Chapter 16
When Mines Go Silent: Exploring the Afterlives of Extraction Sites

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Abstract One of the characteristics of extractive industries, in the Arctic and elsewhere, is their sensitivity to fluctuations on world markets. When demand and prices are high companies expand operations and when they fall, companies tend to close extraction sites. Moreover, no ore body lasts forever. De-industrialisation poses particular challenges to communities in the Arctic, where distances are great, alternative economies few and where the environmental and social imprints of mining often are significant. How can communities that were developed based on extraction transition to post-extraction futures? This is a key question to pose when exploring how to achieve responsible development in the Arctic. This book chapter presents research within REXSAC exploring how mining communities in the Nordic Arctic has dealt with legacies of past mining operations and under which circumstances such legacies have been ascribed new values after extraction has ended. REXSAC has dealt with this research problem in an interdisciplinary way, combining methods and approaches from humanities, social- and natural sciences. The chapter will focus on this process of research and how it has generated insights in to three main post-extraction processes: environmental remediation, heritage making and re-economization.

Keywords Arctic · Mining legacies · Heritagization · Environmental remediation · Heritage tourism · Re-purposing

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16.1 Introduction

One of the characteristics of extractive industries, in the Arctic and elsewhere, is their sensitivity to fluctuations on world markets. When demand and prices are high companies launch prospecting campaigns, start up new mines and/or expand operations in existing ones. When they fall, they tend to do the opposite – cancel prospecting and close extraction sites. In some cases, states will subsidize companies or companies will accept short term losses in order to maintain operations. In other instances, ore bodies are so rich that profitable production is possible even during times of falling demand and low prices. What is certain however is that no ore body lasts forever. Thus, in one way or another, all mines eventually come to an end. When they do, they pose problems. In the Arctic, de-industrialisation poses particular challenges to communities built around a single industry such as mining, and where distances are great and alternative economies are few. It also poses challenges in the form of environmental and social impacts from past extraction, which may be more difficult to deal with there than in industrial core areas further south. How can communities that depend on extractive industries make the best transit to post-extraction futures? How do they best deal with the legacies of past resource extraction in their transitions to post-industrial futures? These are key question to pose when exploring how to achieve responsible development in the Arctic.

This book chapter presents research within REXSAC that considers how mining communities in the Nordic Arctic have dealt with legacies of past mining operations and under which circumstances such legacies have been ascribed new values after extraction has ended. REXSAC has dealt with this research problem in an interdisciplinary way, combining methods and approaches from humanities, social- and natural sciences. The chapter focuses on this process of research and how it has generated insights into different post-extraction processes.

A general tendency in existing academic literature on mining is its focus on potential, emerging and ongoing mining industries. Far less has been written about the closure of mines and their afterlives (Hojem 2014). This is a serious weakness and a clear knowledge gap at a time when the Arctic region is going through a period of expansion of the extractive industries, particularly in mining. Often referred to as a mining boom, this surge of interest in minerals since the early 2000s has been global and has taken place both in the old heartlands of the mining industry and in regions further away from those. In the Nordic countries, the expansion has had a northern direction (SGU 2019: 34, 55). This interest is likely to continue as economies in East Asia and the global south continue to grow and demand for metals needed for green energy increase. Therefore, there is a need to build a body of knowledge on challenges pertaining to post-extraction transitions that can facilitate informed and responsible decision making in the planning and regulation of new mines.

In REXSAC, we have aimed to contribute to the building of such knowledge regarding the Arctic, based on the study of cases of post-mining transitions in the past. In the course of this work, we have identified four main processes taking place

in regions dominated by extractive industries, where companies have closed down their operations. We have named these processes abandonment, remediation, heritagization and re-economization. Under which circumstances do these processes take place and why? What are their environmental and social consequences? In this chapter, we will also provide examples of these processes and discuss the interdisciplinary approach we have used to address them (Fig. 16.1).

16.2 Abandonment

In August 2019, REXSAC conducted fieldwork in south-west Greenland. The investigating group consisted of ten researchers from different Nordic countries within REXSAC and an interpreter.[1] A prime objective of the fieldwork was to gather data usable for reconstructing and explaining the afterlife of large-scale resource extraction projects in the area. Another was to determine how residents and other local stakeholders in this region viewed the future. The team visited several

