors involved (van Buuren and Edelenbos 2004). JKP addresses this challenge (Armitage et al. 2011; Hegger and Dieperink 2014) and has become an essential part of different transdisciplinary programs and projects, including Future Earth (e.g., Mauser et al. 2013).

Experience with JKP-based programs and projects have resulted in valuable lessons learnt. Weichselgartner and Kasperson (2010), for example, reviewed a number of JKP-based case studies around vulnerability and resilience, and called for shared problem perception, linking proposed scientific solutions with the needs of various users, including multiple stakeholders and multiple expertise, and developing a reservoir of experience to support social memory and learning. Experience from Dutch water-management projects showed that knowledge co-production between experts and bureaucrats on one hand and different stakeholders on the other is challenging for legitimate decision-making (Edelenbos, van Buuren, and van Schie 2011). A review of co-management projects in the Canadian Arctic stressed the importance of stakeholders’ long-term commitment and a problem’s collective ownership, the need for various communication and interaction modes, the necessity of an enabling policy environment with multi-layered institutional arrangements, and the ability to see crises as windows of opportunity to reorganize knowledge and learning processes (Armitage et al. 2011).

In their influential analysis of science-policy knowledge systems, Cash et al. (2003) focused on the ability of knowledge to induce societal responses. They concluded that the influence of knowledge depends on the enhancement of three attributes of the knowledge produced: credibility, legitimacy, and salience. Credibility denotes the adequacy of the scientific arguments and evidence used for knowledge production. Legitimacy refers to the fair and equal representation of the diversity of values and beliefs among stakeholders. Salience reflects the relevance to decision makers of the knowledge produced (Cash et al. 2003). According to Hegger et al. (2012), a successful JKP is “a process in which the actors involved have managed to maximize synergy and minimize trade-offs between the salience and credibility of the knowledge produced as well as the legitimacy of the process” (Hegger et al. 2012, 54).

Hegger et al. (2012) further operationalized Cash’s knowledge attributes in a stakeholder-centric way and developed a practical set of conditions for designing or evaluating JKP processes in ecosystem-based management. Hegger et al. (2012) derived seven
conditions for successful JKP (Table 1) and empirically tested them on a regional climate-change adaptation project (Hegger, Van Zeijl-Rozema, and Dieperink 2014). According to Hegger et al. (2012), a JKP project is potentially successful if (1) all relevant stakeholders are engaged and (2) the nature of problems and desired outcomes are openly and thoroughly discussed. Furthermore, (3) different stakeholders’ perspectives should be recognized and taken into account, and (4) explicit communication about stakeholders’ roles and identities should take place. Likewise, (5) all stakeholders must clearly understand the role of researchers and scientific knowledge, and (6) unambiguous incentives and rewards should be in place. Finally, (7) stakeholder communication is enhanced through possession of the right skills, competences and capacities, availability of necessary resources and facilities, and identification of boundary objects. Boundary objects are instruments, concepts, methods, activities or projects that support collaboration between actors across domains (Star and Griesemer 1989). They fulfill a mediating role across the boundaries of science, policy, and practice, and are crucial in bridging diverse stakeholder perspectives (Nicolini, Mengis, and Swan 2012).

The seven conditions cover the analytical domains used in other frameworks, such as the material, cognitive, social, and normative domains in the co-productive capacities framework by Wyborn (2015). Its foundation in well-established tradition and literature and its specific application to ecosystem-based management, makes the framework developed by Hegger et al. (2012) suitable for our study.

We therefore adopted Hegger et al.’s (2012) analytical framework to explore synergies and tradeoffs between credibility, salience, and legitimacy of JKP in the ECORA project. The seven conditions for success serve as indicators for JKP progress and can be categorized in four analytical dimensions: stakeholder involvement; the diversity of perspectives; roles, responsibilities, and rewards; and resources, competences, and boundary objects.

