

**CO-PRODUCING ORES, SCIENCE AND STATES: HIGH ARCTIC MINING AT
SVALBARD (NORWAY) AND NANISIVIK (CANADA)**

by

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ABSTRACT

Though much media and academic attention has been paid to recent Arctic resource development projects such as the Mary River project on Baffin Island (Canada), the extraction of resources from circumpolar regions is not a new phenomenon. In fact enclaves in the Arctic have been industrialized (and in some cases, deindustrialized) for some time now, and these operations have been no less intertwined in historical and contemporary Arctic geopolitics. Through an analysis of historical and contemporary documents complemented by key-informant interviews, this thesis presents historical-geographical research on two case studies - Svalbard (Norway) and Nanisivik (Canada) - that provide valuable insight into the political economies of extractive activities in the Arctic. This thesis argues that the mines at Svalbard and Nanisivik were not simply economic projects intended to produce valuable ores, but were “co-productive” in the sense that they reproduced state territory and fulfilled political, geopolitical or geostrategic objectives. Furthermore, this thesis suggests that the operation of these mines was not characterised by a productive phase followed by a closure phase, but other activities such as scientific research have revalorized these mining landscapes, owing to the geographical, geostrategic and environmental importance of these Arctic sites.

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LIST OF ABBREVIATIONS

DEW - Distant Early Warning (line)

DIAND - Department of Indian Affairs and Northern Development

DFO - Department of Fisheries and Oceans

EC - Environment Canada

EMR - Energy, Minerals and Resources (Government of Canada)

GN - Government of Nunavut

HHERA - Human Health and Ecological Risk Assessment

INAC - Indian and Northern Affairs Canada

IPCC - Intergovernmental Panel on Climate Change

MLA - Member of the Legislative Assembly

MRI - Mineral Resources International Limited

NWB - Nunavut Water Board

NWT - Northwest Territories

PERD - Panel on Energy Research and Development

SSF - Svalbard Science Forum

TEAC - Training and Employment Advisory Committee at Nanisivik

UNIS - University Centre in Svalbard

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CHAPTER 1

INTRODUCTION

This thesis is about the industrial development of mining in the Arctic. At first sight, this is a curious topic. The Arctic, encompassing the northernmost limits of Canada, Russia, Alaska, Greenland, Norway, Sweden, Finland and Iceland when crudely demarcated by a dotted line at 66°N, is an area often considered peripheral to industrial development and commodity production. Though a diverse and dynamic landscape, the Arctic is more commonly envisioned “as a wilderness, a place of the unknown -- cold, mysterious, forbidding, inhabited by wild beasts, yet magnificent in its grandeur -- bereft of Western civilization” (Grant 1998, 27). Physical scientists have, historically speaking, embarked on extensive research campaigns in the Arctic, feeding northern narratives of the north as a dehumanized technospace for scientific exploration and study. Over time the Arctic has been cast as a pristine wilderness (Grant 1998; Powell 2005); used as a space of exploration and scientific discovery (Bravo and Sörlin 2002; Powell 2007; 2008b); deployed as a site of militarization and political contestation (Grant 1988; Lackenbauer and Farish 2007; Wegge 2010); and most recently, understood as a manifestation of climatic change (Johnson 2010; Launius, Fleming and DeVorkin 2010).

As the circumpolar north has grown in importance in recent years, geographers have seized the opportunity to undertake increasingly fashionable Arctic research on diverse themes such as indigeneity, storytelling and colonialism (Cameron 2011; 2012), scientific practice and Arctic exploration (Bravo and Sörlin 2002; Powell 2007; 2008b),

resource development (Johnson 2010; Keeling and Sandlos 2012) and the human dimensions of climate change (Ford and Smit 2004; Ford *et al.* 2006). Focussing on community exposure, vulnerability and adaptive capacity to climatic change, this latter field has become one of the most influential strands of research in the Arctic (social) sciences because it is perceived to be an applied field that informs policy (Smit *et al.* 2008). This research has diversified scholarship on climate change that was largely dominated by physical scientists no more than a decade ago.

Unfortunately, some of this emerging research in the Arctic social sciences is preoccupied with climate change as a force external to broader political-economic processes, including the development of mining projects in the north (Cameron 2012). Despite a lack of critical academic engagement with resource development and political economy in the Arctic, there are clear signs that this is an important issue. Recently, the circumpolar north has become the focus of much new economic activity and estimates suggesting that up to 25% of the world's untapped oil reserves are located in the Arctic (Hargreaves 2006; see also Powell 2008a) have prompted a surge of investment in high-tech resource megaprojects designed to feed global demand for resources in the future. For instance, the British newspaper *The Daily Mail* reported on Russian plans to build an Arctic city called Umka, with an artificial climate to sustain a community in close proximity to hydrocarbon resources: "Welcome to Ice City: Russia plans to build frozen community 1,000 miles from North Pole... as race for Arctic minerals heats up" (Stewart 2011, 1). Fuelling claims of a mining boom in the Canadian north (Nunatsiq News 2012; Postmedia News 2012), the Canadian newspaper *The Globe and Mail* reported on plans to

develop a mine dubbed the ‘Mary River Project’ on Baffin Island with the headline: “A sea port, a mine that will move a mountain, and a 149-kilometre railway in between: The North has never seen anything like the multibillion-dollar plan to tap Baffin Island’s rich supply of iron ore” (Waldie and Sopinski 2011, B1). Amid uncertainty about the impacts of a changing Arctic climate and heightened political anxiety over depleting global natural resources, stories of a booming Arctic economy are becoming commonplace in media narratives of industrial development in the circumpolar north.

This northward flow of industrial capital has not been driven by a profit-motive alone, but has often been motivated by various interconnected geopolitical and geostrategic imperatives. Anticipating a scramble for Arctic resources in the future, symbolic acts of territorial claim such as the planting of a Russian flag on the North Pole seafloor in 2007 demonstrate that the Arctic is increasingly considered a “zone of contestation” (Powell 2008a; Johnson 2010). In response to these developments, several scholars have written about the Arctic as both an economic resource and as a space of political contestation in books such as *After the Ice* (Anderson 2009), *The World in 2050* (Smith 2010), *The Scramble for the Arctic* (Sale and Potapov 2010), and *The Future History of the Arctic* (Emmerson 2010). This surge of attention on Arctic resource development projects has clearly captured the imaginations of the public and policy-makers alike.

Though much media focus is paid to recent geopolitical strategies that seek to secure the economic exploitation of Arctic resources into the future, the extraction of resources from circumpolar regions is not a new phenomenon. In fact enclaves in the

Arctic have been industrialized (and in some cases, deindustrialized) for some time now, and these operations have been no less intertwined with historical and contemporary Arctic geopolitics. Geographers and historians alike have examined the industrialization of the north and the proliferation of resource extractive activities there (McPherson 2003; Barnes 2005; McGhee 2005; Powell 2008a; Hacquebord and Avango 2009; Keeling and Sandlos 2009; Piper 2009; Keeling 2010; Sandlos and Keeling 2012, to name a few). Though this literature is far from a coherent body of scholarship, it often highlights the negative economic, environmental and cultural legacies of northern resource development projects. Mining developments, in particular, are conceived to provide only temporary economic prosperity and infrastructural development, while causing severe environmental destruction. The temporary and destructive nature of mineral extraction is amplified in the Arctic, where remote communities are often dependent on a single resource, where few opportunities for diversification exist, and where mineral extraction can be devastating to the Arctic environment.

At some pioneer industrial sites in the Arctic, however, mines have developed for reasons other than to produce valuable commodities. Some mines have been established not only to produce economically valuable ores but to fulfill a variety of objectives tied to the environmental, political, geostrategic or economic importance of these Arctic sites. These resource development projects are not just economic ventures driven by what eminent geographer David Harvey calls the 'capitalist logic of power' (processes of capital circulation and accumulation following a profit-motive), but are often established to fulfill political, geopolitical or geostrategic objectives, what Harvey calls the 'territorial

logic of power' (processes that (re)create configurations of place and territory across space and scale) (Harvey 2003). Furthermore, some Arctic development projects often operate for a long time, and even after closure seemingly 'post-productive' landscapes continue to perform economic functions and fulfill a variety of objectives as a result of revived mineral development, environmental reclamation activities, tourism promotion, scientific research, brownfield industrial development and even military activities. These renewed activities challenge images of devaluation and degradation after mining projects have stopped producing ores, and illuminate how 'closed' mine sites can continue to be productive. These observations raise the questions: *what functions do Arctic mines perform, and what do they produce during their operation and after their closure?* Rather than conceiving production as a linear process that fulfils economic functions alone, this thesis (re)evaluates the interlocking economic and non-economic imperatives driving mineral production, and examines the "on-going-ness" of production processes at pioneer sites in the High Arctic (cf. Lepawsky and Mather 2011).

This thesis explores these questions through a historical-geographical analysis of the mining political economy at two High Arctic case study sites – *Nanisivik* on north Baffin Island (Canada) and *Svalbard* (Norway) (Figure 1). Though these sites are located on what is popularly imagined as the geographic margins of modern capitalism at 73°N and 78°N respectively, pioneering mining ventures developed as the primary economic activity at Nanisivik and Svalbard, and purpose-built company towns were constructed with state support. Nanisivik and Svalbard are both what I term *minescapes*: sites where mining is the defining characteristic of the human landscape; where mining is the *raison d'être* for the existence of settlements at these Arctic locations; and where flows of

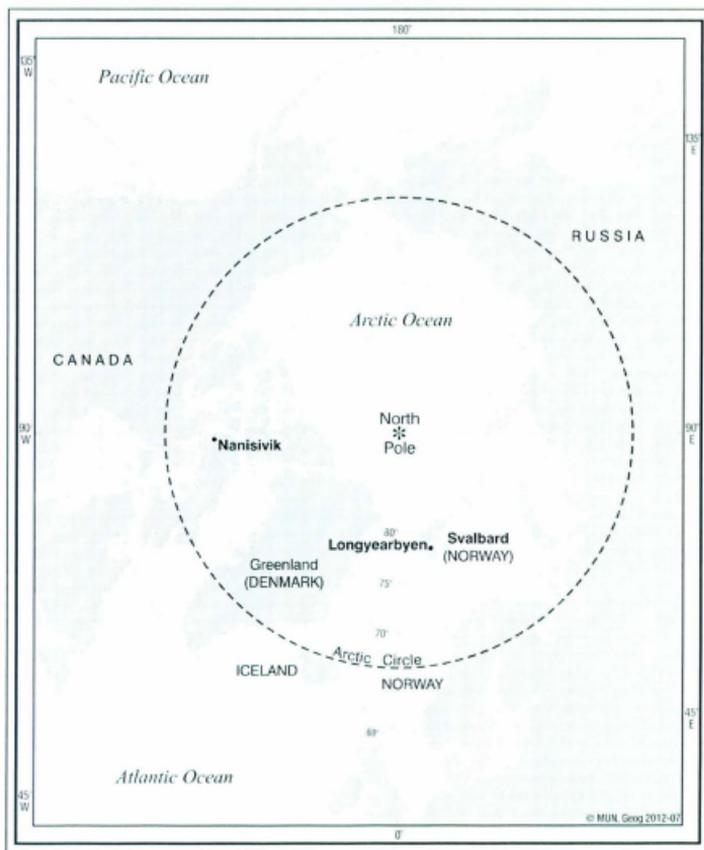


Figure 1. Map locating Nanisivik (north Baffin Island, Canada) and Svalbard (Norwegian High Arctic). Map courtesy of Charlie Conway, Memorial University.

industrial capital are imprinted into the human and physical morphology of the landscape. When they were established, the economic feasibility of establishing mines at both Nanisivik and Svalbard was questionable, and both of these High Arctic minescapes were developed with strong government support to perform national and geopolitical objectives.

Nanisivik and Svalbard have been selected as study sites in this thesis because their stories problematize the notion that mines operate on linear lifecycles determined by economic or geological variables. Both Nanisivik and Svalbard provide interesting historical-geographical examples of the way mineral production did not simply generate valuable commodities, but functioned as a means of fulfilling a variety of political objectives at these pioneering sites. Furthermore, these cases suggest how 'closed' mining sites can be revalorized or can continue to be productive as other activities have made use of these minescapes.

While visiting Svalbard, an archipelago located in the Norwegian High Arctic, for a four month period in 2009 I was intrigued by the industrial mining landscape that dominated Svalbard's main settlements and the unique history of unprofitable coal mining at this Arctic location. At the beginning of the twentieth century, early mining companies from Norway, Sweden, Russia and other nations opportunistically exploited the status of Svalbard as *terra nullius*, driven by a profit-motive. From 1920 onwards, however, only Norway and Russia continued to mine on Svalbard. During this time, the production of coal served as a geopolitical strategy in consolidating and contesting Norwegian sovereignty over the islands. Indeed most of the mining undertaken on

Svalbard has been historically unprofitable, and the need to maintain a Norwegian presence on Svalbard has taken precedence over the economic viability of mineral extraction. While over time, many mines have opened and closed, and many nations have come and gone, several Norwegian coal mines still operating on Svalbard are central to sustaining Svalbard's largest settlements and are important in fulfilling a number of geopolitical strategies. At some former mine sites, other activities have developed (such as scientific research) using mining infrastructures to maintain this landscape as a (geopolitically) productive one. Svalbard offers an interesting insight into the economics of Arctic sites where mining not only produces ores but fulfills geopolitical objectives as well.

Nanisivik, 25km from the Inuit community of Arctic Bay on north Baffin Island, is the site of an abandoned mine and town, now dismantled. Having first learned about the Nanisivik lead-zinc mine from a reading of annual government reports from the 1970s, I was enthralled by the explicit terms that cast Nanisivik as a political project. Operational between 1976 and 2002, the Nanisivik venture was supported by the Canadian government in the hope that this pioneer project would pave the way for mining across Canada's northern resource frontier. The government envisaged Nanisivik as prompting an industrial revolution in the Baffin Region, but also viewed the mine as a method of maintaining Canadian sovereignty and security in the North. In particular, this venture provided an opportunity to develop Canadian shipping in the Arctic, and through rigorous scientific study become a working model of technological innovation and engineering triumph. The Nanisivik townsite was purpose-built for mining, and destroyed after mining finished. After the mine's closure, a variety of technical and scientific

consulting companies were hired to inform reclamation activities. Nanisivik functioned as a site of scientific experimentation that not only produced scientific knowledge, but produced valuations of the cost of reclamation. Far from simply a site of waste and degradation, Nanisivik continued to be a site of (scientific) production and valuation after its closure.

While the stories of Svalbard and Nanisivik are united by a number of similarities and both sites possess fascinating histories of High Arctic industrialization that offer surprises to the dominant modes of understanding mines and their ‘lifecycles,’ there are, of course, important geographical and historical differences between the two. Whereas the Nanisivik townsite, for instance, developed in close proximity to an indigenous community, Svalbard has never sustained an indigenous population, and mining developed at each site under different political, economic and environmental conditions. Importantly, the stories of Svalbard and Nanisivik are not linked to one and another, nor does this thesis attempt to compare or connect these two sites. Rather, narrating these stories together is important because very little detailed scholarship on Svalbard, Nanisivik or indeed, on High Arctic industrial development generally, has been undertaken in geography, history and cognate disciplines. These stories are significant because Svalbard and Nanisivik provide valuable understanding into the potential impacts and legacies of new extractive activities, research that is timely given the recent surge of interest in developing the circumpolar north.

In addition to narrating these stories, this thesis makes a theoretical contribution to understanding the political economy of resource production in the Arctic. The

interlocking political-economic and geopolitical imperatives at play at Svalbard and Nanisivik raise theoretical questions regarding the function and character of historical-geographical capitalist production processes in the Arctic. Little attention has been paid to the political economy of similar Arctic projects despite the recent explosion of interest in Arctic resource development. The different stories of Svalbard and Nanisivik offer an opportunity to enrich geographical and historical understandings of mining political economies in the Arctic.

In response to these gaps in the literature, this thesis narrates the stories of mining at Svalbard and Nanisivik while deploying geographical concepts in political economy to better theorize the (geopolitical) functions Arctic resource projects fulfil, and take account of on-going production processes at these sites after closure. In the next part of this introduction, I introduce and explain these geographical concepts by reviewing existing literature on the political economy of production, before summarising the methods deployed in this thesis research.

1.1 Geographical Perspectives on the Political Economy of Mining: A Literature Review

The goal of this thesis – to reconsider the function and character of production at the Svalbard and Nanisivik High Arctic minescapes – engages with a broad selection of literature in geography on political economy. In general terms, political economy is a body of scholarship that highlights the relationship between political and economic processes in a critique of apolitical, classical and neo-classical economics (Peet and Hartwick 2009). Based on a Marxist tradition, political economy adopts a materialist

conception of history whereby social change is grounded in production (Cloke *et al.* 1991; Graham 2005). However, some scholarship in political economy and cognate fields can be highly theoretical, sometimes lacking substantive grounding. In recognising this problem, David Harvey has called for a greater focus on place and particularity in what he calls 'historical geographic materialism,' that grounds political-economic theory in concrete geographic case studies (Harvey 1984). Adopting this premise, this thesis uses empirical evidence from Nanisivik and Svalbard as the basis for informing the theoretical observations made.

Although geographers are paying a renewed interest in the political economy of resources (Bakker and Bridge 2006), very little scholarship has grounded political-economic theory in an Arctic setting. More generally, Hayter and colleagues suggest that the "resource peripheries are treated not only as peripheral places, but peripheral to disciplinary theorizing" (Hayter *et al.* 2003, 16). Mirroring popular images of geographic marginality, the Arctic has remained peripheral to geographic theorization yet, as in other resource peripheries, "there is a clash of industrial, environmental, cultural and geopolitical dimensions not found in cores, and as a result not theorized in mainstream economic geography" (Hayter *et al.* 2003, 16-19). Answering Hayter and colleagues' call for more attention to the resource peripheries, and in response to a 'revitalized' research agenda that is moving away from managerialist accounts of resource development in favour of critical theory in the field of resource geographies (Bakker and Bridge 2006), this thesis contributes toward understanding the geographies of resource production at sites in the Arctic using concepts in political economy.

This section reviews literature in political economy to situate the thesis within core debates in geography and to inform the terminology used herein. It begins by introducing foundational theoretical scholarship in geography relating to capitalist production, focusing on the ‘production of nature’ (Smith 2008) and the production of landscape in particular. By doing this, I highlight that production not only involves the generation of capitalist commodities and value, but involves the discursive and material co-production of other ‘things’ as well. This literature review then splits into two sub-sections which evaluate works specific to the topic of this thesis. The first sub-section critically interrogates literature on the politics of resource production in peripheral regions to underline how (geo)politically-motivated industrial ventures in these regions can be co-productive of capital and the state, in what I term the ‘geopolitical economy’. The second sub-section reviews literature on the after-life of mining economies to highlight how minescapes can continue to be (co-)produced and productive after their closure.

Geographers have long considered commodity production as a process under which space, nature and landscape (among other things) are entities produced in the capitalist system (Marx 1952; Harvey 1996; 2001; 2003; 2006; Smith 2006; 2008; Prudham and Heynen 2011). In *Uneven Development: Nature, Capital and the Production of Space*, geographer Neil Smith develops a theoretical framework which welds different notions of production together. In this work, Smith, like many other Marxist geographers, theorizes capitalist production as a process under which labour power is deployed to transform non-useful items into useful commodities (Smith 2008). Under this schema, produced commodities embody practical uses (use-values) that are

conditioned by the physical properties of a commodity, the material need for societies to physically reproduce, and the socially produced desire to consume (for more detail see Marx 1952; Harvey 2006; Heynen 2006; Swyngedouw 2009). The key point here is that while the use-value of a produced commodity fulfills human needs and desires, use-values are themselves culturally-produced appraisals of utility. To give an example, the work of geographer David Trigger on remote mine development in Western Australia suggests how 'utility' and 'value' are socially-produced entities:

As the manager of the large Telfer goldmine in the Pilbara put it, 'what a resource is supposed to be is something you can economically recover'; it is not the whole of the landscape which constitutes a 'resource' but rather 'an occurrence of minerals from which valuable or useful materials may be recovered'. In the context of an actual mine, other rock is defined as 'overburden' or 'waste'. This is a very different terminology from that used within environmentalist or Aboriginal discourses, wherein the notion of 'resource' might encompass living fauna or flora and sections of earthscape would not normally be conceived using the notion of 'waste' (Trigger 1997, 170).

So, production involves both the material transformation of non-useful entities into useful ones and the production of value as a socially determined category "through an amalgamation of biochemical processes, material and cultural practices, social relations, language, discursive constructions and ideological practices" (Heynen 2006, 130). Critically, however, commodities are not simply produced for their use-value, but for their exchange-value in order to realize a profit – and this profit-motive serves as both the driving force and organizing feature of modern capitalism. Accordingly, many

geographers, borrowing Marx's general formula for capital (Marx 1952), suggest that capitalist production is largely organized according to an overarching logic:¹

$$M \rightarrow C \begin{cases} LP \\ MP \end{cases} P \dots C' \rightarrow M + \Delta$$

Nature is integral to this production process, as nature is itself transformed to produce commodities and yield profits (Castree 2001; Smith 2006; 2008). As Smith asserts,

Under dictate from the accumulation process, capitalism as a mode of production must expand continuously if it is to survive. The reproduction of material life is wholly dependent on the production and reproduction of surplus value. To this end, capitalism stalks the earth in search of material resources; nature becomes a universal means of production in the sense that it not only provides the subjects, objects and instruments of production, but is also in its totality an appendage to the production process (Smith 2008, 71).

For Smith, nature is not only enrolled in capitalist production processes, but scientific and technological advances have materially produced nature anew – through optimizing crop growth, tinkering with DNA, and the like. This scientific production of nature is often

¹ In this schema of capitalist production, “M (money) is put forward to purchase C (commodities) – namely, MP (means of production; inputs, raw materials, machines) and LP (labour power) – which are combined in the productive process (P) to produce a new commodity (C’), which is then sold for the original money put forward, plus a profit (Δ)” (formula and description taken from Castree 2001, 192-193).

intrinsically tied to a capitalist logic, so that nature itself becomes an accumulation strategy (Katz 1998; Castree 2001; Byrne *et al.* 2002; Smith 2006; 2008).