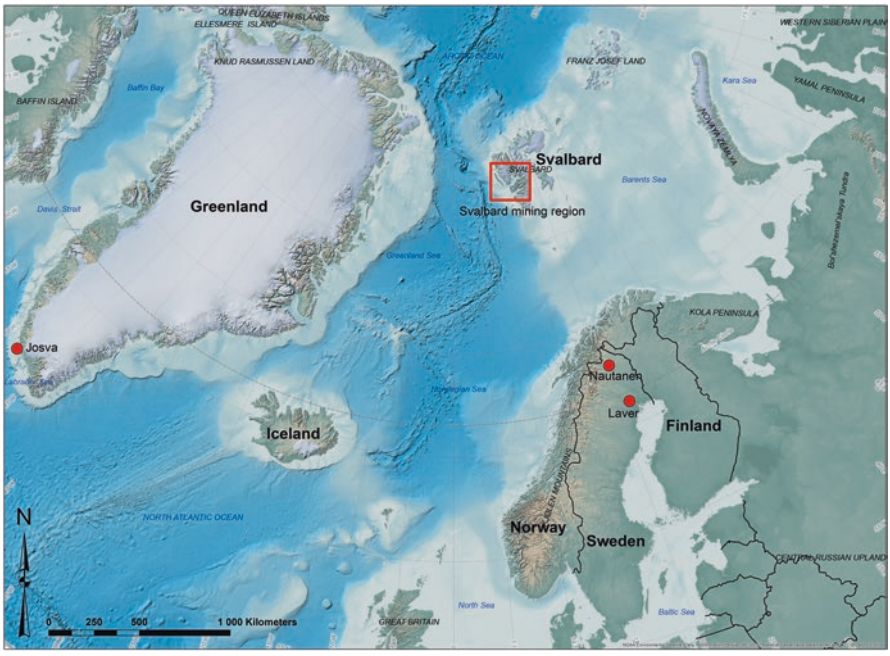

Fig. 16.1 Mining towns in transition, analyzed in this book chapter, at Greenland, in Arctic Sweden and at Svalbard

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communities, some inhabited, some abandoned. Two of them were former military bases. One was Narsarsuaq, a former US Air Force base from 1942 to 1958 that was later re-purposed to also serve civilian aircraft and to act as an arrival hub for visitors to the region. The other was Kangillinnguit /Grønnedal, that had operated as a US Navy base from 1941 to 1951 and then later as a Danish base from 1951 to 2014 and again starting in 2017. Two other research sites were former mining towns that had been solely built for mineral extraction – Ivittuut, where Danish companies mined and exported cryolite from 1857 to 1987 and Josva, where a Danish company mined copper ore from 1905 to 1914. Two others were settlements impacted by mining and where local residents had been involved in the mining operations – Narsaq (uranium prospect mining in nearby Kvanefjeld in the 1950s) and Arsuk near Ivittuut? All these post-mining settlements have been subject to different forms of re-use except for one – Josva. That settlement provides an illustrative example of a category of former mining towns in the Arctic – those that have primarily been subject to a process of abandonment and forgetting after mining operations stopped.

It was an industrialist from England, A. Robinson, who first started mining at Josva – or Innatsiaq, which is the original Greenlandic place name – in 1852. This was one of the earliest mines established in Greenland by actors from overseas. Greenlanders had extracted minerals long before European settlers arrived, soapstone, killiaq and cryolite. A Greenlander named Joshua discovered copper at Innatsiaq in the early 1800s, which is why the mining industry named the site Josva (Sejersen 2014: 11–13, 29–30, 40f). Soon thereafter, Robinson closed his mine in 1856 due to a combination of factors – lost ships, ineffective technology and a lack of knowledge about the ore body (Secher and Burchardt 2000: 250).

In 1904 a Danish mining company, Grønlandsk Minedrifts Aktieselskab, started a new mining operation at Josva and continued it until 1914. The investors and the company director had ambitious plans. They wanted to make it a source of copper for the Danish market, supplying it with the leading raw material for electric cables in the context of the rapid electrification taking place at the time. Their investments suggest they believed their project would last. The company established two mines on opposite sides of a bay. In order to shorten the distance between the mining sites and Qaqortoq, where the Danish colonial authority's administrative center was located, they blasted a canal through an isthmus in 1907–1908. To produce the energy needed they built a coal fired steam engine plant, which they later exchanged for a diesel-powered generator. In order to provide the copper concentrate transports to Denmark, the company acquired ships. The company also built a smelter, which enabled them to concentrate the copper on site, thereby reducing the transport costs to Denmark. The settlement housed 75 workers during the height of production in 1909–1913. The houses were equipped with electric lights – a rare occurrence on Greenland at the time. The obvious purpose for doing so was to create the comfort needed to build social stability at the site by making the work and living conditions pleasant and to attract workers. The company had even greater plans than the ones they actually realized. They intended to connect the peninsula with a sub-sea tunnel to their mine on the mainland across the bay, to build a new settlement and post-processing works there, and to establish a hydro-power station in the inland to

provide the energy needed for copper mining on a much larger scale (Secher and Burchardt 2000: 251–267). In doing so, they were in the processes of building what we in REXSAC has termed a large-scale socio-technical-ecological system.

Despite their highflying plans, Grønlandsk Minedrifts Aktieselskab closed their operations at Josva in 1914, acting on the advice of a consultant who assessed that there was not enough ore there to justify continued mining (Secher and Burchardt 2000: 265–266). At this point the afterlife of the Josva mine begun. In order to gather information concerning this afterlife, REXSAC researchers assembled data from several sources. We needed historical documents describing the activities that people have conducted at the site after the company closed. We also wanted to secure interviews with people who have had reason to relate to the site over the years so as to learn their thoughts about the role of the mine in their lives and in their visions of the future. We also needed information from the site itself. First and foremost, we needed data on what remained there from the time when the mine was in operation. We also looked for traces of re-use at the site during its afterlife and the environmental footprints of the mining system in its surroundings. We also needed usable data for economic analyses of value making during and after Josva was in operation as well as information on how the region where the mine is located has been governed. Gathering this data required methods from across several disciplines. The research group conducting fieldwork in southern Greenland included social and cultural anthropologists, physical and human geographers along with scholars in history, archaeology, political science and economics. In the team there were also Greenlandic researchers and collaborators who – in addition to their competence as academic scholars – also had crucial knowledge regarding local geographical, cultural and social contexts.