### Methodology

This case study of the ECORA project on Kolguev Island is based on qualitative research methods, consisting of open-ended, semi-structured interviews and document analysis (Bickman and Rog 2009; Kvale 2008). Primary data was collected in April–May...

| Analytical dimensions                      | Success conditions                                                                 |
|-------------------------------------------|-------------------------------------------------------------------------------------|
| Stakeholder involvement                   | (1) The broadest possible involvement of stakeholders.                               |
| The diversity of perspectives             | (2) Stakeholder deliberation on the nature of the policy problem and the type of outcome; and |
|                                           | (3) Recognition and accommodation of different stakeholders’ perspectives.          |
| Roles, responsibilities and rewards       | (4) Conscious and explicit communication about the stakeholders’ identities, choices, roles and division of responsibilities; and |
|                                           | (5) The clear role of researchers and scientific knowledge; and                      |
|                                           | (6) Appropriate reward structures and incentives.                                   |
| Resources, competences and boundary objects| (7) Identification of boundary objects that can fulfill a mediating role between stakeholders; presence of facilities and forms of organizational embedding that stimulate exchange of (tacit and explicit) knowledge; attention to competences that enhance collaboration between stakeholders. |
2014 during an expedition to Kolguev Island and the administrative center of the Nenets Autonomous Okrug (NAO) – the town Naryan-Mar, followed in August 2016 by a Skype interview with one of the ECORA scientists and another visit to Naryan-Mar in January 2017. In total 67 interviews were conducted with stakeholders who were either involved or affected by the ECORA project. Of these interviews, 31 were with members of the local indigenous population on Kolguev and 36 with stakeholders who were based on the mainland.

The interviews with the indigenous people of Kolguev Island (in the results labeled as “Indigenous people”) were conducted at the initial stage of the research in 2014 and were intended to explore indigenous people’s experiences from the time of the ECORA project. Interviewees were selected based upon their familiarity with the activities within the ECORA project and ability to comment on the reindeer husbandry development before and after the project. A snowball sampling method for identifying and approaching interviewees was used, which implied a chain-referral of potential interviewees among indigenous participants of the ECORA project.

The permanent local population of Kolguev Island consists of about 450 indigenous Nenets people, most of whom live in Bugrino village throughout the year, where the Kolguev Agricultural Production Cooperative was the main employer before the collapse of the reindeer population and where socio-economic problems and alcoholism are prevalent. Among the interviewed indigenous residents of Bugrino village were seven pensioners, four “female tent workers” (chum-rabotnitsa), three teachers, two tractor-drivers, two child care workers, two unemployed, a head of the kindergarten, an entrepreneur, a firefighter, a doctor, a bath-attendant and a weather station worker. These jobs, including a peculiar “chum-rabotnitsa”, are the legacy of the Soviet collectivization on reindeer herders aimed to industrialize their previous subsistence herding (Vitebsky 2010). In addition to the village-based members of the local population, the chiefs of the two herding brigades and three reindeer herders were interviewed in the tundra. Due to the small size of the island reindeer herders frequently travel from tundra to the Bugrino village. The resulting sample reflected the socio-economic profile of the Nenets community on Kolguev.

The non-local stakeholders that were interviewed resided on the mainland, mostly in the town of Naryan-Mar. These stakeholders included eleven representatives of regional and local authorities (labeled “Authorities”), ten former and present representatives of the Kolguev Agricultural Production Cooperative (labeled “Cooperative”), eight representatives of the oil company (labeled “Oil company”), two scientists involved in the ECORA project (labeled “Scientists”), and five environmental NGOs and civil society organizations representing local and indigenous people (labeled “NGOs”) (Appendix 1). The open character of the interviews allowed for the necessary reflection by the stakeholders on the past events and experiences, and generated a detailed reconstruction of the knowledge production and learning process.

All interviews were recorded and summarized; interviews with key informants were additionally transcribed. The codes were assigned to discern the information regarding three attributes of jointly-produced knowledge: credibility, legitimacy, and salience (Cash et al. 2002). Thus, the codes for credibility included trustworthiness, trust, authority, reliability, integrity, and reputation. Legitimacy comprised fairness, righteousness, justness, inclusiveness, equality and, equity. Salience encompassed relevance, clarity,
appropriateness, applicability, and significance. Documents were consulted to verify, specify, and complement stakeholder interviews. Documents included governmental reports and the ECORA project documentation, study reports and internal documentation of different organizations, such as the Russian World Wildlife Fund (WWF), the oil company, and the Kolguev Agricultural Production Cooperative. The next section presents the key findings of our analysis structured by the four analytical dimensions mentioned above.