Smith also asserts the 'production of nature' is more than just the material transformation of nature, but involves externalizing nature as an entity outside of society. Smith draws parallels between industrial labour processes and scientific methods to argue that both place mechanical practices between labourers and their objects of labour to improve productivity, and in doing so externalize nature. Both share the same "epistemological assumption of an external nature, objectified in theory just as it is objectified in practice in the labour process" (Smith 2008, 15). In sum then, the 'production of nature', according to Smith, involves the deep commodification and material transformation of nature organized according to intersecting scientific principles and capitalist objectives, accompanied by the discursive externalization of nature as an entity mankind can dominate and manage.

In scholarship parallel to work on the 'production of nature', some geographers have been instrumental in merging political-economic theory on production with landscape studies. Reacting to Carl Sauer's 'Morphology of the Landscape' (Sauer 1925), geographers have long emphasized that landscape is not just a physical entity, but bound with power, class and gender relations (Nash 1999; Seymore 2000), signifying systems and cultural representations (Duncan and Duncan 1988; Daniels 1989; Mitchell 1996). Other geographers conceptualize landscapes not just as spaces of representation and consumption, but as produced, material things that perform multiple functions in the production process (Mitchell 1996; 2008). For Smith, landscape refers to both its (produced) natural and anthropogenic elements, through which geographical processes of

uneven capital production and accumulation operate and manifest – a point I will explore in more detail in the last sub-section of this literature review (Smith 2008). However, Don Mitchell perhaps provides some of the most detailed insights into how landscapes are enrolled in production processes.

Deploying a historical geographic materialist methodology, Mitchell suggests that landscapes fulfill numerous material-discursive functions in capitalist production processes. Most fundamentally, Mitchell proposes that landscapes *are* work and landscapes *do* work - they do not just exist, but they are material things that are actively made and remade (Mitchell 1996; 2005; 2008). Landscape (as a totality or items in it) can be produced as a commodity: landscapes are invested in, in the hope of creating conditions for the realization (or direct production) of exchange-value (Mitchell 2008). For instance, landscapes (and nature itself) serve as the means of production for mineral-extractive industries – they are the sites from which ores are extracted in an attempt to realize value (Smith 2008). But also Mitchell posits that “one of the important use-values of the material landscape is not only that it is a site for the investment of circulating capital, but that it is also the means – the very physical conditions – for the circulation of capital” (Mitchell 2008, 35). This is an important point which emphasizes that landscapes are not simply recipients of capital, but landscapes are also generative of the very conditions of the capital process. Because landscapes are produced and productive, they are embedded in, and constituted by the everyday social relations of production, ranging from daily work routines and living conditions to major economic restructuring. As Mitchell explains:

Landscape both establishes the geography of production and works to naturalize that geography, to make it seem inevitable that those who build the landscape are not the same as those who own the landscape. This is a crucial move, because landscapes are necessarily not only the site of production (work) but also reproduction (leisure, rest, entertainment and the attendance of bodily needs) (Mitchell 2005, 1).

Here, Mitchell is trying to move away from the idea that there is some pre-existing landscape 'out there' that acts as the medium or container for capitalist (and other) relations, but instead contends that the landscape is produced and reproduced by those relations. But landscapes are also something more than a projection or representation of those practices, since landscapes are intertwined in material processes and have a material form. Landscapes are thus not only suggestive of, but are constituted by geographical processes of capital production (and reproduction), circulation and accumulation.

The key notion that can be gleaned from literature on the production of commodities, nature, and landscape, is that production is not just a linear process that transforms non-useful objects into useful ones. Instead production involves producing the material-discursive conditions for future rounds of production (including the means of production and a labour force), the commodification and transformation of nature, and the material-discursive production of landscapes (to name just a few dimensions of production). However, although Smith's 'production of nature' thesis has gained substantial currency in the last twenty-five years, some geographers have suggested that ideas relating to the production of nature are productivist in emphasizing capitalist processes at the expense of non-economic or non-capitalist relations in which production

is embedded² (Castree 2001; 2003; for a critique see also Swyngedouw 1999; Bakker and Bridge 2006). Arguing that Smith's 'production of nature' thesis relies on a dualist ontology of nature and society, several geographers have modified this work by conceptualizing production as a "process of perpetual metabolism in which social and natural processes combine in a historical-geographical production process of socionature" (Swyngedouw 1999, 448). This school of thought posits that both society and nature are enrolled in production processes in such interconnected ways that socionatural hybrid "things" are inevitably produced (Latour 1999; Swyngedouw 1999; Bakker and Bridge 2006; Swyngedouw 2009; White and Wilbert 2009).

Drawing from these ideas, scholars working within the 'revitalized' field of resource geographies suggest that resources have a hybrid quality – part natural, part social – because resources are natural things whose use is culturally-produced within particular socio-technical arrangements and historical-geographical circumstances (Bakker and Bridge 2006; Bridge 2009). As Gavin Bridge explains, "what qualifies as a resource can vary over time and space, because it is technology and culture (in its widest sense) that confer utility and value onto materials" (Bridge 2009, 1220). Historian Liza Piper captures the complexity of socionatural production processes using mining activity as an example (Piper 2007). On the one hand, Piper suggests that the bodies of miners are enrolled (as labourers) in a metabolic transformation of nature. On the other hand, Piper proposes that the mine can itself be understood as a body dependent on a variety of

² A related criticism is that this scholarship can, at times, be economically deterministic by reducing production processes and valuations to economic categories. Though monetary valuations appear arbitrary, choosing what is to be valued and how it is valued is an inherently political process (Alexander 2005), and 'value' embodies multiple (contested) meanings beyond the economic realm (Graeber 2005).

socionatural assemblages that circulate flows of air, water and energy to make these mining spaces habitable for miners. Piper explains how surface mills, for instance, physically digest ores extracted by mining men as part of this metabolic process. The key message of this literature is that the production of ores depends on a variety of social, technical, and natural (hybrid) assemblages and metabolic processes (Piper 2007; see also Walker 2010). However, by deploying biological metaphors – of capital reproduction, circulation, competition and survival – there is a risk that this work naturalizes productive processes (Barnes and Duncan 1992; Harvey 1996; Swyngedouw 2009).

In recognition of this critique, this thesis borrows from Sheila Jasanoff's idiom of 'co-production' in science and technology studies to describe how production not only generates capitalist commodities and value, but is a hybrid process involving the co-production of various intertwining economic and non-economic products, logics and relations. Jasanoff deploys the idiom of co-production to explain problems of knowledge-making and argues that co-production is foundational to state-making (Jasanoff 2006). In particular, Jasanoff uses co-production to describe the inseparability between knowledge of the world and the way we live in it, suggesting that "science and society, in a word, are co-produced, each underwriting the other's existence" (Jasanoff 2006, 17). Though co-production in this sense does not relate to political economy, Jasanoff makes clear that co-production is not a law-like theory or a rigid methodological template, but rather a fluid way of interpreting complex phenomena – an "idiom" that captures the inseparability between production processes (whether production involves generating scientific knowledge or economic commodities) and the politics of producing things.

Thus, the aim of Jasanoff's work is to make the "idiom of co-production more tractable so as to encourage conversation with other approaches to political and social inquiry" (Jasanoff 2006, 37).

To illustrate the fluidity of the idiom of co-production, Jasanoff cites the work of James Scott as an example of scholarship relating to the co-production of social and natural order. In *Seeing Like a State*, Scott highlights how some state authorities have eliminated geographically bound and historically specific local measurement systems, rendered illegible by central powers, in favour of standardized measurements (Scott 1998). Using scientific forestry in Germany as an example, Scott explains how geometric concepts were used by forest scientists to carefully plan forests into a grid system, comprising of straight rows of a single species with the underbush cleared. These forests could be organized, manipulated and counted using standardized measurements that allowed the yield of these commodities to be calculated. This, and other examples used by Scott underline how efforts to universalize and standardize measurements have been driven by a synonymous set of scientific, commercial and bureaucratic logics that simplify and order nature into legible units and make territories easier to control from the centre. Scott's insights resonate with the idea that co-production involves the mutual constitution of the social and natural, and these ideas are also important in underlining the ways in which realms such as 'state', 'capitalism', 'economy' and 'politics' are not separate domains but co-produced entities (Jasanoff 2006, see also Mitchell 2008).

In this thesis, I mobilize the idiom of co-production in two ways: first, to describe the co-production of capital and the state, and to capture the interlocking (geo)political

and economic functions of Arctic mineral production in what I call the ‘geopolitical economy’; and second, to describe the co-production of science and the state to illustrate the on-going-ness of productive functions at closed mining spaces where the (scientific) production of knowledge has revalorized these minespaces. Though I incorporate a political economy perspective into this idiom, I attempt to broaden ‘production’ beyond an economic concept, like Jasanoff, by considering production as a process mutually-constitutive of capital, science, states and the like. The following two sub-sections of this literature review attempt to highlight alternate ways of theorizing (co-)production with specific reference to the two key arguments made in this thesis.

The Politics of Production in the Resource Peripheries

As one of its key objectives, this thesis questions how the production of minerals from the Svalbard and Nanisivik High Arctic minespaces fulfilled a variety of (geo)political objectives. Mining at Svalbard and Nanisivik was not merely incidental to the location of ores there, nor were these ventures simply established in response to market demand following the logic of capital, but mining intentionally fulfilled a geopolitical logic. The suggestion that mineral production at these two sites was influenced by geopolitical motives raises questions about what production *is* and what production *does*; clearly, production processes are not just organized around economic profitability alone. Through a synthesis of key literature that highlights the politics of production in resource peripheries, this sub-section suggests that one way to theorize geopolitically-motivated mining ventures is as projects co-productive of capital and the state, in what I call the ‘geopolitical economy’.

Some interesting scholarship in resource geography has examined how peripheral landscapes are materially-discursively produced and productive. This scholarship often deals with questions surrounding why and how peripheral landscapes, far from centres of capital, become sites of commodity production by emphasizing the political geographies of production processes. Though many 'natural resources', including minerals, are randomly distributed across the Earth's surface according to a 'geo-logic,' and human populations settle according to a social logic (Bunker 1989; Freudenburg 1992), some of this scholarship traces how cultural discourses and government policies can produce conditions under which peripheral zones become foci of resource extraction. In line with literatures in resource geography that emphasize how 'resources' are not natural entities whose "location and availability are fixed and given," but rather "cultural appraisals about utility and value" (Bridge 2009, 1219), geographers Gavin Bridge and David Trigger have each argued that peripheral regions are often discursively constructed as spaces amenable to resource extraction. Specifically, these regions may be discursively cast as empty ahistorical and ageographical spaces open for extraction, in which "resource endowment is understood as a gift from nature without reference to its social production" (Bridge 2001, 2154; see also Trigger 1997). Often accompanied by neoliberal policy, these discursive constructions act as pre-conditions to the development of resource extractive projects in peripheral regions. In this sense, theorizing resource production *in* peripheral regions is as much about theorizing the material-discursive production *of* peripheral regions (and landscapes) as a resource. Though this literature is useful in underlining the politics of resource production in peripheral regions, at times

this argument fails to recognize that such discursive constructions predate the nominally neoliberal period.

David Harvey offers a slightly different analysis of resource extraction in peripheral (and non-capitalist) regions through highlighting the state's role in capitalist production processes, during and beyond the neoliberal period. In *The New Imperialism*, Harvey uses the term 'accumulation by dispossession' to describe how new capitalist development (following a capitalist logic of power), often accompanied by strong backing of state power (following a territorial logic of power), can dispossess local people of their resource base and wealth³ (Harvey 2003). State powers may financially and politically support capital's breakthrough into new profitable terrains through, for instance, the provision of infrastructural investments and favourable legal regimes, and are thus important in "keeping the territorial and capitalist logics of power always intertwined though not necessarily concordant" (Harvey 2003, 27). Because the expansion of capitalism (and expansion of the state) often exploits local labour power, raw materials and low land costs, accumulation by dispossession necessarily involves the commodification of labour, privatization of land or resources, suppression of rights to the commons and suppression of non-capitalist forms of production and consumption. Consequently, local communities are often dispossessed from their land, resources and livelihoods. Accumulation by dispossession is not merely a historical event like Marx's notion of primitive accumulation, but rather a theoretical insight into the on-going

³ In *The New Imperialism* Harvey does not discuss resource peripheries *per se*, but instead focuses on the 'accumulation by dispossession' of non-capitalist lands and resources. Because mining is regularly cast as a frontier activity that civilizes and domesticates underdeveloped landscapes (Trigger 1997), mining in peripheral regions is an example particularly amenable to this framework (for more detail see Gordon and Webber 2008; Holden, Nadeau and Jacobson 2011).

reproduction of capitalism that highlights the mutual (re)production and expansion of both capital and the state (Glassman 2006). As a complementary body of literature on the 'anti-politics machine' highlights, the extension of capital and "expansion of bureaucratic state power is enabled without appearing to be a political process as such," but rather cast as a technical solution to development problems on the periphery of the capitalist system (Lepawsky 2009, 267; see also Ferguson 1996). This is important for prompting us to read capitalist production not just as an economic process, but as an inherently political one (Glassman 2007).

One conceptual framework that pays attention to the politics (and geopolitics) of capitalist economies and states is the 'geopolitical economy'. As a framework that "incorporates both processes of economic and political change and the rhetorical understanding that gives a geopolitical order its appeal and acceptability" (Agnew and Corbridge 1989, 168), geopolitical-economic theory has been used occasionally by geographers (e.g. Agnew and Corbridge 1989; Corbridge and Agnew 1991; Le Billon 2004; Glassman 2011) to overcome the critique that geopolitical scholarship privileges analyses of discourses and representations of policy while often neglecting to consider how the political-economic system shapes this policy (Dodds and Sidaway 1994; Mercille 2008). In each case, the geopolitical economy is deployed in different ways. In analysing US budget deficits in the 1980s, for instance, Corbridge and Agnew propose that the geopolitical economy is an approach that pays attention to the uneven development of the world economy and the changing role of the US as an actor in global politics, to affirm the "insistently spatial foundations of capitalist production, exchange, and regulation"

(Corbridge and Agnew 1991, 18). Similarly, Jim Glassman uses the geopolitical economy as an approach to account for geopolitical conflict and struggle absent in literatures on global production networks (Glassman 2011). In contrast, the geopolitical economy is not defined as an approach in explicit terms by LeBillon, whose work on resource wars examines the connections between the geopolitics of resource competition and the political economy of resource exploitation (LeBillon 2004). Although the geopolitical economy is used in each case to bring narratives and analyses of geopolitical regulation, struggle and conflict into conversation with political-economic processes, the geopolitical economy is left largely under-theorized in these literatures.

In a parallel (yet distinct) body of scholarship, some political geographers have deployed geopolitical and geoeconomic analyses (Mercille 2008) that build more sophisticated theoretical apparatus from David Harvey's twin concepts of the territorial and capitalist logics of power, concepts originally used by Harvey to understand capitalist imperialism (Harvey 2003). On the one hand, the capitalist logic of power refers to the "molecular processes of capital accumulation in space and time," discussed earlier in this literature review, that occur "through the daily practices of production, trade, commerce, capital flows" (Harvey 2003, 26-27). On the other hand, the territorial logic of power stresses the "political, diplomatic, and military strategies invoked and used by a state... as it struggles to assert its interests and achieve its goals in the world at large" (ibid.). As James Scott reminds us, state control over a territory is constituted by a range of practices and socio-political struggles. However, Harvey's territorial logic of power is largely undeveloped, often conflating 'territory' and the 'state' – terms which are, in themselves,

considered problematic by political geographers (Paasi 2003; Jones, Jones and Woods 2004; Agnew 2009) – while side-lining issues surrounding power and sovereignty. Other commentators have noted that a lack of attention is paid to political factors (Mercille 2008), and that “this approach carries with it an in-built lack of definition about the kind of geopolitical explanation to be called on stage in understanding how the territorial logic unfolds” (Poza-Martin 2007, 553; see also Ashman and Callinicos 2006). One interesting result of this critique is that some political theorists have turned their attention to the nexus between capital and the state, favouring a reading of Harvey’s twin logics of power as interdependent on one and another. As Ashman and Callinicos explain:

Thinking of the relationship between capitalists and state managers – and, more broadly, that between capital and state – in these terms, as one of structural interdependence, avoids any danger of reducing the state to an instrument of capital, or indeed the interests of either group of actors to those of the other: both capitalists and state managers are accorded an active role as the initiators of strategies and tactics designed to promote their own distinct interests, while, at the same time, the pursuit of these initiatives brings them into partnership with each other (Ashman and Callinicos 2006, 114).

Although Harvey defines the two logics of power as distinct, and argues that both logics do not always operate out of capitalistic motivations but intertwine in complex and contradictory ways (as demonstrated through the notion of ‘accumulation by dispossession’), Ashman and Callinicos suggest more that this: while the two logics have different interests and motives, capitalists and statesmen are co-dependent on each other to achieve their objectives.

In recognizing the need to read production politically, this thesis deploys the idiom of co-production to describe how the Nanisivik and Svalbard mines formed sites at which capital and the state were co-produced, in what I call the ‘geopolitical economy’. While retaining the essence of geopolitical economy as an approach that brings geopolitical analyses in conversation with political-economic processes (Agnew and Corbridge 1989; Corbridge and Agnew 1991; Le Billon 2004; Glassman 2011), the geopolitical-economy (as I use it) has two main features. First, the geopolitical economy adopts a political reading of production processes by incorporating Harvey’s twin concepts of the territorial and capitalist logics of power. The interdependence between these two logics of power is central to explaining the state’s role in facilitating capitalist accumulation, while illustrating how these capitalist ventures themselves (re)produced state territory (Ashman and Callinicos 2006). As mining on Svalbard and Nanisivik illustrate, commercial and political interests in Arctic mining are closely tied, and the production of minerals embodies both economic and non-economic (i.e. geopolitical) utility and value. The co-production and entanglement of economic and non-economic value makes the very concepts of value and production ambiguous. In recognising that territorial and capitalist logics of power are blurred, the geopolitical economy adopts a more fluid approach that understands capitalist and territorial logics, and economic and non-economic value, as intertwined and co-produced. Second, it involves highlighting the geographic particularities of political-economic principles. Drawing from Harvey’s historical geographic materialism, this analysis attempts to ground often abstract and universalistic theory by “integrat[ing] *geographical* sensitivities into general social theories emanating from the historical materialist tradition” (*emphasis added*, Harvey

1984, 10). In sum, the geopolitical economy offers a theoretical terrain in which the political imperatives and geographic particularities of production can be woven together, and mobilizes the idiom of co-production to theorize how commodity production at locations in the resource peripheries can involve the co-production of capital and the state.

The Unstable Political Economies of Resource Production

Another key objective of this thesis is to investigate the ‘on-going-ness’ of production at Svalbard and Nanisivik. Many geographers view capitalist production as inherently contradictory, and mineral production is frequently cited as an example of capital’s instability and ephemerality. These characteristics of resource extractive industries are particularly pronounced in geographically peripheral regions (Bradbury 1979), including (and especially) the Arctic where mining and hydrocarbon booms are reported to drive regional economic growth (Postmedia news 2012). This sub-section reviews literature on the political economy of mineral production. Acknowledging that these literatures often conceive production (and especially mineral production) as a linear process that will inevitably lead to closure as a result of capitalism’s contradictory nature, this sub-section suggests an alternate way of viewing (co-)production as an *on-going* process.

Much geographic literature asserts that capitalist production is fraught with internal contradictions that frequently erupt as crises which often manifest in the

landscape (for more detail see Harvey 2001; Smith 2008). For Smith, uneven development is the essence of contradiction:

The logic of uneven development derives specifically from the opposed tendencies, inherent in capital, toward the differentiation but simultaneous equalization of the levels and conditions of production. Capital is continually invested in the built environment in order to produce surplus value and expand the basis of capital itself. But equally, capital is continually withdrawn from the built environment so that it can move elsewhere and take advantage of higher profit rates (Smith 2008, 6).

So, on the one hand, capital production promotes *differentiation* through the geographic and social division of labour (Smith 2008). On the other hand, capital circulation *equalizes* the geographic distribution of capital. As capital jumps across space in a systematic way, contradiction and crisis is often manifest in the landscape. As David Harvey writes, “a perpetual struggle ensues in which physical landscapes appropriate to capitalism’s requirements are produced at a particular moment in time only to be disrupted and destroyed... at a subsequent point in time” (Harvey 1985, 44). In the case of mining, the geographic rigidity of mineral deposits and physical mining infrastructures are in constant tension with the hypermobility of capital which continually switches to more profitable terrains. The production of dead landscapes - through which capital no longer circulates and which no longer embody value - appears unavoidable in the capitalist system (Edensor 2005).

Much scholarship in geography and history has highlighted the economically unstable character of resource extractive industries (Randall and Ironside 1996; Barnes *et al.* 2001; Barnes 2005; Bakker and Bridge 2006; Bridge 2009) and mining is often cited

as an economic activity that typifies the contradictory nature of capitalism (Aschmann 1970; Bradbury 1979; Cronon 1992; Bridge 2000; 2004; Whitmore 2006; Bebbington *et al.* 2008; LeCain 2009; Richards 2009; Worall *et al.* 2009). Gavin Bridge's excellent work describes the inherent instability of mining economies in terms of 'ecological contradictions' which arise from the commodity production process⁴ (Bridge 2000). Reflecting the inherently contradictory and instable character of mineral production, some scholarship has theorized mining activities as occupying a linear boom-bust lifecycle, whereby valuable ores are extracted during the operational phase of a mine's lifetime, leaving only economically exhausted and environmentally degraded landscapes (Davis 2009). Though an outdated schema in much social science and humanities research, it is an important one that continues to be used by mine companies, economists and governments (see Richards 2009). Scholarship in economics (Black *et al.* 2005) and sociology (Brown *et al.* 2005) has attempted to quantify this boom-bust lifecycle, but economic geographer Homer Aschmann perhaps provides the most complete account of a mine's lifecycle:⁵

1. In the first phase of Aschmann's model, capital is invested in prospecting activities.
2. In the second phase, "someone has decided that the discovery represents a mine with profitable prospects" (Aschmann 1970, 175). The feasibility of mineral extraction is classically connected to economic valuations of the price of a

⁴ An example of one such contradiction is that "mining firms preferentially select the highest grade ('richest') ore bodies that can be processed profitably using current technology. Yet depletion of high grade ores over time means that, without innovation to reduce costs, production costs will rise" (Bridge 2000, 246).