The experience of our team members from Greenland and Denmark was of crucial importance for making our visit at Josva possible. The site is located on a small peninsula, some 300 × 150 meters wide, connected by a narrow isthmus to a mainland characterized by steep mountains rising directly from the sea. This is no place to anchor a boat “for long”, as the Greenlandic sea pilot dryly stated, because of the high swell or waves (Geodatastyrelsen 2018: 28). The peninsula is indeed very exposed to winds from all directions except from the south. For these reasons we planned our stay at Josva to be 1 day only, a 5 h stop along our travel route between Ivittuut and Narsaq. In bad weather conditions, we would not have been able to land. We were lucky however, to arrive during a narrow window of time between low pressures systems.

The objective of our fieldwork at Josva was to conduct a thorough documentation of the abandoned mining site, the environmental impacts and indications of re-use of the site. We made an accurate map of the landscape and of all remains and imprints by collecting spatial data by drone-based photogrammetry. We also undertook photo documentations, text descriptions and measurements of said remains and imprints. We sampled soils to identify the presence of toxic waste. Making this happen within a time frame of 6 h required most of the team to work with methods they were largely unfamiliar with – e.g. economists and political scientists describing and measuring house foundations, and cultural anthropologists photo

documenting derelict industrial production systems. Some tasks required special skills though, such as sampling toxic waste and operating drones. Before the six-hour window closed, we boarded our boat and left Josva very pleased with all the data we had collected.

Understanding post-extraction transitions does not only require site visits to map and collect materials. The anthropologist, political scientists and human geographers spent several days talking with inhabitants of nearby Arsuk about their perspectives on the past, present and possible futures. We also analyzed primary sources in the form of documents in archives, published written sources, statistics and policy documents, before and after the fieldwork itself.

Our work concerning Josva showed that after the Grønlandsk Minedrifts Aktieselskab had closed the mine, there were few attempts to create new values there and no attempts, whatsoever, to remediate the environment. Archival research shows that after the company closed the mine in 1914, they subjected it to a short period of re-purposing and re-economization. First, they maintained it as a base for expeditions in the area for 2 years. Thereafter, from 1915 to 1920, they took down the buildings and moved them to a graphite mine in Amitsoq some 200 km south on the south-western side of Greenland (Secher and Burchardt 2000: 266). From then on, the place contained the same remains and imprints as it does today – house foundations and rusted pieces of technological artefacts. Our chemical analyses of the soil samples at the site suggest that parts of the site are now heavily polluted. During fieldwork, we found no indications of secondary use of Josva (Fig. 16.2).

Our interviews confirmed these observations. Greenlanders living in the region have seen no value in the historical remains at the site and the same is true for the peninsula itself. Its exposure to wind, lack of freshwater along with its unfavorable harbor conditions and the wall of steep mountains blocking access to the inland

Fig. 16.2 Abandoned machinery for extraction and ore processing at Josva. (Photo: Dag Avango)

combine to make it a nasty place to anchor and put up a camp, and useless for hunting. For these reasons, the transition to a post-extraction future at Josva has been a process of slow decay, with erosion and elements of its ecosystem slowly transforming remains of a derelict production system into something that we have yet to put a name on. It is a process of abandonment that characterizes many former mining communities in the Arctic.

16.3 Environmental Remediation

Current legislation on mining and environment in the Nordic countries requires companies to remediate the environment at mining sites after closure. There is a growing literature on this topic, with university scholars as well as officials at state agencies and practitioners within mining and consultancy companies defining problems and searching for solutions. A challenge though is the fact that mineral rich areas in the North contain remains from mining centuries ago, long before the idea of environmental remediation was born. The owners of these abandoned mines are long gone.

In REXSAC, such abandoned mines have provided a window for exploring how pollution pressure from mining operations together with other environmental and social pressures accumulate and affect the long-term sustainability of human actions in the Arctic. Our hypothesis is that even small-scale operations, which took place in the past, still affect the environment significantly. Yet there are few studies of such pollution. The resulting pollution loads need to be accounted for in any assessments of total pollutant pressures on the sensitive Arctic terrestrial, aquatic and marine ecosystems and their implications for people.

All mining operations have impacts, but among the most problematic ones are the impacts from the extraction of sulfide ores. According to the Swedish Environmental Protection Agency, there are about 1000 abandoned sulfide mines just in Sweden. One of these is Nautanen, located in Gällivare municipality in Norrbotten – one of the case study areas of REXSAC in the Swedish North. The site is the subject of several studies in the NCoE and constitutes an important part of at least one PhD thesis (Fischer et al. 2020). The company, AB Nautanens Kopparfält, began operations in 1902 and mined copper for only 6 years before shutting down in 1908. The company mined 72,000 tons of ore, which resulted in around 2000 tons of copper. After closing their mines and emptying the settlement from its more than 400 inhabitants, the bankrupt company sold off their buildings and infrastructures (Ollikainen 2002). From then on, Nautanens remains consist of house foundations, roads, mines as well as waste rock piles, tailings, and metallurgical slags, all containing sulfidic material, on the ground and in the lakes across of the area.