**Joint Knowledge Production in the ECORA Project**

**Stakeholder Involvement**

Involvement of a broad range of stakeholders using a bottom–up approach was a fundamental design principle of the ECORA project. A thorough preparation phase in the early 2000s preceded the project’s implementation. Stakeholder consultations took place and the NAO regional administration, the Kolguev Island administration, and the Russian Association of Indigenous Peoples of the North expressed their commitment to participate in ECORA activities and events. Participation of regional officials in the Kolguev Model Area Implementation Unit was expected to integrate the project with the state administrative structure and increase the impact of generated knowledge. Indigenous people participated in workshops and meetings during the ECORA project development and were represented in the expert task team. Also, the oil company ArktikNeft (“Arctic Oil”), that operates the Peschanoozerskoye oil field on the island and houses 250 shift workers in the nearby Peschanka settlement, agreed to coordinate its environmental and social activities with those of ECORA.

The composition of the project team was expected to allow boundary crossing between the knowledge systems. In particular, the project team aspired to “foster meaningful dialogue between the two forms of knowing” through linking traditional knowledge of indigenous people with natural sciences-based approaches (Kurvits, Kuznetsov, and Larsen 2009, 27). Indigenous knowledge in the project included Nenets phenological observations in relation to local environment and climate, insights into traditional practices, including reindeer husbandry, hunting, harvesting of biological resources, and consumption of wild foods (Indigenous people). Scientific knowledge generation included mapping habitat types and land use, estimating capacity and use of reindeer pastures, economics of reindeer husbandry, and assessing waterfowl numbers and nesting grounds (Scientists). The knowledge of involved officials, though not defined as such, incorporated the know-how of maneuvering through the complex political and administrative landscape of Russian bureaucracy (Authorities). The latter was particularly crucial for advocating anticipated changes in legislation that would institutionalize successful practices and experiences resulting from the project implementation.

In the 2000s, Russia went through significant political, administrative and economic transformations (Fiorino and Ostergren 2012; Mol 2009), which affected the ability of authorities to effectively participate in or contribute to ECORA. Political reforms affected federal and regional authorities, whose support was crucial for ECORA. By the start of the project in 2004, reorganization of the state administrative structure weakened the project team’s decision-making influence. The Russian Ministry of Natural
Resources voided the project’s co-funding and limited its participation to information exchange. The NAO regional administration, while still supportive, suffered from a lack of financial and administrative resources. These unforeseen difficulties delayed project activities and the planned public consultation strategy for more than a year. Consequently, this impeded the efforts to solicit early stakeholder input and strengthen administrative and institutional frameworks (UNEP 2012).

Also, the involvement of indigenous people was narrower than envisaged. The Russian Association of Indigenous Peoples of the North, an umbrella organization for Russian indigenous people, was poorly engaged in project implementation (UNEP 2012), which limited the access to and exchange of indigenous knowledge from the Russian North. Similarly, the lessons learned on Kolguev had limited outreach towards indigenous people outside of Kolguev Island and two other model areas (NGOs).

Scientists on Kolguev perceived practical activities as the most suitable contribution of the Nenets people to the project. For example, the Nenets helped the scientists to assess the reindeer population, study the reindeer population’s structure, and describe the reindeer husbandry system (Cooperative). However, the scientists designed the activities and little room was provided for reflection on mutual learning and exchange. The actors remained in their knowledge systems and lacked awareness of alternative perspectives or methods.

The trainings for indigenous people within the ECORA project illustrate the one-legged definition of indigenous people’s needs by the project scientists. The Nenets were trained to develop local businesses (e.g., fishing, crafting, and tourism) to relieve pressure on reindeer pastures (Kurvits, Kuznetsov, and Larsen 2009). However, neither the rationale for the trainings (lowering pressure on pastures), nor the content of the training (developing local businesses) appealed to the Nenets’ concerns or ambitions. In sum, despite good intentions and commitment expressed during the project development phase, a tangible and meaningful stakeholder involvement did not materialize on Kolguev Island. Political reforms and associated developments hindered initial project activities, while the science-led research agenda lacked critical reflection and a meaningful stakeholder participation process.