⁵ Hacquebord and Avango (2009) apply a similar model to summarise the historical development of mining settlements on Svalbard. See Chapter 2 for more detail.

particular resource, ore grade (resource quality), reserves (ore quantity), and the cost of extraction. These factors determine whether minerals are considered economic and therefore exploitable for profit. If feasible, mining infrastructures are installed and ores begin to be extracted.

3. In the third phase the mining operation stabilizes, but experiences a declining rate of profitability (in the absence of new reserves) due to falling ore grades and rising production costs (particularly labour costs).
4. And in the final phase, mining ceases to be profitable as ores become depleted, as operating costs become too high or as the market price of the mined material becomes too low.

When capital is withdrawn from these sites, ruination is often produced. For Tim Edensor, “the production of spaces of ruination and dereliction are an inevitable result of capitalist development and the relentless search for profit” (Edensor 2005, 4). Explored by environmental historians (Cronon 1992), cultural geographers (DeLyser 1999), among others (see also Bradbury 1984), ghost towns have become a symbol of capital’s transience. This schema is, however, problematic. It reduces mine development to a linear lifespan, with a distinct start and end determined by economic laws and geological factors that position money as the sole measure and representation of value. This literature implies that once the profitable extraction of ore has ceased, mines no longer have a use-value and no longer produce surplus value; closure and ruination appear a completely natural outcome of capitalist development.

Rather than understanding these boom-bust dynamics in terms of a mine’s lifecycle, some geographers have described resource development in peripheral regions as

'cyclonic' to capture the intensity of capital accumulation and cyclical nature of development (Barnes 2005; Keeling 2010). Subjected to flows of capital, technologies, labour and the like, peripheral spaces are often subjected to a whirlwind of cyclonic industrial development that radically remakes a region's "physical and human landscapes, overturning traditional land uses and social arrangements and erecting entirely new forms in their place" (Keeling 2010, 229). Geographer Trevor Barnes uses this cyclonic wind metaphor to conjure dramatic imagery of the ephemerality of resource extractive industries:

Blowing across the economic landscape, global-cyclonic winds touch down at a few sites - single industry towns - to create in a burst of frenetic energy the infrastructure and wherewithal of resource production. But as implied by the central metaphor, stability is always precarious and temporary (Barnes 2005, 111).

The cyclonic nature of resource extractive industries is often particularly pronounced in peripheral regions where resource production frequently involves intensively exploiting non-renewable resources and where there are few opportunities to develop 'linkages' that assist economic diversification (Frickel and Freudenburg 1996). As historical geographer Arn Keeling explains, "such instability renders settlement and economy on the periphery of the capitalist system inherently precarious, subject to the disruptive shocks of geographically distant technological changes, market cycles and government policies" (Keeling 2010, 230). Unlike Aschmann's 'natural history of a mine', interpretations of the cyclonic dynamics of resource development not only pay attention to the biophysical,

ecological or geological limits and characteristics of 'natural resources', but include discussion on the political economy of resource extraction as well.

However, some literature on mining has illuminated how minescapes can continue to be productive after their closure. Geographer David Robertson critiques the idea that "the end of mining usually signals an end to the historical narratives of these 'temporary' locales; and readers are left with the false impression that mining communities have rich but inconsequential futures" (Robertson 2006, 6), and instead suggests that the cultural meaning and emotional significance of mining spaces may serve as a foundation on which local identities and future activities are structured and maintained. As an example, Ben Marsh argues that amid harsh working conditions in the anthracite towns of Pennsylvania, communities with strong emotional attachments to place have developed (Marsh 1987). Though these mines have closed, many people continue to live in mining towns that are rich in cultural *meaning* and memories, although impoverished in economic *means* (Marsh 1987). Similarly, at Butte (Montana), William Wyckoff describes how the mining landscape not only produced minerals and wealth, but accumulated symbolic meaning during the mine's operation (Wyckoff 1995). Though the mining infrastructures at Butte no longer produce ores, they embody and reproduce cultural meaning that symbolise industrial prosperity. These industrial referents have become critical to the development of heritage industries at Butte, where the landscape is productive as a space in which meaning is consumed, rather than one from which industrial commodities are produced. This literature suggests that the life of a minescape is not always linear because these mining spaces can continue to be productive after their

closure, and has injected insight into the ways minescapes are culturally-produced and valued after a mine's closure.

This literature points to the idea that minescapes can be re-valued or revalorized after their closure, and that the productive functions of these landscapes can be 'on-going' in interesting and unexpected ways. This is not to downplay the contradictory or cyclonic character of mineral extractive activities (especially in the Arctic), but to highlight how closed minescapes may continue to be sites from which commodities, scientific knowledge or 'other' things are produced. As such this thesis mobilizes the idiom of co-production in a second, more conventional way, to describe the connections between mining, science, and the state after mine closure. Drawing from the idea that science is involved in productive processes (as outlined by Smith's 'production of nature' thesis), I suggest that the production of scientific knowledge at Svalbard and Nanisivik illustrates how these minescapes continue to have productive functions.

Summary of Literature Review

As stated from the outset of this thesis, both Svalbard and Nanisivik serve as examples that problematize the notion that mines generate valuable commodities, following a linear lifecycle characterized by 'productive' and 'post-productive' phases. Both sites also raise more fundamental questions concerning what production *is* and what production *does*. By means of summary, allow me to pinpoint two key ideas that are valuable to guiding the questions this thesis asks regarding the productive functions Arctic mines perform.

First, the work of many geographers illustrates that production does not simply involve the generation of valuable commodities, but involves the material-discursive production of other things, including nature, space, and landscapes. These ideas are particularly relevant at Svalbard and Nanisivik given that the decision to open and maintain mines at these locations was not solely driven by economic variables, but by geopolitical motives as well. At Svalbard mining not only (unprofitably) produced coal but (re)produced Norwegian sovereignty over the archipelago. At Nanisivik, the mine was designed to produce technological, operational and scientific products that complemented socio-economic policy objectives outlined by the state. I use the term 'co-production' to capture the economic and non-economic things produced by these geopolitical-economic ventures – with a specific focus on the co-production of capital and the state. The suggestion that some Arctic mines are co-productive is pertinent given the (sometimes explicit) geopolitical motives that underlie decisions to exploit resources in circumpolar regions.

Second, though some geographers suggest that mineral production is often ephemeral especially in peripheral regions, the complete withdrawal of extractive economies is not always clear-cut as other activities may revalorize these landscapes. Though mining lifecycles are supposedly pronounced in peripheral regions where operating costs are high and opportunities for economic diversification are limited, both Svalbard and Nanisivik serve as examples that demonstrate the on-going-ness of production after mine closure, where scientific activities have revalorized the landscape. At Svalbard, scientific research made use of existing mining infrastructures and

strengthened the Norwegian settlements on the archipelago. At Nanisivik, scientific knowledge was produced to inform reclamation activities, and this knowledge was used to value the cost of reclamation. Both cases demonstrate how science has (re)produced, re-valued or revalorized these minescapes after mine closure. Whereas the geopolitical economy focuses on the co-production of capital and the state, I use the idiom of co-production a second time to elaborate upon the connections between science, capital and the state.

Clearly political-economic analyses should be sensitive to the geographic particularities of production (in Arctic regions), and consider how the geopolitical, economic and environmental importance of different Arctic sites influences the character and longevity of commodity production. Answering Hayter and colleagues' call for greater theorization of resource peripheries, I treat production as a geographically-particular process that involves the co-production of economically valuable commodities and non-economic things (and discourses), and this production can be on-going owing to the geopolitical, cultural or environmental importance of production at a particular site.

1.2 Methods and Methodology

This thesis uses Svalbard and Nanisivik as case studies that ground political-economic theory on production in specific, concrete situations in an attempt to fulfill Harvey's call for 'historical geographic materialism' (Harvey 1984). Highlighting the geographic particularities of production at these two different study sites helps to explain what functions these sites were intended to fulfill, and understand what these High Arctic minescapes (co-)produced. This thesis adopts a qualitative interpretive methodology,

using a mixed-methods approach tailored to the availability and viability of research material at each site (England 2006). In this section, I describe the methods deployed for each case study and I explain how this research material was subsequently interpreted to answer the research questions.

At Svalbard, a number of semi-structured interviews and correspondence with key informants employed in decision- and policy-making capacities in the mining and science sectors were conducted (using interview techniques described in Schoenberger 1991; Longhurst 2003; Wiles *et al.* 2005; Dunn 2010). Ethics clearance for these interviews was granted by Memorial University's Interdisciplinary Committee on Ethics in Human Research (project clearance code 2010/11-157-AR). Potential participants were approached in person or by email and provided with relevant information regarding the interviews. Before the interviews, participants were given a consent form (appendix I) to read at their leisure, and I verbally explained this consent form during the interview. The interview questions asked were tailored according to the participant's job position on Svalbard, to provide in-depth knowledge about mining on the archipelago (see appendix II for sample interview questions). Interviews were digitally recorded and transcribed. Participants were sent copies of the transcripts, and some participants provided additional information via email correspondence in instances where they felt important information was missing from the transcripts.

In addition to the interviews conducted on Svalbard, I collected government policy documents and corporate reports to investigate key themes that arose from these interviews in greater detail. These policy documents not only related to Norwegian policy

pertaining to Svalbard, but also Svalbard's science infrastructure, Norway's strategy for the High North and Norwegian Arctic research policy. These documents were largely obtained from online sources, but a number of documents were also collected during fieldwork on Svalbard. In the absence of suitable archival material written in English, I conducted a review of the historical literature on mining in Svalbard.

For Nanisivik, a rich variety of historical archival material consisting of government correspondence, annual reports and meeting transcripts was collected from Library and Archives Canada (Ottawa), the Northwest Territories Archives (Yellowknife), the Nunavut Social History Archives (Vancouver), and through the interlibrary loan service provided by Memorial University of Newfoundland. Alongside this array of historical archival documents, a collection of over 1,000 contemporary documents, including government correspondence, technical and scientific reports, newspaper clippings and public hearing transcripts regarding the closure and reclamation of Nanisivik, was also obtained online from the Nunavut Water Board public registry or acquired through inter-library loan. Given the richness and quantity of archival material available and the fact that the mine was closed and dismantled several years before my research began, I decided that undertaking key-informant interviews at Arctic Bay was unnecessary.

Most of these historical and contemporary documents have been digitized, creating a virtual repository of the archival material that can be accessed electronically at a later point in time (for a description and analysis of this 'digital history' method see Keeling and Sandlos 2011). Because thousands of pages of documents were collected and digitally stored, one drawback of this approach is that a lot of irrelevant material was

inevitably collected. However, collecting a broad swathe of documents helped to contextualize important material and often raised new research questions (see Moore 2011; Keeling and Sandlos 2011). I often pursued new themes and ideas that arose from these documents, and adjusted my research questions accordingly.

In analyzing this research material, I did not deploy any type of formal data analysis or coding framework but instead interpret each source separately, sensitive to the geographic and historic particularities of its content and production. This approach attempted to foster a more natural interpretation attuned to the themes and research questions that arise from each source, rather than imposing rigid (and often reductionist) categories upon the research material. Though this approach is not a formal method, it is one many geographers use (Stuart Aitken describes this “couch-potato geography” method in Flowerdew and Martin 1997; while Miles Ogborn describes the process of constructing arguments from documentary sources in Blunt *et al.* 2003). I noted key events, actors, ideas, and themes from each source that could be pieced together to form a narrative. This note-taking was inherent to the interpretation and analysis of these sources, and critical to informing my argument (see Ogborn 2003; Cloke *et al.* 2004). This interpretation was inevitably informed by my research questions and theoretical interests. However the theoretical concepts deployed in this thesis were not pre-determined, but rather emerged from my investigation of each of these cases. In this sense, political-economic theory on production was reworked alongside the investigation of empirical case studies, in line with a historical geographic materialist approach.

In researching and writing this thesis I recognize that “historical representation and interpretation is always a contemporary reconstruction which must be attuned to the

unevenness of the historical record and to the muted voices embedded in its constructions” (Moore 2011). Inevitably, the construction of my interpretation and analysis was shaped by a myriad of factors: the availability, accessibility and content of documentary sources; my research questions and interests; and disciplinary training. I accept and embrace my biases and acknowledge them as unavoidable.

1.3 Thesis Structure

In response to calls for a greater theoretical focus on the political economy of resource production in peripheral regions within the ‘revitalized’ field of resource geography, and a lack of literature on the geographies of Arctic mining at Svalbard and Nanisivik specifically, this thesis adopts a historical geographic materialist framework that attempts to ground political-economic theory in the unique stories of mining at Svalbard and Nanisivik. The following two chapters each present empirical research on Svalbard and Nanisivik, to highlight the geographic particularities of production and ground the concepts developed in the literature reviewed in this introduction. These chapters narrate mine development at these sites, and in doing so, investigate how the Svalbard and Nanisivik minescapes were (and continue to be) functional and productive. Through mobilizing the idiom of co-production, these two chapters suggest, in different ways, how mineral production at Svalbard and Nanisivik was related to both economic and (geo)political imperatives (what I have termed as the geopolitical economy), and both illuminate the on-going-ness of productive functions after closure as scientific activities have developed at these sites. In acknowledging that the historical-geographical stories of each site are unique, I write about Svalbard and Nanisivik in two separate substantive papers that can be read as stand-alone documents in a manuscript thesis format. This

approach is advantageous in allowing me to deal with separate bodies of contextual geographical and historical literature appropriate to each site and provide an enriched discussion tailored to each site, while still using a common approach in political economy and contributing towards a broader body of geographic literature to tie the thesis together. In the second chapter on Svalbard I use key informant semi-structured interviews and contemporary documents to evaluate how the production of coal on Svalbard has been shaped by Arctic geopolitics, and how these geopolitical objectives extend the productivity of Svalbard's minescapes. In the third chapter I use contemporary and historical archival material to investigate how the Nanisivik mine was co-productive in fulfilling economic and political functions during its operation, and how the mine became a site of production and valuation after its closure. To reiterate, this thesis does not attempt to compare the two sites, but rather pays close attention to the geographic and historic particularities of each site to provide a grounded and enriched theoretical account relating to the function of these mining spaces. Consequently each chapter is written slightly differently, as a result of the different research material available and methods deployed. In the final chapter, I conclude by elucidating the key themes and theoretical insights evident at both sites to tie the thesis together.

1.4 Co-authorship Statement

This thesis has been completed in partial fulfillment of the requirements for the degree of the Master of Arts in Geography at Memorial University of Newfoundland. This research was supported by an ArcticNet-funded grant obtained by Dr. Arn Keeling on 'Adaptation, industrial development and Arctic communities'. While I (Scott Midgley, MA candidate) and Dr. Arn Keeling (my supervisor) jointly designed the research

proposal, I was responsible for conducting fieldwork on Svalbard and collecting archival documents under the guidance of Dr. Keeling. I drafted the manuscript thesis, while Dr. Arn Keeling, Dr. Josh Lepawsky and Dr. John Sandlos provided feedback in accordance with their role as supervisory committee members.

1.5 Chapter 1 Bibliography

- Agnew, J. (2009) *Globalization and Sovereignty*. Rowman and Littlefield: Lanham.
- Agnew, J. and Corbridge, S. (1989) 'The dynamics of geopolitical disorder' in Johnston, R.J. and Taylor P.J. (eds.) *A World in Crisis? Geographical Perspectives*. Blackwell: Cambridge.
- Aitkin, S. (1997) 'Analysis of texts: armchair theory and couch-potato geography' in Flowerdew, R. and Martin, D. (eds.) *Methods in Human Geography*. Pearson: Harlow.
- Alexander, C. (2005) 'Value: economic valuations and environmental policy' in Carrier, J.(ed.) *A Handbook of Economic Anthropology*. Edward Elgar: Cheltenham.
- Anderson, A. (2009) *After the Ice: Life, Death, and Geopolitics in the New Arctic*. Harper-Collins: New York.
- Ashman, S. and Callinicos, A. (2006) Capital Accumulation and the State System: Assessing David Harvey's The New Imperialism. *Historical Materialism* 14 (4): 107-131.
- Aschmann, H. (1970) The natural history of a mine. *Economic geography* 46: 172-189.
- Bakker, K. and Bridge, G. (2006) Material Worlds? Resource geographies and the 'matter of nature'. *Progress in Human Geography* 30 (1): 5-27.
- Barnes, T. (2005) 'Borderline Communities: Canadian single industry towns, staples, and Harold Innis' in Houtum, H. V., Kramsch, O. and Zierhofer, O. (eds.) *B/ordering Space*. Ashgate Publishing: Burlington.
- Barnes, T. and Duncan, J. S. (eds.) (1992) *Writing worlds: Discourse, text & metaphor in the representation of landscape*. London: Routledge.

- Barnes, T., Hayter, R. and Hay, E. (2001) Stormy weather: cyclones, Harold Innis, and Port Alberni, BC. *Environment and Planning A* 33: 2127-2147.
- Bebbington, A., Hinojosa, L., Bebbington, D. H., Burneo, M. L. and Warnaars, X. (2008) Contention and Ambiguity: Mining and the Possibilities of Development. *Development and Change* 39: 887-914.
- Black, D., McKinnish, T. and Sanders, S. (2005) The Economic Impact of the Coal Boom and Bust. *The Economic Journal* 115: 449-476.
- Bradbury, J. H. (1984) Declining single-industry communities in Québec-Labrador, 1979-1983. *Journal of Canadian Studies* 19: 125-139.
- Bradbury, J. H. (1979) Towards an Alternative Theory of Resource-Based Town Development in Canada. *Economic Geography* 55 (2): 147-166.
- Bravo, M. and Sörlin, S. (2002) *Narrating the Arctic: A Cultural History of Nordic Scientific Practices*. Science History Publications: USA.
- Bridge, G. (2009) Material Worlds: Natural Resources, Resource Geography and the Material Economy. *Geography Compass* 3 (3): 1217-1244.
- Bridge, G. (2004) Contested Terrain: Mining and the Environment. *Annual Review of Environment and Resources* 29: 205-259.
- Bridge, G. (2001) Resource triumphalism: postindustrial narratives of primary commodity production. *Environment and Planning A* 33: 2149 - 2173.
- Bridge, G. (2000) The social regulation of resource access and environmental impact: production, nature and contradiction in the US copper industry. *Geoforum* 31 (2): 237-256.
- Brown, R., Dorius, S. and Krannich, R. (2005) The Boom-Bust Recovery Cycle: Dynamics of Change in Community Satisfaction and Social Integration at Delta, Utah. *Rural Sociology* 70 (1): 28-49.
- Bunker, S.G. (1989) Staples, links, and poles in the construction of regional development theories. *Sociological Forum* 4: 589-610.

Byrne, J., Glover, L. and Martinez, C. (2002) 'The Production of Unequal Nature' in Byrne, J., Glover, L. and Martinez, C. (eds.) *Environmental Justice: Discourses in International Political Economy*. Transaction Publishers: London.

Cameron, E. (2012) Securing indigenous politics: A critique of the vulnerability and adaptation approach to the human dimensions of climate change in the Canadian Arctic *Global Environmental Change* 22 (1): 103-114.

Cameron, E. (2011) 'Copper Stories: Imaginative Geographies and Material Orderings of the Central Canadian Arctic' in Baldwin, A., Cameron, L. and Kobayashi, A. (eds.) *Rethinking the Great White North: Race, Nature and the Historical Geographies of Whiteness in Canada*. UBC Press: Vancouver.

Castree, N. (2003) Commodifying what nature? *Progress in Human Geography* 27 (2): 273-297.

Castree, N. (2001) 'Marxism, capitalism and the production of nature' in Castree, N. and Braun, B. (eds.) *Social nature: theory, practice and politics*. Blackwell: Oxford.

Cloke, P., Cook, I., Crang, P., Goodwin, M., Painter, J. and Philo, C. (2004) *Practising Human Geography*. Sage: London.

Cloke, P., Philo, C. and Sadler, D. (1991) *Approaching Human Geography: An Introduction to Contemporary Theoretical Debates*. Guilford Press: London.

Corbridge, S. and Agnew, J. (1991) The United States Trade and Budget Deficit in Global Perspective – An Essay in Geopolitical-Economy. *Environment and Planning D: Society and Space* 9 (1): 71-90.

Cronon, W. (1992) 'Kennecott Journey: The Paths Out of Town' In Cronon, W., Miles, G. and Gitlin, J. (eds.) *Under an Open Sky: Rethinking America's Past*. W.W. Norton & Co.: New York.

Daniels S. (1989) 'Marxism, culture and the duplicity of landscape' in Peet, R. and Thrift, N. (eds.) *New Models in Geography, Volume II*. Unwin Hyman: London.

Davis, G. (2009) 'Extractive Economies, Growth, and the Poor' in Richards, J. (ed.) *Mining, Society and a Sustainable World*. Springer: London

DeLysér, D. (1999) Authenticity on the Ground: Engaging the Past in a California Ghost Town. *Annals of the Association of American Geographers* 89 (4): 602-632.