When REXSAC scholars began their work at Nautanen in 2017, their research questions demanded a multi- and even cross-disciplinary approach. We wanted to know how the site had been used since AB Nautanens Kopparfält closed it in 1908, by whom and for what purposes? We also wanted to know how the remains from the

mining had impacted the environment and local communities. We also wanted to learn what attempts had been made to remediate the environment and what the results of these efforts had been. We used a similar set of methods as were utilized in Greenland – archaeological survey, water and soil sampling, interviews as well as archival research.

Already at an early stage, we learned that even though Nautanen had ceased to exist as a settlement and mining site in 1908, it had never been completely abandoned. Over the course of the twentieth century, a variety of actors took interest in the site during different periods. Labor activists used it as a rhetorical device for political mobilization, mining companies explored and evaluated its potential economic values and state agencies branded it as cultural heritage (Winqvist et.al. forthcoming).

Little attention was paid to the environmental impacts of the waste though, until the early 1990s. In 1993, a student at Luleå University of Technology included the site in an examination essay dealing with mine waste in Norrbotten (Larborn 1993). The following year, the county administrative board of Norrbotten conducted an investigation of the water system. This was followed up by a biological inventory and assessments of the state of the natural environment in 2001 and 2002. The results, published by a consultancy on behalf of Gällivare municipality in 2002, showed that the waste rocks, concentration plant sands and smelter slags at Nautanen were releasing some 240 kilos of copper per year into the water system. It was further noted that parts of the site contained high levels of poisonous substances such as arsenic and cadmium, and that ecosystems were severely altered. The consultancy concluded that the site lived up to the Swedish Environmental Protection agency MIFO-model classification at a risk level 2 – meaning severely polluted and hazardous for human health and the environment (Bothniakonsult 2002).

The consultancy recommended neutralizing the main sources of contamination at the site, by moving concentration plant sand and the numerous waste rock piles in the area to one single location, beyond the flow of creeks, and covering it with materials that would contain the leakage of contaminants (Bothniakonsult 2002). In the years that followed, Gällivare municipality acted on this advice by starting up a project with the objective of conducting an environmental remediation of the site. Instead of following the consultant's recommendations however, the municipality made a deal with Boliden – one of the largest mining companies in Sweden with a large-scale open pit copper mine, Aitik, some 20 km from Nautanen. According to reports, Boliden removed some of the waste rock piles in the area in 2005 and 2008 and extracted copper from them in their concentration plant at Aitik (Boliden Mineral AB 2018). Bolidens commitment to the remediation did not extend to the removal of concentration plant sands however. To achieve that, Gällivare municipality launched a project with the objectives of removing the concentration plant sands, cleaning the soil from contamination, and re-direct water flowing through the most contaminated zones (Hifab 2009; Golder Associates AB 2015: 11).

During fieldwork in 2017 REXSAC scholars also sampled water from lakes, streams and soils from the concentration plant and smelter area of Nautanen. We

also collected samples from the uppermost 40 cm of lake sediments. We were especially interested in the water-borne spread of copper (Cu) and its potential consequences for ecosystem functions. Thus, we sampled water from many different sites upstream, at, and downstream of the actual mining area. We compared results from our measurements campaigns in 2017 with synthesized historical measurement data from 1993 to 2014 (Boliden Mineral AB 2018; Larborn 1993).

We found that the concentrations of copper (Cu), zinc (Zn), and cadmium (Cd) on-site as well as downstream from the mining area, still are much higher than the local background values and that the Cu concentrations had been relatively constant during the 25-year period during which monitoring had taken place. Interestingly, the average Cu loads in surface waters 4 km downstream of the main mining area, relative to the number of tailings and slag produced i.e., the stream load-to-tailings ratio, was relatively high in comparison with other larger mining sites (Fischer et al. 2020). So, despite the small scale of the Nautanen mining site, the short duration of its operation, and the long time since closure the impact on the environment is still significant. The results also show that the effort so far to remediate the environment at Nautanen has yet to deliver significant reduction of contaminants in the water system that runs through the area. Based on our results we also suggest that there is an urgent need to pay more attention to the potential release of metals from other abandoned mining sites in the North. We fear that disproportionately large amounts of metals may still be added to surface water systems at sites similar to Nautanen and that the total pollution pressures from mining in Norrbotten therefore has been underestimated.

In 2017, the County Administrative Board of Norrbotten ranked Nautanen as number five on a list of prioritized industrial sites in need of environmental remediation for the period 2018–2020 (Norrbotten 2017: 1717). However, the actual work to undertake it still remains to be done. Today the situation is further complicated by the fact that Boliden holds a prospecting license for Nautanen, first issued by the Mining Inspectorate of Sweden in 2009. In 2016, after 75 drilling operations in the area, the company, nonetheless, concluded that the site held previously unknown bodies of ores that are rich in copper, gold, silver and molybdenum (Boliden Mineral AB 2016). The company has mentioned that there is a possibility to remove the contaminants at Nautanen if they apply for, and receive, a concession to mine. But they have made no promises (Boliden Minereral AB et al. 2018).