The Diversity of Perspectives

The initial delay at the project start limited the room for wider stakeholder deliberations on the nature of the problem and the course of action. This resulted in an undervaluation of traditional perspectives. Scientists involved in the project were concerned with the degradation of reindeer pastures and the loss of traditional nature use practices by the indigenous people. Scientists were also alarmed by the loss of precious wetlands and nesting areas of waterfowl. These concerns informed the scientists’ view that the island’s reindeer population ought to be regulated based on ‘oleneemkost’ (reindeer-pastures carrying capacity) – a concept pioneered in Soviet times to indicate reindeer numbers and control practices of reindeer herding throughout the Russian North. In contrast, indigenous people were indifferent to this concept and skeptical towards the risks of overgrazing as they perceived reindeer as sentient beings, able to take care of themselves (Rouillard 2013). ECORA failed to explicitly recognize, acknowledge, and bridge the differences between these two perspectives in order to produce knowledge jointly.
Scientists and experts regarded the return to traditional indigenous lifestyle to be sustainable for Arctic livelihoods and essential for meeting the required ‘oleneemkost’. Specially appointed indigenous experts conducted trainings for Kolguev’s indigenous population to encourage traditional nature use and revive traditional reindeer husbandry (Project Implementation Unit 2006b). The return to traditional family nomadism and seasonal pasture rotation were, according to the scientists, desirable transformations needed to stop pasture degradation and the loss of indigenous lifestyles (Gofman 2010, 24). Unfortunately, the ECORA scientists undervalued the irreversibility of modernization and the unwillingness of indigenous population to return to previous subsistence practices.

A key case of modernization is the shift from nomadic practices to sedentary lifestyles, brought about by mutually reinforcing changes in several areas, particularly housing and transportation. Kolguev’s reindeer herders traditionally migrated with their herds, rounding up their reindeer around the chum (i.e., nomadic tent) once a day to prevent them from straying too far. In the 1980s and 1990s, the chums were replaced by “balki”, stationary scrap-material shacks that were built along the reindeer migratory routes. To cover the larger distances to the herds, the Nenets increasingly used snowmobiles, a development that was further fueled by the cheap diesel that the oil company ArktikNeft provided. The use of snowmobiles fundamentally changed herding practices by reducing the contact between reindeer and herders (Indigenous people).

“(….) some kind of decay has started. Reindeer herders switched to machines. This marked the beginning of the loss of traditions. The reindeer have grown disaccustomed to people. They graze on their own and herders eased off. We start losing our people, man has himself ruined reindeer herding with his own hands. (…) In my opinion the disconnection of man and his reindeer is occurring” (Indigenous people).

By the mid-2000s free herding had become the norm. The reindeer roamed freely around the island, while the Nenets stayed in their stationary balki in the tundra (Cooperative).

“Nowadays reindeer herders (…) receive salary, but do nothing. They only gather cloudbberries and mushrooms for themselves” (Indigenous people). “Before, we guarded reindeers daily, now we don’t do it. The herd is lost. (…) Now we realize that it is bad” (Indigenous people).

The ECORA scientists’ solution of returning to traditional herding practices stood in striking contrast with the reality of gradual modernization. Indigenous people were nostalgic about their traditional lifestyle, but at the same time unable to resist modernization and understand the consequences of social transformation. Notably, while the scientists advocated for the return to traditional herding practices, they were simultaneously promoting modern reindeer husbandry. This implied recommendations regarding organizational, financial and veterinary aspects, including primary processing of meat, meat export, generation of additional local employment and income on the island (e.g., processing animal skins) (Kurvits, Kuznetsov, and Larsen 2009).

**Roles, Responsibilities and Rewards**

To connect science and practice, and facilitate boundary crossing between knowledge systems, some stakeholders took on dual roles performing their regular work and acting
as researchers. Yet, no translation of scientific knowledge into practical measures was realized. The former director of the Kolguev cooperative, for example, who was part of the project team and acknowledged the detrimental effect of extensive herding on the pastures, praised the benefits of free herding albeit with the introduction of fences regulating reindeer migration (Scientists).