- Dodds, K. J. and Sidaway J. D. (1994) Locating critical geopolitics. *Environment and Planning D: Society and Space* 12 (5): 515 – 524.
- Duncan, J. and Duncan, N. (1988) (Re)reading the landscape. *Environment and Planning D: Society and Space* 6 (2): 117 – 126
- Dunn, K. (2010) 'Interviewing' in Hay, I. (ed.) *Qualitative Research Methods in Human Geography*. Oxford University Press: Oxford.
- Edensor, T. (2005) *Industrial ruins: Space, aesthetics and materiality*. Berg: Oxford.
- England, K. (2006) 'Producing feminist geographies: Theory, methodologies and research strategies' in Aitken, S. and Valentine, G. (eds.) *Approaches to Human Geography*. Sage: London.
- Emmerson, C. (2010). *The Future History of the Arctic*. Public Affairs: New York.
- Ferguson, J. (1994) *The Anti-Politics Machine*. Minneapolis, MN: Minnesota.
- Ford, J., Smit, B. and Wandel, J. (2006) Vulnerability to climate change in the Arctic: A case study from Arctic Bay, Nunavut. *Global Environmental Change* 16 (2): 145-160.
- Ford, J. and Smit, B. (2004) A Framework for Assessing the Vulnerability of Communities in the Canadian Arctic to Risks Associated with Climate Change. *Arctic* 57 (4): 389-400.
- Freudenberg, W. R. (1992) Addictive economies: extractive industries and vulnerable localities in a changing world economy. *Rural Sociology* 57: 305–332.
- Frickel, S. and Freudenberg, W. R. (1996) Mining the past: historical context and the changing implications of natural resource extraction. *Social Problems* 43: 444–466.
- Glassman, J. (2011) The Geo-political Economy of Global Production Networks. *Geography Compass* 5: 154–164.
- Glassman, J. (2007) Recovering from crisis: the case of Thailand's spatial fix. *Economic Geography* 83: 349–370.
- Glassman, J. (2006) Primitive accumulation, accumulation by dispossession, accumulation by 'extra-economic' means. *Progress in Human Geography* 30 (5): 608-625.
- Gordon, T. and Webber, J. (2008) Imperialism and Resistance: Canadian mining companies in Latin America. *Third World Quarterly* 29, (1).

- Grabber, D. (2005) 'Value: anthropological theories of value' in Carrier, J. (ed.) *A Handbook of Economic Anthropology*. Edward Elgar: Cheltenham.
- Graham, E. (2005) 'Philosophies underlying human geography research' in Flowerdew, R. and Martin, D (eds.) *Methods in Human Geography*. Pearson: Harlow.
- Grant, S. (1998) Arctic wilderness and other mythologies. *Journal of Canadian Studies* 32, (2): 27-42.
- Hacquebord, L. and Avango, D. (2009) Settlements in an Arctic Resource Frontier Region. *Arctic Anthropology* 46 (1-2): 25-39.
- Hargreaves, S. (2006) 'The Arctic: Oil's last frontier'. *CNN Money* [accessed January 2012 from: http://money.cnn.com/2006/09/27/news/economy/arctic_drilling/index].
- Harvey, D. (2006) *The Limits to Capital*. Verso: London.
- Harvey, D. (2003) *The New Imperialism*. Oxford University Press: Oxford.
- Harvey, D. (2001) *Spaces of Capital: Towards a Critical Geography*. Edinburgh University Press: Edinburgh.
- Harvey, D. (1996) *Justice, Nature and the Geography of Difference*. Blackwell: Cambridge.
- Harvey, D. (1985) *The Urbanization of Capital*. The John Hopkins University Press: Baltimore.
- Harvey, D. (1984) On the history and present condition of geography: an historical materialist manifesto. *Professional Geographer* 36, 1-11.
- Hayter, R., Barnes, T. and Bradshaw, M. (2003) Relocating resource peripheries to the core of economic geography's theorizing: rationale and agenda. *Area* 35 (1): 15-23.
- Heynen, N. (2006) 'Justice of eating in the city: the political ecology of urban hunger' in Heynen, N., Kaika, M. and Swyngedouw, E. (eds.) *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism*. Routledge: London
- Holden, W., Nadeau, K. and Jacobson, R. D. (2011) Exemplifying accumulation by dispossession: mining and indigenous peoples in the Philippines. *Geografiska Annaler: Series B, Human Geography*, 93: 141-161.
- Jasanoff, S. (2006) *States of knowledge: The co-production of science and social order*. Routledge: London.

- Sandlos, J. and Keeling, A. (2012) Claiming the New North: Mining and Colonialism at the Pine Point Mine, Northwest Territories, Canada. *Environment and History* 18 (1): 5-34.
- Sauer, C. [1925] (1963) 'The morphology of landscape' in Leighly, J. (ed.) *Land and Life: A Selection of the Writings of Carl Ortwin Sauer*. University of California Press: Berkeley.
- Schoenberger, E. (1991) The corporate interview as an evidentiary strategy in human geography. *The Professional Geographer* 43: 180-189.
- Scott, J. (1998) *Seeing like a state: How certain schemes to improve the human condition have failed*. Yale University Press.
- Seymour, S. (2000) 'Historical geographies of landscape' in Graham, B. and Nash, C. (eds.) *Modern Historical Geographies*. Pearson: Harlow.
- Smit, B., Hovelsrud, G. and Wandel, J. (2008) *CAVIAR (Community adaptation and vulnerability in Arctic regions): framework document for an International Polar Year consortium*. Global Environmental Change Group, University of Guelph.
- Smith, L. C. (2010) *The World in 2050: Four Forces Shaping Civilization's Northern Future*. Dutton: New York.
- Smith, N. (2008) *Uneven Development: Nature, Capital and the production of space*. University of Georgia Press: Athens and London.
- Smith, N. (2006) Nature as Accumulation Strategy. *Socialist Register* 2006: 16-36.
- Stewart, W. (2011) 'Welcome to Ice City: Russia plans to build frozen community 1,000 miles from North Pole... as race for Arctic minerals heats up' *Daily Mail Online* [accessed January 2012 from: <http://www.dailymail.co.uk/news/article-2052862/Russia-plans-build-frozen-community-1-000-miles-North-Pole.html>].
- Swyngedouw, E. (2009) 'Circulations and metabolisms: (Hybrid) natures and (cyborg) cities' in White, D. and Wilbert, C. (eds.). *Technonatures*. Wilfred Laurier University Press: Waterloo.
- Swyngedouw, E. (1999) Modernity and Hybridity: Nature, Regeneracionismo, and the Production of the Spanish Waterscape, 1890-1930. *Annals of the Association of American Geographers* 89 (3): 443-465.

- Trigger, D. S. (1997) Mining, Landscape and the Culture of Development in Australia. *Ecumene* 4 (2): 161-180.
- Waldie, P. and Sopinski, J. (2011) 'Cover Story: Arctic Promise,' *The Globe and Mail, Report on Business*. Saturday May 14th 2011.
- Walker, B. (2010) *Toxic archipelago: a history of industrial disease in Japan*. University of Washington Press: Seattle.
- White, D. and Wilbert, C. (eds.) (2009) *Technonatures: Environments, technologies, spaces, and places in the twenty-first century*. Wilfred Laurier University Press: Waterloo.
- Whitmore A. (2006) The emperors new clothes: Sustainable mining? *Journal of Cleaner Production* 14 (3-4): 309-314.
- Wiles, J. L., Rosenberg, M. W. and Kearns, R. A. (2005) Narrative analysis as a strategy for understanding interview talk in geographic research. *Area* 37: 89-99.
- Worrall, R., Neil, D., Brereton, D. and Mulligan, D. (2009) Towards a sustainability criteria and indicators framework for legacy mine land. *Journal of Cleaner Production* 17 (16): 1426-1434.
- Wyckoff, W. (1995) Postindustrial Butte. *Geographical Review* 85 (4): 478-496.

CHAPTER 2

CO-PRODUCING COAL, SCIENCE AND TERRITORY: THE GEOPOLITICAL ECONOMY OF SVALBARD'S MINESCAPES

Abstract

In 1916 the Norwegian mining company Store Norske began extracting coal from Svalbard, an archipelago located on the northern-most limits of Arctic Europe. Store Norske has largely been an unprofitable operation, and much historical and archaeological evidence suggests that early mining on Svalbard was undertaken to fulfill geopolitical objectives for Norway. In spite of its long-term unprofitability as a mining company, Store Norske continues to operate almost one century after the company was first established. This paper investigates the extent to which persisting territorial anxieties and geopolitical objectives continue to shape contemporary coal mining on Svalbard, and questions whether the recent development of scientific research activity on Svalbard supports the mining economy in fulfilling contemporary geopolitical objectives for Norway. Using key-informant interviews and various policy documents, this paper suggests that mining on Svalbard is shaped by an interlocking set of political-economic imperatives and geopolitical objectives - what I describe as a 'geopolitical economy' - because Store Norske's mines not only produce commodities and capital, but also actively co-produce Norwegian sovereignty over Svalbard.

2.1 Introduction

Flying into the town of Longyearbyen (latitude 78°13' north) in the islands of Svalbard, I am just 800 miles from the North Pole. As the plane starts to descend, the view is of snowy mountains, ice caps, glaciers, fjords, and huge expanses of brown tundra (Anderson 2009, 122).

Describing his journey to Svalbard, former editor of *New Scientist* and author of the book *After the Ice*, Alun Anderson conjures images of Svalbard as a pristine yet extreme Arctic wilderness untouched by human activity. Located between 74° and 81° north, the Svalbard archipelago lies midway between northern Norway and the North Pole (Figure 2). Owing to its geographic location in the Norwegian High Arctic, around sixty percent of Svalbard's landscape is covered by glaciers and the darkness of polar night ensues from mid-November to late January. Notwithstanding credentials that merit describing Svalbard as a High Arctic wilderness, something about Svalbard's landscape unsettled Anderson:

A few minutes before landing, out on a stretch of tundra by the sea, the plane flies past row after row of yellow apartment blocks, set around a cluster of enormous industrial buildings. For a moment I wonder if I'm hallucinating: who would build a high-rise housing complex up here in the High Arctic? A minute later the scene shifts again and now I'm in a science fiction movie. Below me, on an isolated dull-brown plateau streaked with snow, are white radar domes; I just have time to count seven or eight large ones, but smaller ones are scattered among them (Anderson 2009, 122).

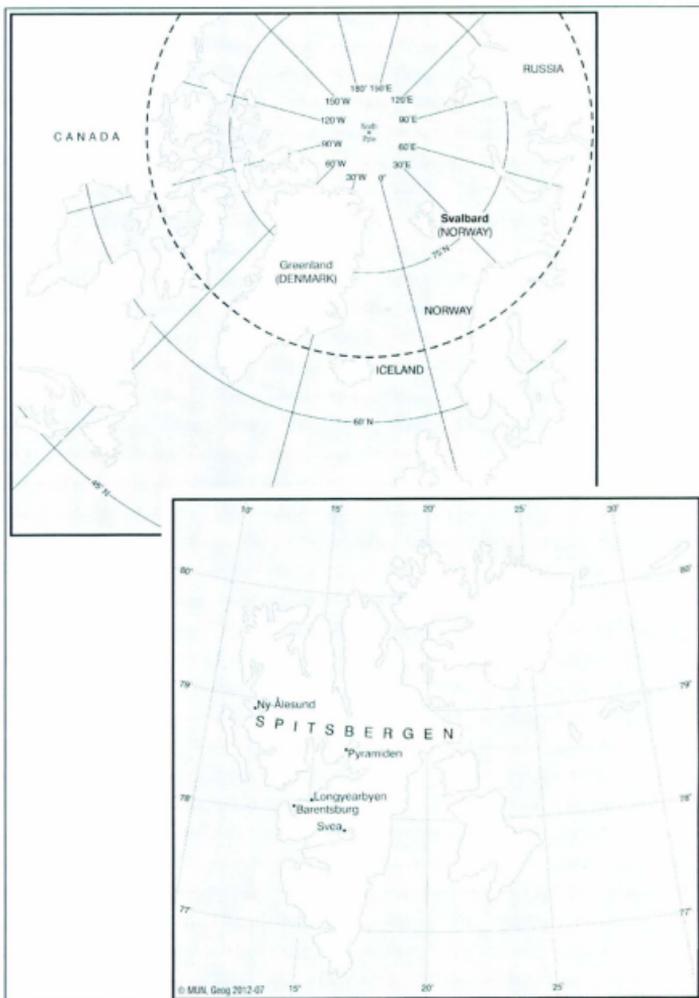


Figure 2. Map locating Svalbard (above) and the main settlements on Spitsbergen (below). Map courtesy of Charlie Conway, Memorial University.

Despite its geographic marginality, and in stark contrast to romanticized images of Arctic wilderness, enclaves of Svalbard's Arctic landscape have become sites for the industrial production of coal. Norwegian explorer Fridtjof Nansen, visiting Svalbard in 1912 almost a century before Anderson, expressed similar bewilderment at Svalbard's industrial landscape:

What a horrid imposition on nature's solitary silence. Those ghastly workers' huts down there in the valley, and the overhead cables and power lines trailing the mountain sides. It's shattering. And the racket created by the lives of all these people, with their strikes and unpleasantness, headed by such rudeness. No, there is nothing here that would tempt me to stay... (Nansen quoted in the Store Norske Annual Report 2005, 5).

Svalbard dramatically depicts how industrial capital, channelled northward by geopolitical motives, extended its grasp to the far north as mining developed beginning in the early years of the twentieth century.

Today, coal is still extracted by Russia and Norway on Svalbard and an industrial minescape characterizes its main settlements. Barentsburg is the last remaining working Russian coal mining town after the town of Pyramiden was abandoned in 1999. While the Russian population of Svalbard has been dwindling in recent years, the Norwegian presence on Svalbard has remained strong. Longyearbyen (in Figure 3), formerly owned and run by the Norwegian coal company Store Norske as a company town, is now the administrative centre of Svalbard with a population of approximately 2000 people. Longyearbyen's skyline is dominated by an iconic coal powerplant smokestack that constantly churns out dark smoke, fed by the coal extracted from Store Norske's mines.

Down the valley from Longyearbyen, 'Mine 7' ('Gruve 7' in Norwegian) in Adventdalen is operated by Store Norske. The company also extracts coal at Svea, 60 km south of Longyearbyen. Despite its high northerly location, Longyearbyen boasts a modern infrastructure and is serviced by a commercial airline throughout the year. Alongside mining tourism, research, education and administrative functions have developed in Longyearbyen. Mining has been fundamental to the development of Svalbard's permanent settlements and has offered a platform for economic diversification, including the development of Arctic science research facilities and a university-level education institution.



Figure 3. *Historic and contemporary mining remains evident at the town of Longyearbyen. Author's photograph.*

In spite of the seeming incongruity of industrial production in an Arctic setting—exposed to extreme (and expensive) operating conditions, and subjected to infrastructural and logistical challenges—Store Norske has operated continuously since 1916 and continues to extract coal on Svalbard. Many economic factors dictate the profitability of Store Norske’s operations: the challenging Arctic environment and isolated geographical location of Svalbard, volatile global commodity prices, and competition from Australia and North America. For instance, in January 2008 the coal price was approximately \$130 USD/tonne, and sharply rose to \$219 USD/tonne by July. However, as the global economic crisis kicked in, by January 2009 the coal price dropped to a mere \$70 USD/tonne (Store Norske Annual Report 2008). Though the economic volatility of mining in the Arctic has cut into Store Norske’s profitability, Store Norske only began generating a profit from 2002. In this respect, the stubborn persistence of Store Norske’s mining operations are not only surprising by virtue of their longevity, but also present a powerful paradox: that Svalbard’s landscapes are productive while failing to generate profit. Norwegian mining on Svalbard historically developed and survives, however, largely as a geopolitical strategy to maintain Norwegian sovereignty over Svalbard. Though mines are conventionally conceived as sites of commodity production, Svalbard’s mines do not merely extract ore but fulfill geopolitical objectives as well.

This paper investigates two interrelated questions that interrogate how Arctic geopolitical imperatives have shaped the capitalist production of commodities on Svalbard. First, how are capitalist productions of coal and landscape shaped by Arctic geopolitical objectives on Svalbard? Second, given that state intervention has been critical

to the survival of mining and has funded scientific activities that make use of mining infrastructures, how do geopolitical objectives extend the productivity of Svalbard's minescapes? At a time when the industrialization of the Arctic is becoming an increasingly contentious geopolitical issue for many Arctic states, Store Norske's mines are important as examples of on-going operations intertwined in historical and contemporary Arctic geopolitics. Svalbard also provides interesting theoretical insight into the interlocking economic and geopolitical functions of mineral production, and how this geopolitical economy has dictated the lifespan and character of mineral production on the resource periphery.

This paper focuses on the histories and geographies of Norwegian mining on Svalbard using a mixed-methods approach.⁶ On their own, Svalbard's landscapes do not recall a history of mining or reveal the geographic political economies of this development. Rather, these minescapes provide a material evidence-base which can be placed in conversation with policy documents, corporate reports and key informant interviews to better understand Svalbard's mining geographies. Interviews were undertaken with key stakeholders employed in decision- and policy-making capacities in the Norwegian mining and science sectors on Svalbard. The interviews followed a semi-structured format, whereby a series of open-ended questions were tailored to each participant's experience, and impromptu questions probed responses in greater detail. Contemporary government policy documents and company reports relating to Svalbard's

⁶ Though many nations have operated mines on Svalbard, and Russia continues to actively extract coal there, I focus on Norwegian mining in this paper. This focus on Norwegian mining reflects the long history and endurance of Store Norske's activities on Svalbard, and the availability of Norwegian documentary evidence for research.

mining, science, communities and infrastructures (provided by interview participants or acquired from the web) have been reviewed to complement these interviews.

Interrogating this research material reveals that mining on Svalbard was not merely incidental to the geo-logic location of ores, nor was coal extracted in response to market demand. Instead, the Norwegian government financially and politically supported Store Norske's coal mining operations to help maintain its sovereignty over the archipelago: an instance of what I describe as a 'geopolitical economy' of resource extraction. Using existing scholarship, this paper begins by outlining Svalbard's history of resource extraction to trace the historical development of Svalbard's mining geopolitical economy. The next section describes the mining geopolitical economy from the late 1970s to present, arguing that the production of coal on Svalbard continues to be heavily influenced by geopolitical imperatives. As such, I suggest that Svalbard's minescapes are productive, not just as spaces from which valuable coal is extracted but are also *co-productive* as spaces that secure Norwegian sovereignty over the archipelago. Then, I describe how the existence of mining infrastructures on Svalbard has served as a springboard for the development of scientific research facilities. I assert that this development of scientific activities on Svalbard has not only extended the productivity of this Arctic minescape in places where mining has formally ended, but also complements mining activity in fulfilling geopolitical objectives. In short, this demonstrates the *on-going-ness* of productive functions at closed mining spaces. First, however, I begin by defining what is meant by the 'geopolitical economy' in theoretical terms.

2.2 Theorizing Resource Peripheries: The Geopolitical Economy

This paper was initially intended to explore the unique character of Svalbard's mining political economy. While much existing scholarship focuses on the historical dimensions of scientific exploration (Jones 2001; 2008; Wråkberg 2006; Lewander 2010), resource development (Hacquebord and Avango 2009; Avango *et al.* 2011), and geopolitics of Svalbard (Mathisen 1954a; 1954b; Machowski 1995; Ulfstein 1995; Åtland and Pedersen 2008; Pedersen 2009), this paper extends existing historical literature to analyse the contemporary status of mining on Svalbard and better theorize the mining political economy there. As research for this paper progressed, it soon became clear that I was not dealing with issues in political economy alone. Instead, mining on Svalbard is shaped by an interlocking set of political-economic imperatives and geopolitical objectives which together demand a reconfiguration of the way we theorize resource extractive activities on Svalbard, not only as productive of material commodities and capital, but also as productive of sovereignty.

This paper offers a theoretical terrain in which the geopolitical imperatives and geographic particularities of political economy can be woven together through an analysis of Svalbard's 'geopolitical economy'. Different variants of this notion have been occasionally deployed by geographers interested in both geopolitical and political-economic analyses (Agnew and Corbridge 1989; Corbridge and Agnew 1991; Dodds and Sidaway 1994; Le Billon 2004; Mercille 2008; Glassman 2011). In particular, this paper draws from the twin concepts of the territorial and capitalist logics of power presented by David Harvey, ideas that have been subsequently mobilized by scholars undertaking

intersecting geopolitical and geoeconomic analyses (e.g. Mercille 2008). The capitalist logic of power refers to the “molecular processes of capital accumulation in space and time” that occur “through the daily practices of production, trade, commerce, capital flows” (Harvey 2003, 26-27). Most fundamentally, this logic of power is driven by a profit-motive, and operates in and beyond fixed territorial boundaries. The territorial logic of power stresses the “political, diplomatic, and military strategies invoked and used by a state... as it struggles to assert its interests and achieve its goals in the world at large” (ibid.). This logic seeks to augment state power, working within a territorialized space confined by fixed territorial boundaries.

The geopolitical economy (as I use it) is a theory that attempts to better conceptualize resource development at Svalbard, and other Arctic sites, where geopolitical imperatives are often decisive in determining the political economy of industrial ventures. The geopolitical economy draws from Harvey’s capitalist and territorial logics of power, concepts that are useful in paying equal attention to capitalistic and state objectives that motivate economic ventures, as well as the connections and conflicts between the two. As mining on Svalbard illuminates, commercial and political interests in mining are closely tied, and the production of coal embodies both economic and non-economic (i.e. geopolitical) functions. In recognising that territorial and capitalist logics of power are blurred, the geopolitical economy adopts an approach that understands commodity production as co-productive of both capital and the state. I use empirical evidence in the remainder of this paper to unpack Svalbard’s geopolitical economy, arguing that both economic and geopolitical objectives shape the character of

coal production on Svalbard and other on-going (scientific and mining) activities on Svalbard.