Adding to the complexity of planning future large-scale interventions in the contaminated parts of the old mining site, is the fact that it is listed as a cultural heritage site, used for recreational purposes by local people in Gällivare and considered as a potential resource for heritage tourism by the municipality and tourism entrepreneurs. Is it possible to harmonize the ambitions to protect heritage values with the need for environmental remediation – and if so – how? An even more burning issue is the fact that Nautanen is located on the lands of a local indigenous Sámi community. The Baste čearru reindeer herding community uses the land as winter-spring grazing pastures for their reindeers. Their position on the future of Nautanen could

very well have a strong influence on what happens in the future, in the aftermath of the Girjas court case.[2]

The case of Nautanen shows just how important it is to pay careful attention to planning for the post-extraction phase of mining projects. It also highlights the need to develop a program for dealing with toxic waste from former mining sites – in the North and elsewhere. Given the multitude of actors who are using these former mining sites for various purposes, it is imperative to allow for strong local scrutiny of the afterlives of former mining sites.

16.4 Re-economization

Nautanen has not just been an instructive case about the challenges of remediating environments transformed by mining that took place long ago, before there were laws requiring environmental remediation. It also showcases the difficulties of making sustainable visitor sites for heritage tourism out of polluted places. Nautanen hardly qualifies as a success story of tourism related to heritage making in the Arctic. There are, however, other more successful examples. Over the course of our research in REXSAC, we have studied several cases of post-extraction transitions in which the legacies of former mining operations have played a role in the creation of new values; thereby contributing to sustaining communities once built for the sake of mining beyond the lifetime of the original activity. In the Arctic, the archipelago of Svalbard provides several examples.

Svalbard carries remains and imprints of more than 400 years of natural resource exploitation. Natural resources was the reason why people came there in the first place. Svalbard was uninhabited when Dutch explorer Willem Barents discovered it in 1596. Reports on abundant whale populations encouraged whaling companies to go there in the early 1600s. They established whaling stations along the coastlines and soon emptied the seas of Greenlandic whales. From the late seventeenth century onwards whaling moved off shore. Hunters from north-west Russia (Pomors) established new stations to support their terrestrial hunting activities for furs and walrus ivory. From mid-nineteenth century, Norwegian hunters also arrived on the scene, adding new hunting stations to the area. During this same period, scientists built stations there, and so did a new wave of whaling companies. Resource exploitation up until this time resulted in massive pressures on the ecosystem of the archipelago, but the built environments that they left behind were comparatively modest compared with what was to come (Avango et al. 2014; Hacquebord 2001).

[2] The Girjas court case, between the Swedish state and the Girjas Sámi Village, was settled by the supreme court of Sweden on January 23, 2020. The court awarded the Girjas Sami Village exclusive rights to issue licenses for hunting and fishing in its management area, instead of the state, based on legal and inherited rights. The court ruling may set precedent for future rulings also on other land use conflicts which involves the Sámi indigenous people in Sweden.

From the opening years of the twentieth century until the early 1920s, a growing demand for energy resources, along with a resource scarcity during the First World War and geopolitical maneuvering by Sweden, Norway and Russia, resulted in a coal mining boom at Svalbard. Mining companies from northern Europe and the USA established several mining towns there. These were for year-round use and together with their extensive infrastructures, they transformed vast areas of land into an industrial setting. In addition, the companies built prospecting camps all over the archipelago (Hacquebord and Avango 2009; Avango 2018). Although the companies abandoned most of these mining installations over the course of the twentieth century, the mining industry still persists in Svalbard up until the present time. In recent years however, mining companies and their state backers have started to phase out mining as a consequence of falling coal prices and the coming of new environmental policies (Avango and Roberts 2017a, b). Therefore, in 2020, Svalbard seems to be at the end of a 400 years era of extractive industries and at the doorstep of a new post-extraction future.

In this process, state and corporate actors on Svalbard are trying to find new ways to remain in business and maintain settlements and infrastructures that were once built for the purpose of mining. The research we have conducted in REXSAC at Svalbard shows that the material remains of these 400 years of extraction – stations for whaling, hunting, science and prospecting, and entire mining towns and their infrastructures – form an important part of an effort to build a tourism-based economy on the archipelago.

A multidisciplinary team of REXSAC scholars have studied this transformation process since 2016. The work included two fieldwork campaigns in the summers of 2016 and 2017. In the first, a team of ten researchers collected data for understanding whether the remains of extractive industries at Svalbard could become a resource for a sustainable post-industrial future, and if so, how and why this could be done. The team consisted of scholars in human geography, the history of science, technology and environment, archaeology, ethnology, and social anthropology. We worked in four different mining settlements – Longyearbyen (provincial capital and seat of the Norwegian administration of Svalbard), Sveagruvan (Norwegian mining settlement), Barentsburg and Pyramiden (Russian mining settlements). Each participant had unique methodological skills to bring to the effort, but working as a team with a large body of data to collect, in four different locations, required us to leave our "comfort zones" and to help each other out. In this manner, we conducted interviews with representatives of mining and logistics companies, engineering consultancies, workers' organizations, tourism firms, state and municipal authorities, museums and representatives of scientific communities in Svalbard. We also documented built environments pertaining to the socio-technical system of mining in the four settlements. Systematic photographic documentation and text descriptions were undertaken. At several sites we combined these methods in the form of "walk and talk" interviews.