As mentioned earlier, the ECORA experts and scientists defined the conditions for participation of indigenous people, expecting them to follow the suggested approaches and methodologies. As summarized in one of the project reports: “Cooperation with scientists is a two-way learning process: while indigenous people share traditional knowledge with scientists, they learn new skills working as research assistants” (Gofman 2010, 24). Assisting the researchers was the role that best described the indigenous people’s recollection of the participation process.

“Ornithologists studied when geese arrived and when they flew away. I helped them. They asked about the weather, geese, ducks, waders. Geese come from Holland ringed. Now they have plastic tapes. I took off the rings and sent them back to the ornithologists” (Indigenous people).

Indigenous people collected data for the project by counting birds, accompanying researchers during fieldwork, and sharing knowledge on the environment and weather through systematic observation. Systematic observation means that the Nenets regularly filled in questionnaires or recorded events in the form of a diary, and send their material to the Moscow ECORA office (Gofman 2010).

Indigenous people enjoyed the social side of this cooperation but missed the actual impact on their daily lives.

“Big misters cooperate here, they know everything, they need to publish books and textbooks for the natives. But somehow they did not let us actually manage the ecosystem” (Indigenous people).

The role of researchers, scientific knowledge, and research results were unclear to the indigenous population. According to one of the indigenous respondents:

“Everything is fine in the reports. They even taught us to smoke reindeer meat, but what happened in the end? The reindeer died. The project was great (…) Scholars wrote documents, coordinators came here, everything was great, but I do not know what the result was. I guess they released reports in English, published books, but what exactly they did for the reindeer herders, I do not know” (Indigenous people).

Further impediments to meeting ECORA’s objectives can be linked to the reward structure. Meat production subsidies, aimed at providing the Nenets with a stable income (Cooperative), encouraged the indigenous population to keep numbers of reindeer that greatly exceeded the science-informed ‘oleneemkost’ (carrying capacity) of 4000–6000 animals. Limits to the reindeer population had been imposed, with exceedance being subject to penalties, which led the Kolguev cooperative to underreport the actual number of animals in its official statistics (Cooperative, scientists, indigenous people). Estimates of the discrepancy vary. According to Lavrinenko and Lavrinenko (2014), there were 500 “personal reindeer” and 2000 wild reindeer in 2010, in addition to the 7500 cooperative-owned reindeer that were officially reported.

The Nenets and the Kolguev cooperative had no incentive to regularly count the animals, or to properly mark cooperative-owned and personal reindeers. In addition, free
herding made these tasks difficult. An accountant of the Kolguev cooperative confirmed the uncertainty around the number of reindeers and infrequent counting:

“Mortality in 2013 reached 1000 reindeer. I don’t know for 2014 but according to estimates some 5000–5500 animals died. There has been no recounting for 2 years. Last year the animals were too weak. The last good counting took place in 2010 or 2011. There should have been a yearly counting before slaughtering” (Cooperative).

The manipulation of statistics has degraded stakeholders’ trust. Skepticism about information provided by others is widespread:

“Now they say that the lack of forage is to blame for mortality, but I don’t believe it. Reindeers are neglected. (…) In the tundra no one works in reality, only in the documents of the agricultural production cooperative. (…) Now on the television they say that 1000 reindeers are left (after the mortality), while (in reality) there would hardly be 100. (…) What else will they lie there? Information is always forged” (Indigenous people).

Resources, Competences and Boundary Objects

Financial resources of the ECORA project, despite the initial total sum of almost 7 million US Dollars, turned out to be insufficient. On one hand, federal authorities failed to provide earlier promised co-funding and participating regions limited their support to in-kind contributions. On the other hand, the improving economic situation spurred a rise in salaries, which made it difficult to attract competent local experts at the planned rates. As already discussed in Section 4.1, this undermined the originally stated ambitions of ECORA and delayed the actual start of the project activities.

Financial constraints severely limited the dissemination of the project results to different stakeholders in Russia and outside of it. Many project reports were never converted into outreach materials accessible for local stakeholders and a societal broader audience. An information center on Kolguev Island did help to maintain indigenous people’s interest in the project, inform them about on-going activities and communicate the results to them.