2.3 A Brief History of Resource Exploitation on Svalbard

Over millions of years, Svalbard has slowly crawled from the southern hemisphere to its current position in the high north. Plate tectonics have driven Svalbard northward, subjecting its physical landscape to monumental change. The landscape was once tropical, and rich in flora and fauna. Buried deep in bogs, these flora and fauna have been subjected to intense heat and pressure over geologic time, to form coal seams which remained untouched by humans until the last century when miners arrived to exploit this coal. Notwithstanding its location in the High Arctic, Svalbard has experienced a surprisingly long history of resource exploitation, some of which has been tied to geopolitical aspirations. Svalbard's geopolitical economy, as it exists today, is very much a product of these historical events. In tracking the historical development of mining and the dynamic geopolitics of Svalbard, this section highlights how the production of coal was increasingly used as a device to fulfil the geopolitical strategies of many nations, and especially Norway.

Before mining started, Svalbard was perceived as *tabula rasa* in commercial terms, attracting whale, seal, Arctic fox and walrus hunting from the 17th century in pursuit of Svalbard's natural riches⁷ (Jones 2001; Hacquebord and Avango 2009). Owing to its geographic proximity to Scandinavia, Svalbard appeared a natural extension to

⁷ For more detail on the historical dimensions of natural resource exploitation on Svalbard see Arlov 1994; Avango *et al.* 2011; Hacquebord and Avango 2009.

Norway and people from Norway's north had long visited Svalbard to hunt and fish (Mathisen 1954a). Norwegian Scientific exploration, undertaken in the 17th, 18th and 19th centuries was closely tied to these economic ventures: "trade and exploration, at this time, amounted to one and the same thing"⁸ (Jones 2001, 16). Whalers from many nations, for instance, explored different coastal areas around Svalbard as a means of finding the most profitable whaling grounds (Jones 2001). Unlike other economic and scientific ventures in the Arctic at this time (cf. Launius 2010), this activity on Svalbard was not explicitly linked to territorial ambitions. Instead, the lack of an indigenous population and few wintering settlements on Svalbard lessened the need for any country to lay claim over the archipelago (Jones 2001).

Nonetheless, questions surrounding the ownership of Svalbard did arise from time to time. In the 19th century, some scientists and hunters began questioning the ownership of Svalbard (Mathisen 1954a). Most notably, Swedish scientist and explorer Professor Adolf Erik Nordenskiöld drew attention to the political status of Svalbard, asserting that establishing a colony on Svalbard would assist year-round meteorological observation.⁹ At this time, some prominent figures offered a variety of suggestions regarding the ownership of Svalbard. For instance, a zoologist with business interests in North Russia named Michail Sidorov declared in a Geographical Society lecture in St. Petersburg that it was a "historical fact" that Svalbard belonged to Russia (Mathisen 1954a, 25). However

⁸ For more detail on the historical dimensions of scientific exploration of Svalbard see Jones 2001: 2008; Wråkberg 2006; 2009; Lewander 2010. For more detail on historical scientific practices in the Arctic generally see Bravo and Sörlin 2002; Launius, Fleming and DeVorkin 2010.

⁹ Swedish explorers and scientists had made significant scientific contributions on Svalbard (see Mathisen 1954a), and this argument was often used to justify Swedish control over Svalbard during discussions regarding Svalbard's sovereignty.

some countries, including Norway, preferred that Svalbard's status remain ambiguous, amid fear that their use of the archipelago would be jeopardized should a formal agreement be reached. Nevertheless, this episode clarified Svalbard's political status as no-man's land – *terra nullius* – unclaimed, unowned and without an indigenous population, open to exploitation by enterprises from across the world.

Enticed by the possibility to profit from Svalbard's natural resources, mineral prospectors accompanied scientific expeditions to Svalbard in the 19th century. During this 'initial phase' of mining on Svalbard, exploration and prospecting expeditions laid claim to easily accessible coal seams (Hacquebord and Avango 2009). Søren Zachariassen, a Norwegian sealing skipper, shipped the first coal from Svalbard to Norway in 1899 sparking a new international interest in Svalbard (Mathisen 1954a; Ulfstein 1995). In the early years of the 20th century Dutch, British, American, Norwegian, Swedish and Russian experimental mining ventures were soon established on Svalbard – though few enterprises lasted long (Mathisen 1954a; Avango *et al.* 2011). These early ventures were principally established for economic reasons, exploiting only the most profitable resources and investing in coalfields requiring the least initial capital outlay (Avango *et al.* 2011). One of the most notable mining ventures was undertaken by American financier John Munroe Longyear, who opportunistically established the Arctic Coal Company in 1906 after visiting Svalbard in 1903 as a tourist and recognising the potential for commercial coal mining (Arlov 1994; Hartnell 2009). The Arctic Coal Company acquired Zachariassen's interests, mining coal at Adventfjorden and establishing Longyear City, the site of the present-day administrative centre of Svalbard –

Longyearbyen. During this ‘establishment phase’, early claims were sold to industrialists, and new companies established permanent year-round settlements (Hacquebord and Avango 2009).

While early mining ventures were economically-driven, resolving the political ambiguity of Svalbard became an increasingly contentious issue. The rapid proliferation of mining on Svalbard brought about disputes between different nations, companies and their workers. As historian Trygve Mathisen explains, “though the economic possibilities were considered favourable, there was every reason to think twice about investing capital in mining ventures, as long as the political status of the archipelago was so uncertain and law and order so insecure” (Mathisen 1954a, 45). The government of the United States, for instance, feared that sovereignty disputes would interfere with the Arctic Coal Company’s economic activities on Svalbard (Hacquebord and Avango 2009).

Mining on Svalbard also became politically important for Norway and Sweden at this time. In a period of increased rivalry between the two countries – unified until 1905 – Svalbard offered an opportunity for expanding the influence of newly independent Norway (Jones 2001; Avango *et al.* 2009). Furthermore, because Norway and Sweden had no coal resources within their national boundaries, establishing mines on Svalbard would make these countries less vulnerable to price fluctuations and help sustain independence (Avango *et al.* 2011). The development of mining thus drove the need for a system of law and order, and once again raised questions about Svalbard’s political status.

Though installing a stable political regime on Svalbard was deemed essential to ensuring that mining remained profitable, mining activity itself strategically marked territorial claims for several nations operating on Svalbard. Norwegian mining companies, for instance, claimed both resources *and* territory for Norway through “performing rituals of possession and by erecting symbols of occupation”¹⁰ (Hacquebord and Avango 2009, 35). Though resource claims were driven primarily by private economic interests, these rituals also strengthened Norwegian territorial claim over Svalbard. Additionally, Norwegian, Swedish and Russian mines received financial and political support from their governments to establish effective occupation of Svalbard (Avango *et al.* 2011). This illuminates one way in which the territorial and capitalist logics of power were distinct, yet closely tied and co-dependent in Svalbard’s geopolitical economy at that time.

During World War I the Scandinavian countries again realized they were at a great disadvantage being dependent on foreign coal, especially when the price of coal was high (Mathisen 1954a). In this context, the Store Norske Spitsbergen Kulkompani (referred to as Store Norske for the remainder of this paper) was established in 1916 as a syndicate financed by several banks and encouraged by the Norwegian state, with the idea of taking control of the Arctic Coal Company’s property (Mathisen 1954a; Arlov 1994). That same year, the Kings Bay Kul Compani established as a private Norwegian company at Ny-Ålesund in Kongsfjorden (see Figure 2). Alongside the establishment of more mines on Svalbard, Norway organized conferences with Sweden and Russia in 1910 and

¹⁰ Interesting examples of claiming both resources and territory are briefly described by Avango *et al.* (2011).

1912, and various powers were invited to a conference in Oslo in 1914 to discuss the legal status of Svalbard¹¹ (Mathisen 1954a). However, in closed meetings the Norwegian government decided that Norwegian sovereignty over Svalbard was the best solution for the international community (Ulfstein 1995). It should be noted that Norway's actions were not aggressively expansionist, but rather aimed to promote diplomacy and neutrality, ideals championed during Norway's independence (Mathisen 1954a; Ulfstein 1995).

In 1920 the 'Svalbard Treaty' was submitted to the League of Nations and signed by fourteen initial parties.¹² Still in effect today, the Treaty grants the "full and absolute sovereignty" of Svalbard to Norway, so that all countries present on Svalbard must conform to Norwegian law (Ulfstein 1995). The 1925 'Svalbard Act' officially placed Svalbard under Norwegian sovereignty and installed the 'sysselmann' (the governor of Svalbard) as the highest Norwegian authority on Svalbard (Ulfstein 1995). Notwithstanding Norwegian sovereignty over Svalbard, the Svalbard Treaty also preserves the international character of Svalbard through the non-discriminatory access of signatory nations to Svalbard's resources. As such, Article 7 of the Svalbard Treaty states that:

[w]ith regard to methods of acquisition, enjoyment and exercise of the right of owner ship of property, including mineral rights, [...] Norway undertakes to grant to all nationals of

¹¹ For more detail on the political history and legal status of Svalbard see Mathisen 1954a; 1954b; Ulfstein 1995.

¹² Interestingly, the Norwegian Ministry of Foreign Affairs did not actively prepare this treaty, but instead Store Norske established a committee to draft the treaty (Ulfstein 1995). The fourteen initial signatory nations were the United States, Denmark, France, Italy, Japan, the Netherlands, Norway, Sweden, the United Kingdom, and British overseas dominions of Canada, Australia, India, South Africa and New Zealand. Presently, there are now over forty signatory nations.

the High Contracting Parties treatment based on complete equality [...] (The Svalbard Treaty 1920).¹³

Though this clause permits signatory nations to undertake resource extractive activities on Svalbard, they must follow Norwegian mining regulations on Svalbard. Accordingly, ‘The Mining Code’ was presented simultaneously to the Treaty at the Paris Peace Conference, and ratified by Royal Decree in 1925. The Mining Code permits signatory nations to search, acquire and exploit natural deposits of coal, mineral oils and other minerals and rocks (Article 2, The Mining Code 1925).

One commentator has noted the terms of the Svalbard Treaty are very much a product of historical events at that time:

In the aftermath of the Great War, the Svalbard Treaty resolved the unfeasibility of Spitsbergen not being allocated to a particular nation. The dividing up of geographical spoils throughout the world has become a political necessity and this allocation of international territory conferred recognition of Norway’s acknowledged status as a nation (Jones 2001, 37).

Nevertheless, in the period immediately after the Treaty was enforced, Norwegian jurisdiction over Svalbard was virtually non-existent (Pedersen 2009). During this time, instances of Soviet non-compliance with Norwegian policies have been noted, but the sysselmann did not have sufficient staff or logistical resources to exercise Norwegian

¹³ As well as these principles, the Svalbard Treaty enforces environmental conservation, promotes the peaceful utilisation of Svalbard, and demands that all taxes collected on Svalbard are spent on Svalbard (Ulfstein 1995).

sovereignty (Ulfstein 1995; Pedersen 2009). Even had the sysselmann been able to enforce Norwegian jurisdiction, some scholars suggest that “small state Norway” did not want to provoke any sort of dispute with the Soviet Union during this time, so adopted a *laissez faire* approach to Svalbard (Pedersen 2009).

Towards the end of the 1920’s an economic depression heavily impacted mining activities on Svalbard, leaving only Norwegian and Russian mines on the archipelago. While the economic opportunities Svalbard offered had been exaggerated, the costs of production in the Arctic had been underestimated (Østreng 1978). As the price of coal fell in the 1920’s, only mines with strong government support survived in the post-1920’s ‘consolidation phase’, which was characterized by fewer actors involved in mineral extraction, more investment in operations and housing, and the establishment of multiple permanent settlements which acted as administrative headquarters (Hacquebord and Avango 2009). Alongside the Norwegian settlements at Longyearbyen and Ny-Ålesund, the Russian state-owned coal company Trust Arktikugol maintained mining communities at Barentsburg and Pyramiden (see Figure 2). In 1933 the Norwegian state acquired all the shares of the Kings Bay Kul Compani at Ny-Ålesund by writing-off the company’s debt to the government¹⁴ (Østreng 1978). This maintenance of Norwegian and Russian mines on Svalbard was clearly linked to geopolitical-economic imperatives: while Norway still relied on Svalbard as her only source of coal, the Soviet Union had no other significant production in her northern regions (Mathisen 1954b).

¹⁴ However, the Kings Bay Kul Compani closed the mine at Ny-Ålesund in 1963 after a mining accident, and the company’s mining rights were transferred to Store Norske.

During the Second World War coal was important for Norway, and the Norwegian government strategically ordered an increase in the production of coal from Svalbard's mines (Mathisen 1954b). Though Svalbard did not play an important role during the war, there were some outbreaks of combat around the archipelago which raised questions about the Svalbard Treaty, and specifically its peaceful utilization clause. In particular, the Soviet Union asserted that the Russian government had not been represented during the Treaty negotiations in Paris, and argued that two of the signatory nations had fought against the Soviet Union during the war. This discussion came at a time when the exiled Norwegian government had to operate from London and the Soviet Russian government no longer recognised Norway as a sovereign state (as it was under German occupation). However, Mathisen suggests that the Soviet Union did not question the Svalbard Treaty to exploit Norway's weak state, but rather sought to consolidate its power on Svalbard (which was viewed as an important defence of north Russia) in response to increasing American influence in the Arctic. This not only gives insight into Russia's interests in the Arctic, but illustrates that Norwegian sovereignty over Svalbard was still contentious.

Tensions between Norway and Russia remained, especially amid a climate of "fear, mistrust and suspicion" between Norway and Russia that climaxed during the Cold War. On the one hand, press reports suggested that Norway was struggling to maintain its sovereignty as around 2,500 Soviet residents were based on Svalbard in the 1950's (Pedersen 2009). On the other hand, Russian mistrust of Norway grew as Norway became a NATO member and sparked fears that Svalbard could become a NATO base which

would violate the Svalbard Treaty's peaceful utilisation clause¹⁵ (Åtland and Pedersen 2008; Pedersen 2009). Åtland and Pedersen suggest that this tension between Russia and Norway was influenced by Russia's fluctuating relationship with the United States and NATO (Åtland and Pedersen 2008). In response, Norway took steps to consolidate its jurisdiction on Svalbard from the mid-1970s onwards (Pedersen 2009). In 1976 the *sysselemann* was finally given a helicopter, more administrative staff were employed and a new office was built to help exercise sovereignty over Svalbard (Ulfstein 1995). Alongside this, the Svalbard budget swelled from 0.7 million Norwegian Kroner in 1960 to over 90 million by 2000 (Pedersen 2009). Furthermore, the Norwegian state increased its stake in *Store Norske* to save the company from bankruptcy and keep *Store Norske* afloat. The post-1970s geopolitical economy of mining is described in the next section in greater detail, but it is important to highlight at this point that Norway evidently sought to consolidate its presence on Svalbard during a period in which Norwegian sovereignty over Svalbard was on shaky ground.

Despite ratification of the Svalbard Treaty, increasing co-operation between Russia and Norway, and the contraction of Russian mining on Svalbard, Norwegian sovereignty over Svalbard remains a contentious issue in the post-Cold War era. Some policy documents suggest that Norwegian sovereignty over Svalbard is important as a method by which the terms of the Svalbard Treaty can be upheld:

¹⁵ As well, Russia registered its opposition to Norway's interpretation of the Svalbard Treaty. In particular, Russia contested Norway's claim to exclusive rights in zones beyond the territorial sea and viewed environmental protection measures undertaken by Norway as prohibitive of Russian mineral exploration and exploitation (for more detail see Åtland and Pedersen 2008; Pedersen 2009).

The Government's overriding objectives in respect of the policy towards Svalbard comprise consistent and firm enforcement of sovereignty, proper observance of the Treaty relating to Spitsbergen and control to ensure compliance with the Treaty, maintenance of peace and stability in the area, preservation of the area's distinctive natural wilderness and maintenance of Norwegian communities on the archipelago (Norwegian Ministry of Justice and the Police 1999).

In this, and other policy documents, Norway is cast as a guardian of Svalbard's unique environmental and cultural character. Yet as the remainder of this chapter argues, mineral extraction continues to be an important method by which Norwegian sovereignty on Svalbard is exercised.

In sum, Svalbard's mining history can be characterized by a more or less constant struggle to maintain Norwegian and Russian economic activities on Svalbard, driven by changing geopolitical motives. Government subsidization, a key characteristic of Svalbard's mining geopolitical economy, has been essential to sustaining economic operations on Svalbard, particularly during the Cold War. Yet at times, the exact reasons for maintaining economic activity on Svalbard are ambiguous, leading one commentator to note that "Norway, consciously or unconsciously, seems to have worked hard over the previous couple of decades to ensure Spitsbergen could be perceived as a territory *worth* acquiring..." (Jones 2001, 37). The next section argues that this sentiment is still true today, and uses primary research material to analyse how the production of coal (from the 1970s onwards) has been driven by geopolitical economic imperatives described in this section.

2.4 Svalbard's Contemporary Mining Geopolitical Economy

Svalbard's summertime reveals a landscape that comes alive under the midnight sun. The snow covering Adventdalen melts to expose a straight road that cuts down the valley – from Mine 7 to Longyearbyen. Trucks loaded with coal roar down this dusty road, heading to the harbour (Figure 4). Meanwhile, small planes shuttle miners 60km between Longyearbyen and Svea. Whereas Mine 7 produced a mere 75,000 tonnes of coal, the Svea Nord mine produced 2.6 million tonnes in 2009. Store Norske's coal is a commodity, containing value and circulated in the capitalist system. Used for energy, cement and metallurgy, this coal is principally sold to Germany, the Netherlands, Portugal, and France among other European countries. Although the landscape remains industrious, productive and integrated into flows of capital and commodities, this economic productivity is not the only – or even principal – source of its value; rather, the production of coal is valuable by virtue of Svalbard's geostrategic location in the Arctic. One main strategy to extend the life of mining, and thus, extend Norwegian sovereignty on Svalbard, has been to develop Longyearbyen into a more stable, 'normal' community. Set within the context of Longyearbyen's 'normalisation', this section uses an array of policy documents, corporate reports and interview material to explore how the co-production of coal, landscape and territory is shaped by geopolitical-economic imperatives on Svalbard.



Figure 4. *A truck transporting coal from Mine 7 in Adventdalen (background, left). Author's photograph.*

The last 30 years of Norwegian activity on Svalbard can be broadly characterized by an intensification and consolidation of Norway's presence in response to Cold War territorial anxieties and the limited nature of Norwegian sovereignty over Svalbard. As explained in the previous section, because the Svalbard Treaty allowed signatory nations to undertake economic activity on Svalbard, "Norway received a very special and highly restricted sovereignty over the archipelago" (Østreng 1978, 28). Recent policy documents demonstrate the political importance of maintaining Norwegian activity on Svalbard:

Several conditions have to be met in order to ensure that Norwegian sovereignty is prolonged. One important one is that there have to be Norwegian economic activities at Svalbard... when the treaty was signed, mining was the dominating economic activity (Bjørnsen and Johansen 2010, 17).

In response, there has not only been a marked increase in state investment and a growth in bureaucratic capacities that strengthen Norway's sovereignty on Svalbard, but an effort to turn Longyearbyen into a more stable settlement through 'normalisation'.

This 'normalisation' effort sought to develop Longyearbyen as a permanent family community to firmly root a Norwegian presence on Svalbard. Longyearbyen was initially established as a company town owned and controlled by Store Norske, and typical of company towns, the male-dominated workforce at Longyearbyen occupied temporary job positions and lived in temporary accommodation (Norwegian Ministry of Justice and the Police 1999; see also Viken 2006). However, from 1975 onwards government policy sought to 'normalise' Longyearbyen as a family community and diversify economic activity there (Norwegian Ministry of Justice and the Police 1999). During this period of normalisation, infrastructural assets have been transferred to the Norwegian state, food and clothing stores opened, new housing developed and an airport built. Store Norske has played a central role in Longyearbyen's normalisation, by building family housing, sponsoring sports and cultural activities, and remaining as the largest employer on Svalbard (Carlsen pers. comm. 2011b). Norwegian policy documents illustrate how normalisation has been used to develop Longyearbyen into a more permanent family community to prolong Norway's presence on Svalbard:

One of the main objectives of Svalbard policy is the maintenance of Norwegian communities in the archipelago. This objective is met through the family community in Longyearbyen. Over the years there has been a conscious effort to facilitate three fields of activity in particular. Throughout history, coal mining has formed the basis for Longyearbyen and other communities in the archipelago. There has also been a focus on research, education and tourism. These efforts have all helped to make Longyearbyen the modern community it is today (Norwegian Ministry of Justice and the Police 2008, 8-9).

As part of a “conscious effort” to maintain Norwegian mining on Svalbard, the Norwegian state took control of one third of Store Norske’s shares in 1973, and by 1976, the state owned 99.9% of Store Norske to save the company from bankruptcy. Store Norske’s coal mining has been historically unprofitable and the state has absorbed Store Norske’s financial losses, paying 100 million Norwegian Kroners annually to subsidize Store Norske during the 1980s (Ulfstein 1995). Recent annual reports published by Store Norske illustrate that the Norwegian state continued to subsidize Store Norske’s losses, at times in excess of 100 million Kroners, in the early 2000s (see Figure 5). Read in the context of normalisation, state ownership of Store Norske clearly complements efforts to strengthen a Norwegian presence on Svalbard. This consolidation of Norwegian power through increasing the state-owned share of Store Norske, vividly exemplifies how “sovereignty capitalizes a territory” (cf. Foucault 2007, 20), driven by geopolitical economic imperatives.

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Production (1000 tonnes)	404	632	1788	2132	2944	2904	1471	2395	4073	3430	2641	1934
Sales (NOK mill.)^a	124	223	557	687	940	1310	1132	1256	1854	3445	2041	1507
Profit/ loss before subsidies/ taxes (NOK mill.)^b	-87	-176	-133	63	78	217	52	-111	153	1056	432	349
Subsidies (NOK mill.)^c	87	154	136	0	0	0	0	0	0	--	--	--

^a Labelled as 'Turnover (NOK mill.)' from 2007 onwards.

^b Labelled as 'Profit before tax (NOK mill.)' from 2008 onwards.