The actors we talked to had different visions and ambitions about the future of Svalbard, but a shared common understanding that coal mining belonged to the past and the future was associated with the tourism industry, education and scientific

research. Almost all actors we talked to considered the legacies of past extraction as something valuable and useful when building this future. Tourism entrepreneurs argued that housing and service buildings from mining could be reused as hostels, shops and storage facilities. Our documentation of the built environments from mining era showed that this is already happening. Tourism has grown into a substantial business in the former mining town of Longyearbyen, profiting from the proximity of an airport with daily connections to Norway. Several actors argued that the same is possible in addressing de-industrializing elsewhere at Svalbard. Framed as industrial heritage in remote locations with more direct access to the Arctic wilderness, settlements like Barentsburg and Pyramiden are already attracting a growing number of tourists – the latter as a "frozen moment of time" from the former Soviet Union. This narrative seems to work. The owner, Trust Arktikugol, has claimed they are making almost as much money from tourists as they do from coal (Fig. 16.3).

Our surveys also showed that there are many examples of built environments originally designed for resource exploitation, that today are used to house scientists and laboratories. The same is true also for education. Since the Norwegian state established The University Centre in Svalbard (UNIS) in Longyearbyen in 1993, education has changed the balance of its outputs from coal to academic scholars and professionals. It has also changed the social composition of Longyearbyens population and the usage of its built environment. Former mine workers barracks nowadays house students. The Norwegian government is promoting this change. Opinions

Fig. 16.3 The former mining town Pyramiden – a coal mining settlements from (1910) 1946–1998, today the subject of heritagization and re-economization as a visitor site for tourists. (Photo: Dag Avango)

diverge, however, as to whether science and education is enough to sustain permanent settlements that contain costly infrastructures for energy production, heating, water management and transport. The former mining community of Ny Ålesund, today a platform for research in the natural sciences, is often mentioned as a successful example (Paglia 2019). The idea of doing something similar focused on geo-science at the closed mining settlement of Sveagruvan has not resulted in the same enthusiasm (Avango et al. forthcoming). Critical voices ask how many Ny Ålesunds there can be on Svalbard? Two? Three?

Despite these examples of enthusiastic re-economization of built environments of the mining settlements at Svalbard, our research also showed that not all legacies of mining are reused. The landscapes surrounding the former mining settlements are dotted with remains of transport infrastructures, waste rock piles, and industrial buildings, which no one is using for anything. It could seem awkward to ascribe values to such remains in an archipelago that the Norwegian government describes as a "well-preserved wilderness". Nevertheless, many of these remains are protected by Norwegian heritage laws and most actors we talked to hope that they will be preserved because they value them as representations of what they believe makes Svalbard unique as an industrial outpost in the high Arctic. A common argument heard was that Longyearbyen and Svalbard should not become just like any other place in Norway. Svalbard should be a different place, because that's why we like to live and work here and that's why tourists come here.

The results from the REXSAC fieldwork campaigns in Svalbard both adds to and confirms results from previous research we have conducted within the polar regions. It indicates that successful re-economization of abandoned built environments rests on two related conditions. One is the presence of actors who see benefits in repurposing them for new economic activities. The other one is the will and possibility to ascribe heritage values to them. At Svalbard, the Norwegian environmental laws, which stipulates that any material remains older than 1946 are protected as cultural heritage, creates favorable conditions for ascribing heritage values to mining legacies. Thus, with committed actors and an amenable institutional framework, mining legacies can generate new incomes, both directly through re-purposing and more indirectly through heritagization that both contributes to place- and destination making conditions for tourism.

At Svalbard, heritage making has also other important dimensions. Since the signing and ratification of the Treaty concerning Spitsbergen (often called the Svalbard Treaty) in 1920 and 1925, Norway has developed a policy of exercising sovereignty by maintaining Norwegian settlements on the archipelago. For most of the twentieth century, the Norwegian used the coal mining industry as the economic base for this policy. From the 1980s, Norway gradually opened up its main settlement on Svalbard, Longyearbyen, also for other economic activities such as tourism and from the 1990s education. With the de-industrialization that started in earnest in 2015, Norwegian governments have stepped up its efforts to promote tourism, education and science development in order to create a new economic basis for maintaining the settlements and exercising sovereignty. The re-economization and heritagization of former coal mining settlements works in favor of this policy.