Plans to disseminate scientific findings to the scientific community in a concise edited volume did not materialize (UNEP 2012). Because of limited funds, most reports could not be translated into English, which limited foreign experts’ feedback and knowledge transfer. The involvement of foreign experts was also limited because of the island’s remoteness and its lack of reliable communication infrastructure, which made contact between the experts and local coordinators problematic and irregular (Project Implementation Unit 2006a).

ECORA project team members and scientists on Kolguev lacked interdisciplinary competences and experience with cross-cutting issues. The benefits of interdisciplinary and multi-stakeholder interactions were not necessarily obvious to stakeholders and different ways of knowing complicated the ambitions of mutual learning. The ecosystem approach, a central concept of the project that was envisaged to bring stakeholders together and function as a “boundary object”, remained intangible for indigenous people and local authorities. The trainings on common understanding of project objectives and the ecosystem approach among the project team members attempted to address this deficiency (Larsen, Kurvits, and Kuznetsov 2011). However, a broad discussion
about the ecosystem approach and its relevance for the indigenous population never took place.

**Discussion**

This paper set out to analyze the failure of joint knowledge production in the ECORA project. A number of shortcomings clearly emerge.

First, despite expressed commitment of a wide group of stakeholders in the preparation phase of the ECORA project, the ambitions did not materialize during the project implementation. Rapid institutional, economic, and administrative reforms undermined the earlier plans and agreements between stakeholders, which particularly affected the involvement of indigenous people in defining problems and desired outcomes. ECORA’s limited stakeholder involvement hampered the evolvement of common knowledge, which reduced chances for tangible changes in practices and institutional structures.

At the start of the ECORA project, little experience and few guidelines existed on how to arrange and facilitate joint knowledge production within the ecosystem approach. As such, this project was an experiment on its own. However, more recent experience, for example, from the United Kingdom acknowledges “messiness” of environmental decision making and non-availability of linear and rational models of knowledge utilization (Haines-Young and Potschin 2014). Here, as in the case of ECORA, it is of importance how, by whom, and in which context ecological knowledge is embedded in decision-making (Turnpenny, Russel, and Jordan 2014). Different institutional settings, distinctive social, cultural and political processes, divergent perspectives and strategies of actors make knowledge utilization always a tailored endeavor (Jordan and Russel 2014).

Second, and related, bridging the stakeholders’ diversity of perspectives proved to be a major challenge. Our results suggest that the scientists, in their efforts to preserve the island’s ecosystem, were caught in a narrative of over-population, and prioritized conservation goals over social development goals of indigenous people. In the ECORA project scientists primarily led the official knowledge production, while disregarding (or being ignorant about) the space for learning from and with indigenous people. Scientific recommendations to return to a traditional indigenous lifestyle as more ecologically sustainable did not appreciate social relations and economic incentives for indigenous people. This disconnect resulted in poor credibility, legitimacy and salience of scientific knowledge: it did not resonate with indigenous peoples’ ideas of living on Kolguev.

The failure to bridge different “ways of knowing and doing”, and the lack of a shared perspective on the problems and their causes and potential solutions, were apparent in the aftermath of the reindeer mortality. The Kolguev Nenets population explained the collapse by the decline and gradual loss of indigenous knowledge and culture. The Kolguev cooperative administration and regional authorities deemed the scientific arguments of excessive reindeer numbers secondary to periodic freeze–thaw cycles, which possibly affected the foraging of the animals. However, independent studies of reindeer population numbers in Russia claim that the influence of political events and managerial decisions exceeds the
impact of natural factors, such as climate change (Klokov 2012). These perceptions do not necessarily contradict each other but reveal differences among the stakeholders in knowing the reality and the events which led to the mass mortality. The causes of mortality are thus proximal and distal. In the absence of a comprehensive knowledge brokering, the diversity of perspectives remained divided.