^c Subsidies were no longer listed from 2008 onwards.

Figure 5. *Table of Store Norske's production, sales, profit before taxes and subsidies between 1999 and 2010 using data compiled from Store Norske Annual Reports (2004;2007;2010).*

The diversification of Svalbard's economy has been integral to these normalisation efforts, and a particularly important strategy to maintain Norwegian economic activity on Svalbard given Store Norske's unprofitability. Though mining is still critical to Svalbard's economy, the emergence of other (arguably more stable) economic activities on Svalbard, such as research and tourism, has also facilitated Longyearbyen's normalisation. As one report reviewing the status of Svalbard's mining economy explained:

Norwegian coal mining operations were previously the main measure for maintaining the Norwegian presence on Svalbard, but now the private sector of the economy also plays a major part in relation to settlement in Longyearbyen... A well-developed economic sector is an important basis for a viable local community, and the services industry is of

particular importance for other activities on the archipelago (Norwegian Ministry of Justice and the Police 1999, 1).

In view of changes and challenges to Svalbard's economy and society during normalisation, numerous policy documents (reviewed throughout this paper) have been produced to monitor the status of Svalbard's economy. The Norwegian Institute for Urban and Regional Research (NIRB) assesses the importance of mining to the Longyearbyen community on an annual basis (Bjørnsen and Johansen 2010), while the Polar Affairs Department of the Norwegian Ministry of Justice and the Police has submitted three reports to the Storting (the Norwegian Parliament) regarding the economic and political status of Svalbard at decadal intervals. These documents are themselves suggestive of the importance of Norwegian economic activities in keeping Norway's settlements on Svalbard productive. Together, the normalisation of Longyearbyen and the diversification of Norwegian economic activities on Svalbard helped strengthen Norway's presence on Svalbard during the Cold War period, and state control of Store Norske has been the centrepiece of this effort.

In 1999, however, one of the reports produced by the Department of Polar Affairs proclaimed that a new geopolitical situation had arisen on Svalbard. The breakup of the Soviet Union earlier that decade, the report claimed, allowed increasing cooperation between the Russian and Norwegian settlements on Svalbard (Norwegian Ministry of Justice and the Police 1999). Alongside this, the Russian population on Svalbard had been decreasing, especially since the abandonment of Pyramiden in 1999 left Barentsburg as

the only remaining permanently inhabited Russian settlement on the archipelago.¹⁶ Yet this same report also included a cautionary note, that as “experience has shown, however, that the Norwegian authorities cannot relax their vigilance as regards the firm and consistent exercise of sovereignty” (Norwegian Ministry of Justice and the Police 1999, 1). Nonetheless, just three years after this report, Store Norske began ‘normal’ mining operations whereby the government stopped subsidizing the company after the opening of the Svea Nord mine. Like other enterprises within the state’s portfolio, Store Norske is now operated as a business using “commercial principles with a view to achieving a market return on the capital invested”¹⁷ (Norwegian Ministry of Trade and Industry 2007, 25). Indeed, Store Norske has generated its own profit and paid government royalties since 2002 as coal production has increased and the price of coal improved (see Figure 5). In 2002 for instance, the price of coal was a mere \$36 USD/tonne, but by 2008 this figure had risen to \$175 USD/tonne (Store Norske Annual Report 2008, 2). In 2002, Store Norske’s profit after tax was \$64 million Norwegian Kroners, and by 2008 this figure had risen to \$881 million.

Despite focusing on commercial mining, Store Norske’s current coal production clearly continues to fulfil not only economic objectives, but geopolitical imperatives that help secure Norwegian sovereignty over Svalbard. ‘Government Ownership Policy’ documents, produced by the Norwegian Ministry of Trade and Industry to increase transparency of government-owned enterprises, admit that:

¹⁶ For more on the abandonment of Pyramiden and its post-productive landscape, see Andresen, Bjerck and Olsen 2010.

¹⁷ Enterprises within the state’s portfolio fulfil political and economic objectives, including the maintenance of command over Norwegian resources, providing a source of income for society and ensuring long term value creation (Norwegian Ministry of Trade and Industry 2006).

The objective of state ownership of Store Norske Spitsbergen Kulkompani is to contribute to the continued existence and further development of the community in Longyearbyen and to ensure that it develops in a manner that underpins the overriding aims of Norwegian policy for Svalbard... The jobs in connection with the operation of the coal mines have made a substantial contribution for many years to maintaining stable, year-round Norwegian activity and settlement on Svalbard (Norwegian Ministry of Trade and Industry 2007, 25-26).

In this policy document, riddled with nationalist sentiment, state ownership of Store Norske clearly helps to maintain Norwegian control over Norwegian resources. Seeking to cultivate conditions that present mining as both stable and appropriate for 'Norway's Svalbard policy', Store Norske's Annual Reports adopt a similar rhetoric:

Coal mining accounts for about 40% of employment. Half of all children in Longyearbyen have parents who work for Store Norske or for associated companies.

In view of this, it is important that Store Norske manages its resources as efficiently as possible. Production volume is extremely important for long-term planning of the coal mining operation. If too many Store Norske employees do not live permanently in Longyearbyen, this will weaken the family-based society and make mining less suitable as a tool in Norway's Svalbard policy (Store Norske Annual Report 2008, 4).

These documents reveal how the production of coal by Store Norske is tailored around a geopolitical-economic logic that focusses on sustainable extraction to extend the life of its mines and prolong Norwegian sovereignty over Svalbard. Rather than conceptualising Store Norske's coal reserves as a potential commodity whose economic value is waiting

to be realized, Store Norske's focus on sustainable extraction suggests that these reserves are valuable in securing both Norwegian mining and Norwegian sovereignty on Svalbard in the future. There are several important conceptual implications for understanding how the production of coal under capitalism is shaped by Norwegian geopolitical objectives on Svalbard.

First, Svalbard's minescapes are the means of multiple geopolitical-economic productions. By this, I mean that Store Norske's mines are not only economically productive (though not always profitable) in producing coal (or more abstractly, value), but are also co-productive in the sense of reproducing Norwegian sovereignty on Svalbard. As a Store Norske Annual Report notes, "Store Norske's product, in addition to coal, is a long-term and stable presence in Longyearbyen" (Store Norske Annual Report 2008, 9). The extraction of coal is motivated not only by the use-value or exchange-value of this "natural resource" informed by the capitalist logic of power, but by the geostrategic and political function that the performance of coal mining on Svalbard represents: Norwegian mining is sovereignty exercised and actualized. Critically, the minescape (including the Norwegian mining town of Longyearbyen) is itself produced, by the operation of the state-subsidized firm Store Norske, as a material manifestation of Norwegian sovereignty on Svalbard. So, one characteristic of Svalbard's geopolitical economy is that Store Norske's mines are not only economically productive of ores, but are a material product of Norwegian sovereignty claims.

Second, although Svalbard's minescapes are productive they have not always been economically profitable. If we were to accept the idea that capital evacuates from

unprofitable terrains and enterprises must produce surplus value to survive, Store Norske, by this capitalist logic, would have failed long ago. As a Store Norske representative noted in an interview: “[when] it comes to a point where you can choose between profit and sovereignty, sovereignty is more important” (Carlsen pers. comm. 2011a). Instead, the production of coal is shaped around a territorial logic that seeks to extend the productivity of Norwegian mining on Svalbard. Thus, the political economy of mining on Svalbard has been organized, not just around a profit-motive alone, but attuned to geopolitical objectives: it is a geopolitical economy. Accordingly, another characteristic of Svalbard’s geopolitical economy is that the territorial and capitalist logics of power are closely intertwined in the production of coal.

In sum, the normalisation of Longyearbyen has been closely associated with efforts to maintain a Norwegian presence on Svalbard. Though Norway’s geopolitical motives for maintaining a Norwegian presence on Svalbard have changed over time, this normalisation has been central to determining the lifespan and nature of Store Norske’s coal mining. Mining on Svalbard is not just incidental to the geo-logic location of ores on the archipelago but centred around maintaining sovereignty, and to a lesser extent commercial profitability should global markets allow. In keeping with the idea that “power itself is not a resource, but rather something generated or actualized through the control and reproduction of different kinds of resources” (Allen 2003, 44), mining on Svalbard demonstrates one way in which sovereignty is materially manifest - in short, mining on Svalbard is co-productive of both capital and the Norwegian state. At Svalbard (and other Arctic resource development projects) these geopolitical imperatives extended

the lifespan of Store Norske's mines (under government assistance), disrupting conventional conceptualisations of resource lifecycles that view mining as ephemeral. The next section argues that these dual geopolitical and economic imperatives continue to characterize new activities on Svalbard, including the development of scientific facilities, which complement normalisation efforts and economic diversification attempts.

2.5 The Scientization of Svalbard's Minescapes: Co-producing Science and Territory

While Store Norske's operational mines continue to perform geopolitical-economic functions, Svalbard's 'post-productive' minescapes have been rejuvenated by scientific activities, driven in part by on-going geopolitical imperatives. These closed minescapes may appear as if they are no longer productive of coal (or Norwegian sovereignty), however elements of historic and contemporary mining infrastructures have served as platforms for the development of scientific facilities on Svalbard. Even though the proliferation of science has occurred at a time when Arctic research has become fashionable, this section argues that the development of scientific institutions and facilities on Svalbard has also been influenced by Norwegian territorial anxieties. I suggest that science on Svalbard does not merely *complement* the continued operation of mining, but is itself a *component* of Svalbard's on-going geopolitical economy. The scientization of Svalbard's minescapes question the idea that activities in peripheral regions are always ephemeral, instead suggesting that past and present mining infrastructures can act as platforms for diversification with the shared goal of keeping Svalbard's Norwegian mining settlements productive of both resources and sovereignty.

This scientization also demonstrates the on-going capitalist and territorial motivations at play on Svalbard.

Svalbard's closed minescapes might appear as if they are no longer productive. For instance, in Adventdalen old mining structures run parallel to the road to Mine 7, seemingly contrasting the productivity of the operational mine. These structures haunt the landscape; old mines can still be seen, precariously perched on the cliff sides of connecting valleys but remain disused. Old mine cableways and headframes are integrated into the fabric of the landscape, acting as banal reminders of past mining. The mountainsides are scarred with piles of wood, wires, crates and pieces of coal.

In line with this aesthetic, Svalbard is often portrayed as a natural and historical relic, a space reclaimed from capitalist production. Cultural heritage literature produced for visitors romanticize this long gone history:

Today there are no more hammer strokes from the copper boilers, creaking from the ships' ropes, shouting and laughter from workers building railways and the almost silent footsteps of a hunter on his way to tend to his traps. However, the traces of the people remain as silent testimonies of the people of past times. By having the having the opportunity to meet up with these histories out in the wilderness, and the opportunity to hear the tales where they took place, we can reach an understanding for the value of what was left behind, and experience constructive meetings with the past (Prestvold 2003, 2-3).

Archaeological research on Svalbard also places mining activities firmly in the past (Hacquebord and Avango 2009; Kruse 2011), and many visitors view abandoned mine sites as "rubbish, as waste" (Sandodden pers. comm. 2011). For this literature, the

abandoned minescape performs no work, it produces nothing; just an infrastructural skeleton remains. It scars the landscape. It ruins the beauty of the Arctic. It has no use. It has no value.

However, these mining remnants unwittingly overshadow new structures in the minescape, whose work is equally as silent. Now, scientific instruments are embedded into the fabric of the minescape. These scientific projects are not always obvious within the minescape. In some areas, a lone marker or quadrat indicates the presence of scientific research. Aside from the occasional truck from Mine 7, this valley still appears as if it isn't a working landscape. Few people work here. But these scientific instruments are automated, continually logging and probing nature (Figure 6). This is still a landscape of production; technological assemblages are the means of production of scientific knowledge, mining data from the environment. Although Svalbard has for centuries been subjected to scientific exploration, from 1989 onwards Svalbard experienced a period of unprecedented investment in physical infrastructures for scientific use. Svalbard's minescapcs have been scientized: rapidly colonized by scientific facilities, institutions, research projects and personnel, supported by state-funded investments and stabilized by a favourable political climate which has revalorized the minescape.

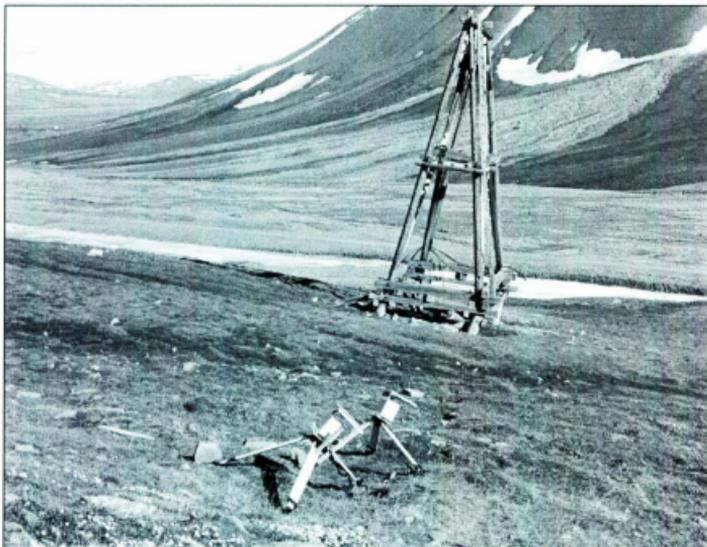


Figure 6. *Scientific equipment beside an abandoned mining structure in Endalen (close to Longyearbyen). Author's photograph.*

National policy documents reveal that the scientization of Svalbard's minescapes occurred at a time when the Arctic has become regarded as the crucible of global climate change in scientific and political circles, and gained a new prominence in Norway's national research agenda. In response to the (re-)emergence of the Arctic as a frontier of scientific knowledge, a white paper on Norwegian research to the Storting (Report No. 42, 1992-93) presented plans to forefront polar science that would assist Norway in

becoming a “leading Arctic research nation”¹⁸ (The Research Council of Norway 2004, 8). Strategic planning of this task was assigned to the Research Council of Norway, which subsequently established a National Committee for Polar Research and developed policy for Norwegian research in the Arctic¹⁹ (see for example, The Research Council of Norway 1998a; 2004).

As Arctic science became a research priority in Norway, Svalbard was hailed as a scientific platform to fulfil these national objectives, owing to the archipelago’s Arctic location. In addition to its location and well-developed research infrastructure (The Research Council of Norway 1998b), Svalbard is also made scientifically valuable by the variety of natural phenomena observable there:

Svalbard’s position in the far north improves the extent and range of registrations and monitoring of weather and climate parameters of importance to both weather forecasting and climate research. Svalbard and the surrounding sea areas are also important “archives” of information about earlier climate fluctuations. Glaciers on Svalbard, and the extent and quantity of drift ice, could also provide significant monitoring parameters in connection with future changes of climate. Svalbard is thus a key area for research and

¹⁸ The full mission statement outlined by the Research Council of Norway reads: “Norway is to be a leading Arctic research nation, and will in the period 2004–2008 seek to advance its understanding of the processes governing climate and environmental change in the Arctic, as well as the impacts of change on the natural environment and society, as a basis for better management of the region” (The Research Council of Norway 2004, 8).

¹⁹ The National Committee for Polar Research is responsible for the development of research strategy and co-ordination of financial and logistical resources (The Research Council of Norway 1998b). The Research Council subsequently highlighted three key objectives, namely: 1) “to obtain basic knowledge about the physical and biological environment in the Arctic by exploiting their unique qualities as a natural laboratory, 2) to improve the foundation of the knowledge required for management of the Arctic, 3) to exploit Norway’s natural advantages for research in the Arctic to ensure both environmentally friendly and economically sustainable industrial development. (The Research Council of Norway 1998a).

surveillance relating to changes in the global climate (Norwegian Ministry of Justice and the Police 1999).

Once valued as a geostrategic outpost during the Cold War, these policy documents suggest how Svalbard's geographic location became valuable as a space sensitive to a changing climate and as a frontier of Arctic research. As Wegge notes, this shift has been observed across the Arctic: "while during the Cold war the high north was important primarily because of its military strategic value, the recent surge might rather be explained by changes related to global warming and its consequences" (Wegge 2010, 1). In response to the various policy documents promoting science on Svalbard, the Svalbard Science Forum (SSF) was established in 1998, funded by the Norwegian government, to encourage Svalbard as an "international platform for research" by facilitating and coordinating research on the archipelago (The Research Council of Norway 1998a; 1998b; Hübner pers. comm. 2011).

A variety of research infrastructures and scientific institutions have been established in response to the rising importance of Arctic science in Norwegian policy. At Ny-Ålesund, the world's northernmost permanent settlement, the former mining town has been transformed into a centre for research. Though the state-owned King's Bay Company closed its mine at Ny-Ålesund in 1963, from 1974 the former mining company assumed responsibility for the operation of Ny-Ålesund and turned its attention to establishing a research station. The Norwegian Polar Institute had already established a scientific station at Ny-Ålesund in 1968. As owner of much of the land and buildings at Ny-Ålesund, the Kings Bay Company developed the old town infrastructure into a

'research village' that offered accommodations to scientists and provided logistical support. From 1989 Ny-Ålesund really came alive. One by one, year after year, nations from across the world began establishing research stations.²⁰ An "international scientific community" developed: the celebrated internationalism of the Svalbard Treaty manifest in the landscape (Paulsen pers. comm. 2011; Gislås pers. comm. 2011).

The development of Ny-Ålesund as a research base from 1989 onwards occurred alongside government efforts to normalise Longyearbyen and the development of a university there. Establishing an Arctic college or university on Svalbard "had long been a dream of biologists and geologists at the universities on the mainland" (Flå pers. comm. 2011). In 1992 the Norwegian government decided to establish a university centre specialising in contemporary Arctic-related environmental issues. In 1993, the University Centre of Svalbard (UNIS) was founded, and accepted its first students who studied in provisional premises at Longyearbyen. Reflecting on the development of UNIS, one government report notes that "the rate at which UNIS was established is without parallel in Norwegian - and probably international - university history" (Norwegian Ministry of Justice and Police 1999). Estimates suggest that over 1 billion Norwegian Kroner has been invested in Svalbard's research infrastructure between 1990 and 1999 alone (Norwegian Ministry of Justice and the Police 1999). The scientization of these Norwegian settlements dramatically illuminates the way scientific activity has revalorized Svalbard's minescapes.

²⁰ Stations were established in 1968 (Norway), 1989 (Norway and Sweden, a joint station), 1990 (Germany), 1991 (the United Kingdom), 1992 (Japan), 1995 (Norway and the Netherlands), 1996 (Norway), 1997 (Italy), 2001 (France), 2002 (Korea), 2003 (France and Germany, a joint station), 2004 (China) and 2008 (India).

The timing of Norway's scientization of Svalbard not only coincides with an intensified Norwegian Arctic research effort, but is linked to a range of other Norwegian objectives for the Arctic. Though Norwegian scientific agendas cast the Arctic as "a pristine natural laboratory for the field sciences" (Bravo and Sörlin 2002, vii)—and indeed the central motto of UNIS is 'nature as laboratory' (Arlov 2003)—the scientization of Svalbard's landscapes was far from an apolitical process, but rather heavily influenced by existing Norwegian territorial anxieties in the Arctic. As Jensen and Skedsmo assert, "the European Arctic is at the head of the Norwegian political agenda in a way that has not been since the Cold War" (Jensen and Skedsmo 2010, 439). One of many strategic plans that justify Norwegian research in the Arctic explains that:

As the only country that has possessions in the Arctic and also upholds territorial claims in Antarctica, Norway has a special responsibility for building up knowledge of the polar regions. Norway's objective is therefore to be a leading player in the investigation of its own Arctic land and sea territory and adjacent areas about which too little is known and where there are major research challenges (The Research Council of Norway 2004, 5).

Other documents on Norwegian 'High North' policy outline Svalbard's importance in similar terms: "Svalbard's geographical location means that it is of strategic importance for the management of our [Norwegian] resources in the North" (Norwegian Ministry of Foreign Affairs 2004, 22). Clearly, the development of scientific research institutions and infrastructures on Svalbard has been driven by geostrategic objectives as well as scientific ones.

This resurgence of interest in Arctic research not only fulfils scientific and geostrategic agendas, but occurred during a period in the 1990s in which the mining company Store Norske faced an uncertain future. As one employee of the Svalbard Science Forum explained: “The Norwegian government [was] seeking for platforms for other reasons to be here. And research is certainly one, an important one” (Hübner pers. comm. 2011). Another interviewee, who has worked at the University Centre since its opening, suggested that: “It was a political decision that even if mining was going down, the Norwegian government didn’t want less people, they wanted people, so they had to find something productive to do here in case mining was going down” (Flå pers. comm. 2011). Indeed, strategic research policies explicitly assert that research should use existing Norwegian settlements and new scientific infrastructures should complement each settlement to “keep people productive”²¹ (The Research Council of Norway 1998b; UNIS Annual Report 2011). More specifically, policy documents suggest that the development of scientific research complements normalisation efforts, providing a “socially useful investment and an important contributor to settlement and community life”²² (Norwegian Ministry of Justice and the Police 2008), and helps to maintain Norwegian sovereignty on Svalbard:

Norwegian research and Norwegian research bases are important means not only of meeting the obligations in the Svalbard Treaty with regard to preserving the region’s

²¹ Additionally, foreign institutions constructed within Norwegian settlements are considered Norwegian property (The Research Council of Norway 1998b).

²² This nationalist sentiment is also evident in documents produced by the Research Council of Norway, which state that: “the development of Svalbard as an international research platform depends to a large extent on the continued existence of a stable family community in Longyearbyen. This community will, in turn, be based primarily upon coal mining, research and tourism for the foreseeable future” (The Research Council of Norway 1998b).

characteristic wilderness, but also of upholding national interests and exercising sovereignty (Norwegian Ministry of Justice and the Police 1999, 1).