16.5 Heritage Making

REXSAC scholars have drawn important insights about post-industrial processes of change in former mining settlements from our research at Nautanen and at the former coal mining settlements in Svalbard. In both cases – with very different results – actors have attempted to ascribe new values to mining legacies by defining them as cultural heritage. In public debates about sustainable development in the Arctic, cultural heritage is often connected with positive values – preservation as opposed to destruction, remembrance and recognition as opposed to amnesia and ignorance. Cultural heritage sites were, and often still are, considered as places representing universal human values rather than individual interests. For REXSAC, working towards the objective of contributing to Arctic sustainability, it has been imperative to approach the concept of heritage in a critical way. This necessitates exploring not only how but also why historical remains are transformed into cultural heritage. Therefore, from the outset, we took inspiration from the field of critical heritage studies (Harrison 2013; Walsh 1992; Lowenthal 2015). We considered cultural heritage as something constructed and fluid, in constant transformation due to socio-cultural as well as natural processes. These made and re-made our cultural heritage through a wide range of interacting human and non-human agents. To answer the question of why some remains from past extractive industries have been constructed as cultural heritage, we used concepts developed by heritage scholar Rodney Harrison (2013). He drew a distinction between "official" and "un-official" heritagization. The former are processes in which state authorities designate remains as heritage, guided by expert advice, and then act to protect them under law. The latter involve processes where non-state actors, for example local historical societies, ascribe heritage values to sites and maintain them by other means. To these two categories, we added the concept of corporate heritagization, where commercial companies play a leading role in the heritagization process. Our rationale for doing so grows out of the fact that companies often play a leading role in designating and preserving cultural heritage in the Arctic. This is particularly the case for tourism firms but also companies in the extractive industries. Through their social networks, financial resources and often influential positions locally as job providers, such actors have the means of making heritage and defining history that local historical societies seldom have.

In the Nordic Arctic, official heritagization of mining legacies has, first and foremost, occurred in northernmost Sweden and Norway, and in Svalbard. In the latter case, many of the systems and built environments formerly used for mining are now protected as heritage based on their age. There are also noteworthy cases where the Governor of Svalbard has designated mining remains that are younger than 1946 as heritage sites. In northernmost Sweden, the Swedish National Heritage Board has designated parts of the large systems of mining there as national interests of cultural heritage – including components that are still in active use. Just like in Svalbard, this official heritage making has been part of Swedish national policies to diversify the economy, with cultural heritage serving as a resource for place making and heritage

tourism. However, the state and municipalities have also seen heritage making as a way to build a sense of belonging and thereby a new quality of life for local communities (Avango and Roberts 2017b).

We have also investigated examples of unofficial heritage making pertaining to extraction sites in the Arctic. An example from Sweden is the Porjus hydro-power station. Here, the state hydropower company, Vattenfall, saved the facility because of an initiative by a local historical society for whom the old power station was, at least partly, a monument to Swedish working-class history. As Anna Elmén Berg has shown, it was also about preserving local identity and pride in a settlement where most jobs in hydropower sector has disappeared (Elmén Berg 2007). There are more examples of this type of effort, but it is noteworthy that unofficial heritage making at industrial sites in the North is far less common than in the southern parts of Fennoscandia. The reason remains to be explained, but there is no doubt that such mega-projects are challenging to transform into working life museums, because of their sheer size or their locations far from main roads and population centers. Another reason for their difficulty in establishment pertains to the contested nature of their histories and their impacts on the land uses and lifestyles of local and indigenous people.

REXSACs research has also provided new insights regarding the role of industrial companies as drivers of heritagization in the Nordic Arctic. In some cases, they have played an important role, benefiting local communities in transition. One example is Svalbard, where the Norwegian mining company Store Norske Spitsbergen Kull Co (SNSK), has invested heavily in preserving parts of its former production systems and buildings as heritage sites, offering visitors experiences of mine work and narrating their history in guided tours. Other cases contain more tensions. The mining company LKAB, which operates the iron ore mines at Kiruna, Svappavaara and Malmberget in northernmost Sweden, has made considerable efforts to protect its own historic buildings in Kiruna and Malmberget for posterity. This has been done as a part of their project to relocate these settlements because of their ongoing mining operations. The company has also invested in the writing of its history, producing books and pamphlets, often in connection with anniversaries. In addition, LKAB has produced museum exhibitions for its own museum in Malmberget and their immensely popular visitor centre inside of their mine in Kiruna. Not surprisingly, these heritage sites, publications and exhibitions tend to celebrate the histories of the company and the built environments it created. However, the perspective is solely that of the storyteller, the company. Other voices and possible narratives are largely absent.

The field-based learning we developed for the REXSAC PhD student school and the field-based workshops for current researchers, has enabled us to discover more dimensions of corporate heritage making than we anticipated when we started our research. From Kittilä and Kolari in Finland, to western Greenland, to Finnmarken in Norway, to Svalbard and Norrbotten in Sweden, we became increasingly aware of the ways in which mining companies enroll and mobilize legacies of the former mines in an effort to influence public opinion and decision-makers in governing bodies of states with regard to new mining projects.

Companies use mining legacies in three types of narratives in which they connect the past and the present in ways meant to work in their favor. The first of these are narratives about local identity, where companies make remains of former mines into anchor points for the argument that the settlements where they want to start new mines are, in fact, are old mining communities. Against this background, new mining projects are made to represent continuity, a re-vitalization of old traditions, new building blocks placed on foundations constructed by generations before. The second type of narrative is one that suggests that the proposed site is no longer pristine. It has already been transformed by mining in the past and therefore should not be assessed in the same way as a location where no mining has taken place in the past. In this type of narrative, companies use historic mines to advance an argument that re-opening a former mine is better than impacting un-impacted environment elsewhere. In some cases, mining companies will connect this line of argument to a third type of narrative, in which new mining projects may be seen to undo harm to the environment that took place in the past. A recent case example of this use of narrative can be seen that of a new proposed mine at Nautanen described above.