Most recently, partially as a response to science’s crises (Saltelli and Funtowicz 2017), critical calls are made for recognition of different ways of knowing, experiencing, and observing the environment, and for putting them on a par with the scientific knowledge system (Hewson 2015). Engaging in JKP across fundamentally different knowledge systems, such as (western) science and indigenous knowledge, has become increasingly important in realizing ambitions for sustainable and inclusive development (Mistry and Berardi 2016). For this, a shift from a knowledge suppliers’ to knowledge holders’ perspective on knowledge utilization is advocated. In this light Johnson et al. (2016) calls for “weaving” indigenous and scientific knowledge systems through enhancing transparent, constructive and legitimate collaboration. Practical guidance for such collaboration, non-existent at the time of the ECORA project, has gradually become available. For example, five tasks proposed by Tengö et al. (2017) - to mobilize, translate, negotiate, synthesize, and apply multiple forms of evidence - can arguably improve collaborative processes and bridge indigenous and scientific knowledge systems.

Third, roles and responsibilities were well-defined among the project team members involved as coordinators or as experts and scientists. The indigenous people of Kolguev, however, perceived ECORA as just another scientific endeavor. The project scientists involved some indigenous people as research assistants but failed to actually learn from and with them. The indigenous people appreciated social activities but did not identify themselves as ECORA project team members. The indigenous population missed a feeling of project ownership and opportunity to actually manage the ecosystem. The project outcomes were clearly not perceived as salient, i.e., useful in decision-making.

The lack of actual “learning from and with” indigenous people was the key characteristic of the relationship between the scientists and Kolguev’s indigenous population. While this relationship is in line with mainstream scientific tradition, the literature on co-productive capacities labels it as scientific elitism. This literature emphasizes the necessity to build up capacities for scientifically-informed interventions that are sensitive to local interests, knowledge, and cultures (van Kerkhoff and Lebel 2015; Wyborn 2015).

Fourth, financial rewards in the form of subsidies for reindeer meat production challenged the scientific advice on limiting the reindeer population propagated by the ECORA project. The Soviet legacy was still visible, as economic activities were subsidized by the state and create financial incentives for the reindeer population’s increase. At the same time, a lack of enforcement gave rise to irregular reindeer counting and manipulations with official statistics on the number of animals by the Kolguev cooperative. This eroded authority of official information sources, affected the credibility of the produced scientific information and undermined the legitimacy of management processes.

Fifth, the lack of financial resources, interdisciplinary and cross-sectoral competences among stakeholders, and shared understanding of the ecosystem approach hampered the ECORA project’s implementation. The promised funding from regional and federal authorities was canceled. Financial problems prohibited extensive educational activities
among stakeholders aimed at improving interdisciplinary and cross-sectoral competences. Locally skilled experts left the project in search of better salaries elsewhere. Also, the ecosystem approach, imposed by the project architects as an overarching concept, remained an intangible notion for indigenous population.

The ecosystem approach was a poor boundary object that disregarded the local context and did not perform the communicative role to intrinsically motivate stakeholders. There were no skillful and self-aware knowledge brokers either, who would assume their roles to bridge diverging interests and knowledge. The absence of commonly accepted boundary objects and knowledge brokering may help explain the failure to deliver joint knowledge production in the ECORA project. Knowledge brokers can tackle the challenge of reaching mutual understanding and facilitate joint learning (Gustafsson and Lidskog 2018). Boundary objects and brokers may contribute to providing the necessary resources and expertise to realize knowledge exchange and learning. While boundary objects enable communication and exchange across different knowledge systems, knowledge brokers assist deliberations and translate knowledge from one group into the language of another (Kimble, Grenier, and Goglio-Primard 2010). Indigenous experts appointed to conduct trainings partially fulfilled the role of knowledge brokers. However, their influence on the project design and implementation was limited.