As with Store Norske, these objectives have been achieved through state-ownership of the Kings Bay Company and UNIS, which operate non-profit businesses selling scientific services while firmly rooting a sovereign Norwegian presence at Ny-Ålesund and Longyearbyen respectively. The Kings Bay Company is owned by the Norwegian Ministry of Trade and Industry, and is operated as a non-profit business whose “customers” are scientists that use its logistical services (Gisnås pers. comm. 2011). ‘State Ownership’ documents explain that government ownership of the Kings Bay Company is intended to help sustain and internationalize Norwegian scientific research on Svalbard through establishing Ny-Ålesund as an international scientific community (Ministry of Trade and Industry 2006; 2007). Though UNIS is owned completely by the Norwegian Ministry of Education and Research as a non-profit limited company, approximately 30% of UNIS’ funding derives from corporations (including Store Norske) who purchase consulting and logistical services from UNIS (Flå pers. comm. 2011). Thus, there is not only cooperation between scientific institutions and resource extractive corporations on Svalbard but a co-dependency between them which continues to sustain the mining geopolitical economy on Svalbard.²³ Through channelling state investment in scientific projects to existing Norwegian settlements on Svalbard, these settlements are strengthened in their role as material manifestations of Norwegian

²³ This might be described as a knowledge economy whereby scientific knowledge, technical services and products, and logistical support is produced for sale. These scientific activities provide trickle-down economic benefits to other enterprises in Longyearbyen, including food and clothing stores, accommodations and recreational facilities. The knowledge economy, however, is operated as state-owned businesses whose objectives are not driven by a profit-motive.

sovereignty on Svalbard. The recent scientization of Svalbard has not only supported the existing mining geopolitical economy – through extending the productivity of Svalbard’s minescapes, for instance – but UNIS and the Kings Bay Company work as a geopolitical-economic contingency should mining fail.

However, several recent documents produced by the Research Council of Norway suggest that Norway’s sovereignty claims possess a new economic and geopolitical importance under climate change. In these documents, the Arctic is valued simultaneously as a landscape needing environmental protection while cast as a landscape from which resources can be exploited in the future:

The challenges in the Arctic have assumed a new character. Formerly in the foreground of national security, the Arctic now lies at the point of intersection between large-scale industrial development and the preservation of Europe’s last remaining wilderness (The Research Council of Norway 1998a).

On the one hand, the potential impacts of climate change provide a rationale for protection of the Arctic ‘wilderness’, which justifies the proliferation of scientific research on Svalbard. On the other hand, the anticipated material transformation of the Arctic environment under climate change offers the possibility of opening new shipping routes and unlocking previously inaccessible natural resources in the north, which may provide economic opportunities to shipping, logistics and knowledge industries.²⁴ In its most recent report on Svalbard, the Norwegian Ministry of Justice and the Police

²⁴ This rhetoric is also evident in policy on the ‘Norwegian High North’, which underlines the economic, geopolitical, environmental and scientific importance of the Arctic. As a result, a ‘High North Commission’ was established in 2003 to provide coherent policy regarding Norwegian activities in the Arctic (Norwegian Ministry of Foreign Affairs 2004; 2006; 2009).

recognised that "...an increasingly ice-free Arctic Ocean could also open up new routes for international shipping between East and West" (Norwegian Ministry of Justice and the Police 2008). The shortest route through the Arctic Ocean to the Bering Strait, from the large cargo ports on the European continent, pass just west of Svalbard. Describing this potential "development boom in the north," Store Norske Chief Executive Robert Hermansen wrote in an annual report:

With our 100 years' experience of logistics and operations at inaccessible Arctic areas such as Svea, Store Norske is well equipped for taking on new challenges. In the years ahead, we will expect to enjoy substantial demand for the development and use of Arctic technology and experience in Svalbard-based coal and oil exploration activities. Our experience of environmentally safe operations in the north is also expected to become a valued asset (Store Norske Annual Report 2005, 5).

Government policy documents suggest that Store Norske's knowledge of operating in the Arctic could be "exploited" for research by UNIS – useful in particular for the development of oil and gas industries in the Barents Euro Arctic Region (The Research Council of Norway 1998b). Indeed, the Technology Department at UNIS first developed out of a necessity to provide practical solutions to infrastructural and operational challenges on Svalbard (Arlov 2003). The shifting materialities of and discourses surrounding climatic change may revalorize Svalbard's minescapes after mining has ceased, allowing Store Norske and UNIS to profit from Svalbard's geostrategic position within the warming Arctic (The Research Council of Norway 1998b; 2004; Norwegian Ministry of Justice and the Police 2008). The development of scientific research and

education activities on Svalbard is clearly driven by interlocking capitalist and territorial logics of power.

All of this suggests that, while anticipated climatic change may offer economic opportunities to Store Norske and UNIS, this new economic activity depends on the maintenance of Norwegian sovereignty on Svalbard. Once established, this economic activity will facilitate the Norwegian government in “keeping people productive” to consolidate sovereignty claims. These coupled economic and geopolitical imperatives may extend the longevity of Store Norske’s operations, and permit the reuse Svalbard’s minescapes for alternate purposes. This complicated configuration of cause and effect reveals the on-going entanglement of economic and geopolitical productions of Svalbard’s minescapes, reinforcing the utility of a geopolitical-economic analysis.

In sum, from 1989 onwards a number of scientific facilities and institutions developed on Svalbard using existing mining infrastructures. Though Norwegian involvement in Arctic science has increased alongside the rising prominence of Arctic issues relating to climatic change, the development of science on Svalbard is shaped by territorial anxieties and assists mining in achieving geopolitical objectives. Like Store Norske, the Kings Bay Company and UNIS are key components of Svalbard’s geopolitical economy, operating as state-owned businesses that achieve geopolitical objectives. Though state subsidization of Store Norske was withdrawn in 2002, the state has instead invested in the development of scientific facilities which act as a geopolitical-economic contingency should mining fail. These scientific institutions mirror and support the geopolitical-economic work that historical and contemporary mining does to maintain

Norwegian sovereignty on Svalbard. Svalbard's geographic location in the High Arctic continues to make the (scientized) minescape geostrategically and economically valuable into the future, possibly providing an emerging impetus for strengthening Norwegian sovereignty over Svalbard.

2.6 Conclusion

The beginning of this paper painted an image of the Arctic landscape as a space of wilderness, pristineness, and marginality. Though romanticized, these images have been used to support notions that the Arctic may soon be subjected to irreversible and devastating environmental transformation. When I first visited Svalbard in September 2009, for instance, the Secretary-General of the United Nations Ban Ki-Moon described the Arctic as a vulnerable landscape susceptible to catastrophe, as he stood on Svalbard's polar ice rim to draw the world's attention to the impacts of climate change. As the Arctic is increasingly impacted by, and connected to global climate change, global capital and international politics, Svalbard looks set to continue to be an important Arctic site owing to its economic, environmental and geopolitical significance.

Through investigating the contemporary ways in which Svalbard's minescapes have been both produced and productive, this paper has extended existing historical analysis, using key-informant interviews and documentary evidence, to answer two questions concerning the contemporary mining geopolitical economy on Svalbard. The first asked how capitalist productions of coal and landscape are shaped by Arctic geopolitics. This paper has recognised that Svalbard's minescapes were not only

productive as spaces of coal extraction, but were productive in terms of reproducing Norwegian sovereignty shaped by interlocking capitalist and territorial logics of power. Historians have suggested that mineral exploitation by Store Norske was, from the outset, framed by geopolitical imperatives and intrinsically tied to Svalbard's geographic position in the Arctic. These activities were not solely incidental to the geo-logic location of coal on Svalbard or driven by a profit-motive, but fulfilled geopolitical objectives as well. Despite being prone to global commodity price fluctuations and high operating costs (among other economic pressures), Store Norske continues to operate and the Norwegian state has been instrumental in subsidizing unprofitable mining as a means of securing sovereignty on Svalbard. Until very recently, Store Norske was not a profitable enterprise, nor was its sole goal "accumulation for accumulation's sake; production for production's sake" (Marx 1952, 294), but rather coal production offered a method of maintaining Norwegian sovereignty on Svalbard by "keeping people productive".²⁵ So, Svalbard's minescapes are not only valuable by virtue of the material commodities they produce, but function as material manifestations of Norwegian sovereignty. However, this is not to say that the geopolitical function of mining is discrete and separate from its economic imperative, but rather, they are co-dependent and their outcomes are co-produced. This co-production of economic commodities and geopolitical imperatives, and

²⁵ As noted in the introduction, this paper has focussed on Norwegian activities and settlements on Svalbard for practical and logistical reasons. Nonetheless, the arguments presented in this paper largely reflect the status of Russian mining as well. Similarly to Store Norske, the two most recently operational Russian mines – Pyramiden and Barentsburg – were state-owned by Trust Arktikugol. Though Pyramiden closed in 1999, the Trust operates tours around the town and is redeveloping the hotel to be reopened in the future. Barentsburg continues to be operational, and is also being developed as a scientific research base by the Trust.

of the capitalist and territorial logics of power, is a key characteristic of Svalbard's mining geopolitical economy.

The paper also investigated how geopolitical objectives have extended the productivity of Svalbard's minescapes. This paper suggests that operational and closed minescapes have acted as platforms for economic diversification as scientific research has made use of these mining infrastructures, to revalorize and extend the lifespan of Svalbard's mining spaces. Alongside material infrastructures already in place, a number of policies and discourses assisted the development of science on Svalbard. Just as Arctic field sciences have historically acted as a means of knowing colonial frontiers, and scientists have acted as "witnesses of sovereignty and truth" (Bravo and Sörlin 2002, 18; see also Launius 2010),²⁶ material manifestations of science on Svalbard strengthen Norway's sovereignty claims over the archipelago. Driven by historically persisting geopolitical imperatives and stabilized by emerging discourses around climatic change, Svalbard's geostrategic location in the Arctic has both an economic and geopolitical importance, which revalorizes Svalbard's minescapes and demonstrate the on-going geopolitical-economic functions Svalbard's mining spaces fulfil.

By focusing on the geographic importance of Svalbard's position in the Arctic – from its role in expanding the influence of newly independent Norway, to its potential role in future Arctic shipping and logistics industries – we see how the character of capitalist production is determined by the geographic particularities of place, and its

²⁶ The proliferation of scientific programs in the Arctic is a well-documented way of offsetting anxieties over sovereignty (Powell 2007; 2008; Howkins 2010).

geopolitical significance. On Svalbard capitalist production does not just result in the production of commodities for circulation and exchange, but also involves the co-production of physical landscapes which perform as material expressions of Norwegian sovereignty. This geopolitical economy has been maintained by state-supported enterprises (in the mining and research sectors) whose objectives are not just profit-driven but often geopolitically-motivated. Svalbard's geopolitical economy provides important insight into the connectedness of economic and geopolitical objectives at historical and contemporary Arctic resource development projects.

2.7 Chapter 2 Bibliography

Primary Sources and Government Documents

- Bjørnsen, H. and Johansen, S. (2010) *Samfunns – og næringsanalyse for Svalbard 2010*. NIBR Rapport 2010.
- Carlsen, T. pers. comm. (2011a) Interview with Terje Carlsen (Head of Communications at Store Norske), 15th July 2011.
- Carlsen, T. pers. comm. (2011b) Email Correspondance with Terje Carlsen (Head of Communications at Store Norske), 19th September 2011.
- Flå, H. pers. comm. (2011) Interview with Helen Flå (Assistant Director of the University Centre of Svalbard), 13th July 2011.
- Gisnås, H. pers. comm. (2011) Interview with Halvar Gisnås (Research Advisor at the Kings Bay Company), 14th July 2011.
- Hübner, C. pers. comm. (2011) Interview with Christiane Hübner (Svalbard Science Forum), 12th July 2011.
- Norwegian Ministry of Foreign Affairs (2009) *New Building Blocks in the North: the next step in the Government's High North Strategy*. [Accessed October 2011 from: http://www.regjeringen.no/upload/UD/Vedlegg/Nordomr%C3%A5dene/new_building_blocks_in_the_north.pdf]

- Norwegian Ministry of Foreign Affairs (2006) *The Norwegian Government's High North Strategy*. [Accessed October 2011 from: <http://www.regjeringen.no/upload/UD/Vedlegg/strategien.pdf>]
- Norwegian Ministry of Foreign Affairs (2004) *Opportunities and Challenges in the North*. Report No. 30. (2004-2005) to the Storting. [Accessed October 2011 from: http://www.regjeringen.no/upload/kilde/ud/stm/20042005/0001/ddd/pdts/stm20042005001ud_dddpts.pdf]
- Norwegian Ministry of Justice and the Police (1999). *Svalbard*. Report No. 9 to the Storting (1999-2000) [Accessed October 2011 from: <http://www.regjeringen.no/en/dep/jd/Documents-and-publications/Reports-to-the-Storting-White-Papers/Reports-to-the-Storting/19992000/report-no-9-to-the-storting-.html?id=456868>]
- Norwegian Ministry of Justice and the Police (2008). *Svalbard*. Report No. 22 to the Storting (2008-2009) [Accessed October 2011 from: <http://www.regjeringen.no/nb/dep/jd/dok/regpubl/stmeld/2008-2009/stmeld-nr-22-2008-2009-/2.html?id=554890>]
- Norwegian Ministry of Trade and Industry (2006) *The State's Ownership Report 2006*.
- Norwegian Ministry of Trade and Industry (2007) *The Government's Ownership Policy 2007*.
- Paulsen, B. pers. comm. (2011) Interview with Bodil Paulsen (Directorate of Cultural Heritage), 15th July 2011.
- Prestvold, K. (2003) *Isfjorden*. Governor of Svalbard, Environment Section.
- Sandodden, I. S. pers. comm. (2011) Interview with Irene Skauen Sandodden (Cultural Heritage Advisor, Governor's Office), 14th July 2011.
- Store Norske Spitsbergen Kulkompani AS (2010) *Annual Reports and Account 2010*.
- Store Norske Spitsbergen Kulkompani AS (2009) *Annual Reports and Account 2009*.
- Store Norske Spitsbergen Kulkompani AS (2008) *Annual Reports and Account 2008*.
- Store Norske Spitsbergen Kulkompani AS (2007) *Annual Reports and Account 2007*.
- Store Norske Spitsbergen Kulkompani AS (2006) *Annual Reports and Account 2006*.
- Store Norske Spitsbergen Grubekompani AS (2005) *Annual Reports and Account 2005*.

Store Norske Spitsbergen Grubekompani AS (2004) *Annual Reports and Account 2004*.

The Research Council of Norway (2004) *Policy platform document for Norwegian Research in the Arctic 2004-2008*. [Accessed October 2011 from: http://www.forskingsradet.no/CSStorage/Flex_attachment/Arcticpolicy.pdf]

The Research Council of Norway, Environment and Development Division (1998a) *Strategic plan for Norwegian research in the Arctic* [Accessed October 2011 from: http://www.forskingsradet.no/bibliotek/publikasjoner/strat_arktis_engelsk/index.html]

The Research Council of Norway, Environment and Development Division (1998b) *Strategy for development of Svalbard as a research platform* [Accessed October 2011 from: http://www.forskingsradet.no/bibliotek/publikasjoner/strat_svalbard_engelsk/index.html]

The Mining Code (the mining regulations) for Spitsbergen (Svalbard), laid down by Royal Decree of 7 August 1925 as amended by Royal Decree of 11 June 1975. [Accessed April 2011 from: <http://www.syssemmannen.no/hovedEnkel.aspx?m=45304>]

Treaty between Norway, The United States of America, Denmark, France, Italy, Japan, the Netherlands, Great Britain and Ireland and the British overseas Dominions and Sweden concerning Spitsbergen signed in Paris 9th February 1920. [Accessed May 2011 from: www.syssemmannen.no/The_Svalbard_Treaty_9ssF]

UNIS (2011) *UNIS Annual Report* [Accessed May 2012 from: http://www.unis.no/30_ABOUT_UNIS/4010_Root/documents/annual_report_2011/UNIS_annual_report_2011.pdf]

Works Cited

Agnew, J. and Corbridge, S. (1989) "The dynamics of geopolitical disorder" 266–288. In Johnston, R.J. and Taylor P.J. (eds.) *A World in Crisis? Geographical Perspectives*, (2nd edn.). Blackwell: Cambridge.

Allen, J. (2003) *Lost Geographies of Power*. Blackwell: Oxford.

Anderson, A. (2009) *After the Ice: Life, Death, and Geopolitics in the New Arctic*. Harper-Collins: New York.

Andreassen, E., Bjerck, H. and Olsen, B. (2010) *Persistent memories: Pyramiden – a Soviet mining town in the High Arctic*. Tapir Academic Press.

- Arlov, T.B. (2003) *Universitetet pa tundraen: UNIS 1993-2003*. UNIS: Svalbard.
- Arlov, T.B. (1994) *A Short History of Svalbard*. Norsk Polarinstitutt: Oslo.
- Åtland, K. & Pedersen, T. (2008) The Svalbard Archipelago in Russian Security Policy: Overcoming the Legacy of Fear - or Reproducing It? *European Security* 17 (2): 227-251.
- Avango, D., Hacquebord, L., Aalders, Y., De Haas, H., Gustafsson, U. and Kruse, F. (2011) Between markets and geo-politics: natural resource exploitation on Spitsbergen from 1600 to the present day. *Polar Record* 47 (240):29-39.
- Bravo, M. and Sörlin, S. (2002) *Narrating the Arctic: A Cultural History of Nordic Scientific Practices*. Science History Publications: USA.
- Brown, R., Dorius, S. and Krannich, R. (2005) The Boom-Bust Recovery Cycle: Dynamics of Change in Community Satisfaction and Social Integration at Delta, Utah. *Rural Sociology* 70 (1): 28-49.
- Corbridge, S. and Agnew, J. (1991) The United States Trade and Budget Deficit in Global Perspective – An Essay in Geopolitical-Economy. *Environment and Planning D: Society and Space* 9 (1): 71-90.
- Dodds, K. J. and Sidaway J. D. (1994) Locating critical geopolitics. *Environment and Planning D: Society and Space* 12 (5): 515 – 524.
- Foucault, M. (2007) *Security, Territory, Population*. Lectures at the College de France 1977-78. Palgrave Macmillan: New York.
- Glassman, J. (2011) The Geo-political Economy of Global Production Networks. *Geography Compass* 5: 154-164.
- Hacquebord, L. and Avango, D. (2009) Settlements in an Arctic Resource Frontier Region. *Arctic Anthropology* 46 (1-2): 25-39.
- Hartnell, C. (2009) *Arctic Network Builders: The Arctic Coal Company's Operations on Spitsbergen and its Relationship with the Environment*. PhD Thesis in Industrial Heritage and Archaeology, Michigan Technological University.
- Harvey, D. (2003). *The New Imperialism*. Oxford University Press: Oxford.
- Howkins, A. (2010) 'Science, Environment and Sovereignty: The International Geophysical Year in the Antarctic Peninsula Region' in Launius, R., Fleming, J. R. and

DeVorkin, D. (eds.) *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years*. Palgrave Macmillan: New York.

Jensen, L. and Skedsmo, P. (2010) Approaching the North: Norwegian and Russian foreign policy discourses on the European Arctic. *Polar Research* 29: 439-450.

Johnson, L. (2010) The fearful symmetry of Arctic climate change: accumulation by degradation. *Environment and Planning D: Society and Space* 28: 828-847.

Jones, M. (2008) Swedish Scientific Expeditions to Spitsbergen, 1758-1908. *Tijdschrift voor Skandinavistiek* 29 (1-2): 219-234.

Jones, M. (2001) *The Endless Utility of Spitsbergen: patterns of usage from 1596 to 1920*. MSc Research in Scandinavian Studies, Edinburgh University.

Kruse, F. (2011) 'Four former British mining settlements on Spitsbergen' *Mining Perspective: the 8th International Mining History Congress 2009*.

Launius, R., Fleming, J. R. and DeVorkin, D. (2010) *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years*. Palgrave Macmillan: New York.

Launius, R. (2010) 'Toward the Poles: A Historiography of Scientific Exploration during the International Polar Years and International Geophysical Year' in Launius, R., Fleming, J. R. and DeVorkin, D. (eds.) *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years*. Palgrave Macmillan: New York.

Le Billon, P. (2004) The Geopolitical Economy of 'Resource Wars'. *Geopolitics* 9 (1): 1-28.

Lewander, L. (2010) 'Swedish polar policies from the first International Polar Year to the present' in Launius, R., Fleming, J. R. and DeVorkin, D. (eds.) *Globalizing Polar Science: Reconsidering the International Polar and Geophysical Years*. Palgrave Macmillan: New York.

Machowski, J. (1995) Scientific activities on Spitsbergen in the light of the inertantional legal status of the archipelago. *Polish Polar Research* 16 (1-2): 13-35.

Mathisen, T. (1954a) *Svalbard in International Politics 1871-1925: The Solution of a Unique International Problem*. Norske Polarinstitutt: Oslo.

Mathisen, T. (1954b) *Svalbard in the Changing Arctic*. Gyldendal Norsle Forlag: Oslo.

Marx, K. (1952) *Capital*. Encyclopaedia Britannica Inc: Chicago.