There are cases where actors with diametrically different opinions about new extraction projects in the Arctic are using the same historic mining sites to advance widely differing narratives of what these sites represents in the present and future. An example of this, that REXSAC scholars are now researching, is the abandoned mining town of Laver in Norrbotten, northern Sweden. In 1936, the Boliden mining company built a mine there to extract copper. This mining settlement had some 350 inhabitants. Boliden was designed it to have comparably generous living conditions for its inhabitants – spacious houses and flats, electrified kitchens, hot and cold running water, water closets and central heating. The community had its own school, grocery shops, communal hall and a cinema.

Despite these investments, Boliden decided to close Laver 10 years later and empty it of its inhabitants. The company proceeded to pull down or move the existing houses to new locations. In the forest, the company left house foundations, the imprints of streets, the mine and its above ground production system and waste management facilities, including a substantial tailing pond encompassing the toxic wastes from a decade of copper ore concentration (Alerby 1994; Lundqvist and Boliden mineral 2016: 63–69).

Today Boliden wants to open a new mine at Laver. It would be an open pit copper mine which together with its tailing dam and waste rock piles is meant to cover some 46 km^2. The inhabitants of Älsbyn municipality, where Laver is located, have divergent opinions about the project. The mining company, together with politicians and locals in favor of the new mine, argue that it will bring employment and economic spin-offs. Those who are opposed to it argue that it will have massive impacts on the environment, pose serious environmental risks for centuries to come and will destroy indigenous reindeer herding.

To support their vision of the future, Boliden and its supporters offer a narrative history where the new mining project is simply a continuation of the old one. The new mine will re-awaken the mining identity of Laver and provide recognition of the efforts of those who started it all back in the 1930s and 1940s. The opponents

provide an alternative historical narrative of Laver. They highlight the collapse of its tailing dam in 1952 and the subsequent pollution of land and water downstream. Both sides anchor their narratives in the site of old Laver. Both bringing visitors there for guided tours. For those in favor of the new mine, the site provides the remains of a celebrated settlement. For those opposed, the site offers a view of a toxified landscape impacted by the old tailing pond.

The cases mentioned above demonstrate how the material legacies of the Arctic can mean different things to different actors. They also suggest that actors frame and use their histories in relation to their experiences, their visions of the future, and their interests. This multiplicity of perceptions of the past is seldom represented at mining heritage sites, however, and only rarely in popular publications. This will be a challenge for those who believe that heritage making can contribute to responsible and sustainable post-extraction futures in the Arctic. How can we make mining legacies as heritage interesting and useful to a wider range of actors?

16.6 Conclusions

Through our multi- and transdisciplinary approach, REXSAC took important steps towards an understanding of if, how and under what circumstances legacies from past extractive industries can contribute to sustainable and responsible futures in the Arctic. To begin with, it is clear that the majority of former mines in the Arctic are, and will most likely continue to be, abandoned places where no new detectable values are created, but where significant amounts of toxic wastes are deposited in the environment. These are what environmental history scholars like Arn Keeling and John Sandlos have called "zombie mines" – abandoned mines that are dead but who continue to haunt the living through heavy metals and, in some cases, also by memories of colonial abuse (Keeling and Sandlos 2017). Cases like Nautanen, Josva and Laver also show that historic mines need to be taken into account in all environmental impact assessments of new mining projects – not as an argument in favor of carte blanche approvals of new environmental impacts, but as an important reminder of the multiple pressure arising from resource extraction undertakings that affect the environments and communities in Arctic regions today.

REXSACs research into post-extraction transitions also show that the legacies of mining have the potential to contribute to local livelihoods and well-being through re-economization. Some contexts seem to work in favor of this, such as when institutional frameworks provide different possibilities to deal with remains of mining after closure, encourage local influence over such processes, allow for manageable environmental legacies and the contributions of committed actors who envision and ascribe values to remains from the past – economic values and / or heritage values.

Some context does not work in concert with such approaches. These are locations which are extremely costly to get to and that few people even know exist. There are mining sites where all buildings have been removed or destroyed. Sometimes existing legislation offers few opportunities for post-extraction efforts.

There are also sites where toxic waste, unwanted physical barriers and difficult histories discourage actors from ascribing values to them.

Heritage making may provide an avenue for responsible post-extraction futures in the Arctic, but it is clear that it requires a careful balancing of needs and desires to heal real and perceived existing wounds to the environment and to people. This is not only an issue of environmental remediation, but equally important, an issue of how heritage makers choose to narrate historical remains and places. There is a need to include a greater multiplicity of perspectives and historical experiences of mining, including from those who never benefited from it and only received its problematic impacts. And there are all those in between these extremes, who both suffered and gained something. In this way, extraction legacies made heritage could become an arena for public debate about both the past and the future of resource extraction in the Arctic and what it takes to make it sustainable in the decades to come.

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