Finally, divergent interests make knowledge (co)production an intrinsically political process requiring negotiation in determining common interests. According to Forsyth’s (2003) critical political ecology perspective, knowledge cannot be separated from wider social framings and discourses that have strong historical roots. Thus, science co-evolves with state and societal institutions and is embedded in the governance system with related management practices and rules. Indigenous knowledge is part of this system, but additionally it is “generated in the practices of locality” (Ingold and Kurttila 2000). For this reason Forbes and Stammler (2009) urge to place research agendas in a “proper local and regional context and temporal framework: for example, by collaborating with herders on the topics of weather instead of climate change, herding skills instead of wildlife management, and ways of engaging with the tundra instead of traditional ecological knowledge” (Forbes and Stammler 2009, 38). Similarly, reindeer herders on Kolguev generally were not concerned about the reindeer-pastures’ carrying capacity (’oleneemkost’). Instead, when reflecting on the risk of overgrazing, herders reasoned that thus far reindeer could feed themselves, hence perceiving the reindeer as having their own will and logic (Rouillard 2013, 174). For meaningful JKP that involves knowledge transformation (Carlile 2004), stakeholders should be able to leave their “knowledge comfort zone” and willing to consider tradeoffs. Therefore, as it is part of a political process, knowledge co-production comes at a cost (Stange, van Tatenhove, and van Leeuwen 2015).

**Conclusions**

This paper evaluated the level of success of joint knowledge production (JKP) in the project ECOIogy of the Russian Arctic (ECORA) on Kolguev Island in the Russian Arctic. Our conclusion is that JKP in the ECORA project, although it was clearly aimed for, failed completely. The project did not meet any of Hegger et al.’s (2012; 2014) seven conditions for successful joint knowledge production: stakeholder involvement, problem
formulation, diversity of perspectives, clarity of actor roles, role of scientific knowledge, incentives and rewards, availability of resources, and competences and boundary objects. The project particularly failed to genuinely involve indigenous people perspectives and their knowledge in problem definition and knowledge production process. The role of natural scientific knowledge was clearly prioritized, while accommodating socio–economic development goals fell short. Indigenous people did not identify themselves as members or co-owners of the project, and there was insufficient reflection on the political embedding of the JKP process. Not all threshold levels for credibility, legitimacy, and salience, Cash et al.’s (2003) three attributes of actionable information, were achieved. The project predominantly focused on optimizing natural scientific credibility, while the legitimacy and salience of the project’s outcomes were low.

The Kolguev case holds some key lessons for JKP in the Russian Arctic and in other parts of the world where broad stakeholder participation in knowledge production or decision-making processes is limited. First, it appears that in such contexts JKP is challenging to realize within the duration of a single project, as it requires trust and reflexivity among the stakeholders, as well as familiarity and competence with regard to organizing participatory processes. This requires time. Second, a more substantial involvement of interdisciplinary-skilled researchers and local knowledge holders can help avoid some of the pitfalls. Finally, JKP can never be based on a blue print; it can only succeed as a locally-tailored and carefully monitored and managed process.

In the meantime, the people of Kolguev Island still experience the repercussions of the dramatic reindeer mortality 4 years ago. Recovery of the reindeer populations on Kolguev has been slow and not supported by stakeholder-science collaboration. The Nenets seem to have become accustomed to living without reindeer. They now pursue alternative economic activities like fishing and crafting, and explore possibilities for tourism, as once suggested by the ECORA scientists.

1. The ECORA project uses the less common synonym ‘integrated ecosystem management’.

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## Appendix 1. List of interviews

| Stakeholder code | Stakeholder group                                           | Time and location                  | Number of interviews |
|------------------|-------------------------------------------------------------|------------------------------------|----------------------|
| Authorities      | Regional and local authorities                             | April 2014, Naryan-Mar             | 11                   |
| Cooperative      | Kolguev Agricultural Production Cooperative representatives | April 2014, Kolguev and Naryan-Mar | 10                   |
|                  | Oil company ArktikNeft representatives                     | January 2017, Naryan-Mar           | 8                    |
| Scientists       | Scientists involved in ECORA project                       | August 2016, Moscow; January 2017, Naryan-Mar | 2                   |
| NGOs             | Environmental NGOs and civil society organizations representing local and indigenous people | April-May 2014, Naryan-Mar; January 2017, Naryan-Mar | 5                   |
| Indigenous people| Indigenous people                                           | April 2014, Kolguev                | 31                   |

Note: Interviews were conducted in the period from April 3 till May 7, 2014 in Naryan-Mar and Kolguev Island (Nenets Autonomous Okrug). Additional interviews took place in Naryan-Mar from 8 till 15 January 2017. One interview was conducted via Skype on August 30, 2016.