- Mercille J. (2008) The radical geopolitics of US foreign policy: geopolitical and geoeconomic logics of power. *Political Geography*, 27 (5): 570-586.
- Østreg, W. (1978) *Politics in High Latitudes: The Svalbard Archipelago*. McGill-Queen's University Press: Montreal.
- Pedersen, T. (2009) Norway's rule on Svalbard: tightening the grip on the Arctic islands. *Polar Record* 45 (233): 147-152.
- Powell, R.C. (2008) Becoming a geographical scientist: oral histories of Arctic fieldwork. *Transactions of the Institute of British Geographers*, 33(4): 548-565.
- Powell, R.C. (2007) "The rigours of an Arctic experiment": the precarious authority of field practices in the Canadian High Arctic, 1958-1970. *Environment and Planning A*, 39 (8): 1794-1811.
- Prestvold, K. (2003) *Isfjorden*. Governor of Svalbard, Environment Section.
- Ulfstein, G. (1995) *The Svalbard Treaty: From Terra Nullius to Norwegian sovereignty*. Scandinavian University Press: Oslo.
- Viken, A. (2006) 'Svalbard, Norway' in Baldacchino, G. (ed.) *Extreme Tourism: Lessons from the World's Cold Water Islands*. Elsevier: Oxford.
- Wegge, N. (2011) The political order in the Arctic: power structures, regimes and influence. *Polar Record*, 47: 165-176.
- Wråkberg, U. (2009) 'IPY Field Stations: Functions and Meanings' in Shadian, J. M. and Tennberg, M. (eds.) *Legacies and Change in Polar Sciences: Historical, Legal and Political Reflections on the International Polar Year*. Ashgate Publishing: Farnham.
- Wråkberg, U. (2006) Nature Conservationism and the Arctic Commons of Spitsbergen 1900-1920. *Acta Borealia* 23 (1): 1-23.

CHAPTER 3

PRODUCING A HIGH ARCTIC EXPERIMENT: THE DEVELOPMENT AND CLOSURE OF THE NANISIVIK MINE

Abstract

As the first mine to operate within the Arctic Circle in Canada at the time of its opening in 1976, the Nanisivik mine was cast as an experimental project designed to test the feasibility of mining in the High Arctic. Accordingly, the Canadian government hoped that Nanisivik would pioneer new technologies, provide wage employment opportunities to the Inuit of north Baffin Island, and help secure Canadian sovereignty in the north. Through narrating the historical development of this unique mine project using historical and contemporary documentary evidence, the first part of this paper suggests that Nanisivik's establishment functioned as much as an expansion and enforcement of government objectives for the north as it was an economic project intended to produce profitable ores. The second part of this paper suggests that, after the closure of this pioneer project in 2002, the seemingly 'post-productive' minescape was in fact a site of the production of scientific knowledge and valuations of the cost of reclamation. In dealing with the legacies of mining at Nanisivik, the minescape continued to function as a space of experimentation as scientific knowledge about the environment was produced to inform reclamation efforts. Together, these two arguments question the idea that mines simply function as economic ventures with a linear lifespan. Instead, the Nanisivik mine

illustrates how production can be politically-motivated and continue beyond the economic lifespan of a mine.

3.1 Introduction

In 1976 a new mine began production on the northern tip of Baffin Island in the Canadian High Arctic – a location that experiences complete darkness from late November until early February and an average temperature of -29°C in January. Located 750km north of the Arctic Circle (see Figure 7), the Nanisivik lead-zinc mine opened by Mineral Resources International (MRI) was the first mine north of the Arctic Circle and northernmost mine in Canada at the time of its establishment. The purpose-built townsite constructed on Strathcona Sound, some 25km from the Inuit community of Arctic Bay, was financially supported by the Canadian government in the hope that this pioneering project would serve as an experiment to test the feasibility of operating in the High Arctic, and pave the way for mining across Canada's northern resource frontier. This experiment proved successful: the Nanisivik mine profitably operated for twenty-six years until its closure in 2002 and typically employed a workforce of 200 people. As the vice-president of CanZinco Ltd. (the current owner of the Nanisivik property) explained in one public hearing:

...one of the visions was that this would be a pilot project. It may not be successful, but if it was, what a wonderful way to find out if we could do natural resource exploitation in the north. In 2007, there was \$1-and-a-half billion that came through the north in mining, and Nanisivik was the first one north of the Arctic Circle and a pioneer breaking the way for all those others that have followed (Bob Carreau in NWB 2009, 18).

For the first owners of Nanisivik, MRI, the products of this mine were economically valuable lead-zinc concentrates. In contrast, the government “saw benefit in the [Nanisivik] project as a ‘pioneer project’ that without setting precedents might enable large scale experimentation in Arctic mining techniques and transportation” (Hickling-Partners 1981, 6). Like previous Inuit employment at the Rankin Inlet Nickel Mine and at the DEW (Distant Early Warning) line, the government also hoped that Nanisivik would introduce some Inuit residents in the Baffin region to wage-labour in an industrial setting for the first time. As this quote suggests, the Nanisivik venture was not just driven by profitability alone but was also developed to achieve various government objectives.

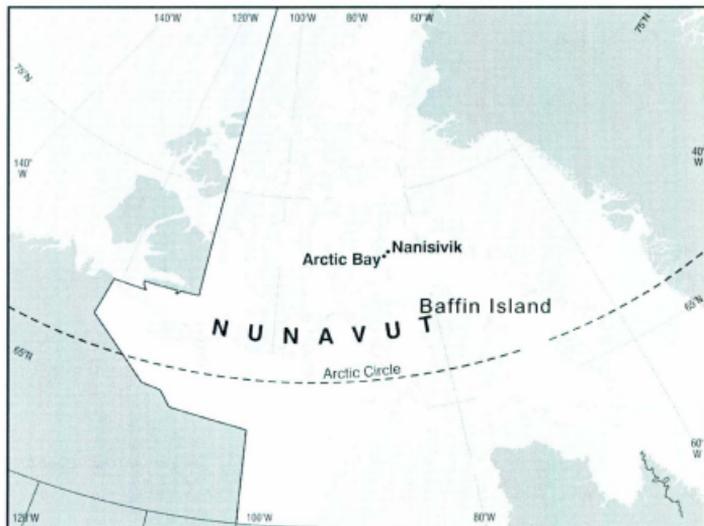


Figure 7. Nanisivik is located on north Baffin Island in the Canadian High Arctic. Map courtesy of Charlie Conway, Memorial University.

After the closure of the mine in 2002, CanZinco and the Government of Nunavut worked with the community of Arctic Bay on a closure and reclamation plan for Nanisivik, as part of their commitment to forge a positive legacy to conclude this Arctic experiment. Newspapers documenting this process reveal something intriguing about Nanisivik's closure (Nunatsiaq Online 2002a; 2002b; 2003). While the mine had closed and its production stopped, newspaper stories written by Nunavut's territorial newspaper *Nunatsiaq News* illustrate ways in which Nanisivik continued to be valued, and how these valuations were contested by CanZinco, the government and the community. Huge valuations were suggested (and contested) by each party: \$29.5 million in one instance, \$9.1 million in another instance, before settling on \$17.6 million. These valuations were estimations of the cost of reclamation. The closed Nanisivik minescape had become a hive of new activity that produced scientific knowledge to inform valuations of the cost of reclamation, which were subject to dispute between CanZinco (as payee of the reclamation) and the Government of Nunavut (as regulator of the reclamation). The most fascinating aspect about this production process is that this knowledge-making embodied scientific authority and neutrality that was used to assert the cost of reclamation by these different parties. Despite appearing to be an economically worthless post-productive space — as popularly imagined of closed mines — these newspaper articles suggested ways in which the minescape was a site of the production of both scientific knowledge and valuations of the cost of reclamation.

At a time when the production of industrial commodities in Canada's north is intensifying, the story of Nanisivik's establishment and closure highlights the historical-

geographical production processes, actors and geopolitical-economic imperatives at play at different stages of mining (and post-mining) in the Arctic. In particular, this paper investigates two key themes that emerge from Nanisivik's operation and closure. First, as a pioneering project designed to produce technical innovations, develop shipping in the north, and secure Canadian sovereignty in the Arctic, this paper evaluates how the Nanisivik mine was co-productive in fulfilling both economic and political functions during its operation. Second, this paper examines how the seemingly degraded and devalued minescape became a site of on-going production and valuation amid efforts to offset the impact of mining after closure. Rather than conceiving production at Nanisivik as a linear economic process, this paper tells an alternate story about the life of a mine – a story that has multiple points of departure from traditional narratives of mining lifecycles that view mineral production as an economic process. As the first Canadian mine located north of the Arctic Circle, the story of Nanisivik provides important insight into the interlocking economic and political functions mineral production fulfils, and the complex, often contentious, environmental, cultural, economic and political legacies of such ventures in the Arctic.

This story uses research from a variety of contemporary and archival documents relating to the opening, closure and reclamation of the Nanisivik mine. Alongside an array of historical archival documents and reports, a collection of over 1,000 separate contemporary documents regarding Nanisivik's reclamation and closure were obtained from the Nunavut Water Board (NWB) public registry. Throughout its operation, the mine held three licences with the Northwest Territories Water Board and the Nunavut

Water Board after the creation of Nunavut in 1999, and these licences detailed the conditions of the mine's operation and reclamation. The Nunavut Water Board was also the primary government body responsible for overseeing reclamation of the Nanisivik mine, and the Board collected all documents relating to closure and reclamation activities at Nanisivik. As part of the Northwest Territories Waters Act,²⁷ the water board is obliged to maintain a public register of all documents pertaining to each water licence, supporting documents, public hearings, reports and correspondence (Smith 2002). This registry thus represents a relatively complete collection of official documents that have been used to understand the mine's reclamation in detail. These contemporary archives document the opinions of the government, mine company and community, rooted in the historical and geographical circumstances at a given moment in time. For instance, the Nunavut Water Board public registry contains public hearing transcripts where the views of community members are captured. Although all archives (and readings of archives) are widely acknowledged as problematic repositories of 'facts', shaped and ordered according to particular institutional norms and practices (Ogborn 2003), these documents are useful in providing detailed insights into events surrounding the reclamation of Nanisivik.

Through an analysis of this archival and contemporary material, this paper narrates the establishment of the Nanisivik mine and examines the reasons for the mine's development. This paper suggests that Nanisivik was intended not only to produce valuable concentrates but to generate social, scientific and technical products in accordance with government objectives and as part of the mine's experimental character.

²⁷ Though the territory of Nunavut formed in 1999, The Northwest Territories Waters Act continues to apply to Nunavut until it is replaced.

I describe this as an example of a *geopolitical economy*, whereby the Nanisivik mine was designed to be *co-productive* of both capital and the Canadian state. This paper then describes the closure of the mine and deploys the idiom of co-production a second time to explain the co-production of scientific knowledge of reclamation and valuations of the cost of reclamation, and suggest this demonstrates the *on-going-ness* of production after the mine closed. First, however, I briefly explain how these arguments contest traditional narratives of mining lifecycles and introduce the idiom of co-production.

3.2 Rethinking Mining Lifecycles: Towards an Account of Co-production

Mineral extractive activities are considered critical to the economies of Canada's north. In 2002, Indian and Northern Affairs Canada (INAC) estimated that the cumulative value of metal and mineral production for the three territories since 1977 was over \$18 billion, a figure rapidly growing as a result of a mining boom in Canada's north (INAC 2002; see also Waldie and Sopinski 2011; Nunatsiq News 2012; Postmedia News 2012). New mining projects in the north, such as the proposed Mary River mine on Baffin Island, are often endorsed as ventures that promote economic development on Canada's resource frontier (Waldie and Sopinski 2011). Such mines are often conceived by mining companies, governments and economists to operate according to linear lifecycles – with a distinct start and end to their lives – dictated by economic and geological factors.²⁸ These mines open with the intention of producing economically valuable commodities sold on the capitalist market to generate a profit, but this production process necessarily depletes

²⁸ See Homer Aschmann's 'natural history of a mine' (1970) for more detail on this schema; see also Richards 2009.

ore reserves while generating wasteful (as well as useful) materials, degraded landscapes and damaged communities as a by-product – often recognised as ‘strong contradictions’ inherent to the production process – which can impact profitability, or even prompt mine closure (Bridge 2000; 2004). These mining lifecycles may be particularly evident in the Arctic, at sites far from the centres of capital and at locations where operating costs are high.

As Canada’s first mine north of the Arctic Circle, the Nanisivik mine was seen as a test of capital’s feasibility in the Canadian north, and mine closure was considered to be a natural and inevitable outcome of the mine’s lifecycle. After the closure of Nanisivik in 2002, for instance, the Vice President of Environment and Sustainability at CanZinco Resources Bob Carreau presented closure as an inevitable milestone in the lifecourse of the mine:

Unlike many businesses where closure often means failure, closure of a mine is, in fact, a measure of success. It means that you have gone through all the stages of a mine, and you have reached closure and reclamation, at least a plan in closure and reclamation. If you didn't do that, you would be doing abandonment, and that's not the case with Nanisivik. We have reached this final stage, closure and reclamation, it is a measure of success... Now, as we enter the final stage of the project, we culminate the success with the closure of the mine and the townsite. Closing a mine is never a happy event. And in the case of Nanisivik where this means the community will cease to exist, it is that much harder. However, as stated at the outset of this introduction, the closure of the mine is inevitable, and planned reclamation, it is the final milestone of that achievement (Bob Carreau in NWB 2004a, p13-16).

Much like Homer Aschmann's 'natural history of a mine' (Aschmann 1970), Carreau reinforced the popular idea that the 'life' of the mine was characterized by pre-productive, productive and post-productive phases, and suggested that closure was a normal feature of production, a measure of the mine's success. Production, in this sense, followed a linear lifecycle determined by economic and geological variables.

However, a close examination of the historical-geographical story of Nanisivik reveals that the lifecycle of the lead-zinc mine was far from linear. This paper mobilizes the idiom of co-production (Jasanoff 2006) using a political economy perspective to illustrate this argument in two ways. First, this paper suggests that Nanisivik was established as a prototype project designed to not only produce valuable ores but fulfil a variety of geopolitical-economic objectives including the provision of employment for Inuit on north Baffin Island, the development of the Canadian shipping sector, and the maintenance of Canadian sovereignty and security in the north. I use the term 'geopolitical economy' to capture the interlocking capitalist and territorial logics of power at play at Nanisivik, and evaluate how the mine was designed to be co-productive of both capital and the state (Harvey 2003).

Second, I suggest that in the mine's 'post-productive' phase, the closed minescape continued to be a site of the co-production of scientific knowledge and valuations of the cost of reclamation. I suggest that scientific activity charged with informing the cost of reclamation for this high-profile pioneer mine was important in dealing with the environmental legacies induced by the opening and operation of Nanisivik. I discuss how this involved generating objective, authoritative and neutral knowledge that was used to

legitimize different claims about the environment and verify contesting valuations of the cost of reclamation. Drawing from the idea that knowledge-making is connected to production processes – whether it be through the production of nature (Smith 2008) or the production of states (Jasanoff 2006) – the idiom of co-production is used to describe how scientific knowledge and economic valuations of the environment were co-produced, as efforts to legitimize the authority of scientific knowledge on reclamation concurrently legitimized economic valuations of the Nanisivik minescape.

Together, these arguments contest notions that mines simply generate valuable commodities following a linear lifecycle, after which closed mine sites are no longer productive or valuable. By mobilizing the idiom of co-production, this paper illustrates a more complex conceptualization of production that pays attention to the ways the multiple and interconnected ways the Nanisivik mine was productive of capital, state territory, geopolitical objectives, and scientific knowledge, throughout its ‘lifespan’ and beyond. Given the recent expansion of industrial ventures in the circumpolar north, these concepts are important in highlighting the multiple interlocking functions commodity production in the Arctic fulfils, and the legacies of such ventures at sites of cultural, geopolitical and environmental importance in the circumpolar north. The following two sections use empirical evidence drawn from a variety of archival and contemporary documentary material to narrate the development and closure of the Nanisivik mine, and substantiate these theoretical assertions.

3.3 Historical Development of Mining at Nanisivik

The history of the Nanisivik mine is characterized by significant government influence throughout the mine's operation, driven by a desire to use Nanisivik as an experiment to test the feasibility of resource development in the Canadian Arctic. The Nanisivik mine, considered to be a potentially lucrative venture for the mine company Mineral Resources International (MRI), was financed with state support in the form of non-recoverable grants and loans. The government's financial backing was granted on the basis that Nanisivik would strengthen Canadian industry, consolidate state power in the north and test the feasibility of operating in the Arctic. By highlighting the government's motives for financially supporting Nanisivik's establishment using archival evidence, this section suggests argues that Nanisivik was intended to function as much as an expansion and enforcement of government objectives for the north as it was an economic project - a geopolitical-economic venture designed to co-produce capital and the state.

Amid a post-war economic boom and an increased Cold War demand for industrial minerals, the Nanisivik mine established at a time when the federal government was instrumental in the development of mineral extractive activities across Canada,²⁹ and particularly influential in facilitating mineral exploration and development projects in the Canadian north (McAllister 2007). From the end of the Second World War, the Department of Mines and Resources deployed increasing numbers of field parties to survey the north (Department of Mines and Resources 1947), and its Geographic Bureau

²⁹ McAllister notes that from 1880-1980 the Canadian government heavily promoted and invested in mineral industries across Canada – in part, to build an industrial economy that could rival Europe's (McAllister 2007).

later took aerial photographs of the Arctic islands as a way to assess the feasibility of operating in the Arctic (Department of Mines and Resources 1948). As fieldwork was time-consuming and expensive, the first use of helicopters in ‘operation Keewatin’ increased the surveying capacity by 30 times (Department of Mines and Technical Surveys 1953). This mineral exploration and development effort intensified in the late-1950s, when the Conservative Prime Minister John Diefenbaker promoted the idea that Canada’s future prosperity hinged on the development of the north (Damas 2002). The exploitation of natural resources in Canada’s north was a central tenet of this ‘northern vision’, and a feature that fuelled nationalist concerns over Canada’s sovereignty in the north (Grant 2010). Schemes such as ‘Roads to Resources’, the ‘Remote Airports Program’ and the ‘Prospector’s Assistance Program’ were implemented to assist the exploration and development of resources in the north, in accordance with Diefenbaker’s ‘vision’.³⁰

A number of mining mega-projects sprang up across the Canadian north, and by 1974, the mining industry reportedly contributed more than \$70 million to the economies of the Yukon and Northwest Territories, while paying over \$7 million in royalties to the federal government (Department of Indian Affairs and Northern Development 1974). Compared to 1960, the value of mineral production in the Northwest Territories increased 1,238% while in the Yukon it increased 742%. Over the same period, mineral production

³⁰ The Remote Airports Program, for instance, was designed to provide northern communities with the same service and facilities found at southern airports. Like the Roads to Resources program, the Remote Airports Program utilized local and native labour, thus providing an income to northern communities (Department of Indian Affairs and Northern Development 1974). For mining developments alone, a total of \$800000 was made available annually for airstrip construction in the Northwest Territories in 1961, and the government was prepared to pay up to one half of the cost of an airstrip (Department of Northern Affairs and National Resources 1961).

rose by 470% in Canada as a whole, illuminating the economic significance of northern mining projects and their rapid growth (ibid.).

This mineral development frenzy occurred not only during a favorable political and economic climate, but at a time when mining was positioned as a method of solving social and economic problems in the north (Sandlos and Keeling 2012; see also Damas 2002). After the Second World War, the government adopted an increasingly paternalistic stance to improving the well-being of indigenous northerners in response to the ‘Caribou Crisis’, a rapidly growing population, and the increasingly inhumane living conditions experienced by the Inuit³¹ (Damas 2002). Welfare state policy extended federal social programs to the north, focussing on the provision of housing, medical and educational services, and financial services for northern indigenous residents (Gibson 1978; Dickerson 1992). The state also looked to secure employment opportunities for Inuit in construction projects, such as the DEW line in the 1950s, but these opportunities were few in number, often short-lived and had negative cultural impacts (Duffy 1988; Farish 2006). One report produced by the government of the Northwest Territories suggested that Inuit people were largely “taken from cradle to the grave under the care of bureaucrats” and communities had lost dignity and self-respect (Government of the Northwest Territories Baffin Region 1982, i). Arctic mining projects were positioned as a source of income that would help solve these problems while improving the well-being of northerners (Damas 2002; Boulter 2011). For instance, the Rankin Inlet nickel mine was

³¹ The government had, previously, adopted a ‘Policy of Dispersion’ to prevent the centralization of people in areas close to trading posts, for instance, in an attempt to preserve traditional nomadic culture as well as reduce the reliance of Inuit on welfare payments (Damas 2002).

the first mine in Canada to employ Inuit labour in 1957, and the mine was seen as a “beacon of hope” that would make Inuit economically viable citizens (Boulter 2011, 33). As well as the supposed economic benefits of mining to native peoples, mineral extractive activities complemented the government’s growing bureaucratic apparatus in the north and the government’s development strategy for northern communities (Grant 1988; Damas 2002). The extension of the state and the expansion of mines across the north had a profound impact: what Mark Dickerson claims to be the beginning of colonialism in the north (Dickerson 1992).

The development of the Nanisivik mine occurred during this period of mining prosperity and increased government interest in the Canadian north. First discovered in 1910 by Arthur English, a prospector on Captain Joseph Bernier's second Canadian government expedition to the High Arctic, the lead-zinc ore body at the site on north Baffin Island that later came to be known as Nanisivik was mapped by the Geological Survey of Canada in 1954. Texasgulf Inc. initiated further exploration in 1957 (Gibson 1978) and an estimated 6,000,000 tons of ore with an average grade of 14.12% zinc and 1.40% lead was delineated in a deposit roughly 3km long, 100m wide and 10m thick (Watts, Griffis and McQuat Limited 1973; Stewart 1998). Texasgulf, wary about the limited shipping season from north Baffin Island, sold the property to Mineral Resources International Limited (MRI)³² in 1972 in exchange for 35% of the net profit once MRI had recovered its initial capital outlay (Gibson 1978). MRI formed Nanisivik Mines

³² MRI later became a wholly owned subsidiary of AEC West Limited (NWB 2002a). The most recent owners of the mine, Breakwater Resources Limited, acquired Nanisivik Mines Ltd. from AEC West Limited in 1996, and in 1997 the mine was sold to CanZinco Limited, a wholly owned subsidiary of Breakwater (NWB 2002a).

Limited and commissioned a feasibility study undertaken by Watts, Griffiths and McQuat Limited. As well as providing recommendations regarding the feasibility of the project, the study was also intended to advise on the impacts of mining on the nearby community of Arctic Bay – an Inuit community that had slowly developed alongside the establishment of a Hudson’s Bay Company post in 1926 (Bowes-Lyon 2006; Damas 2002). The study suggested that a mining operation at Nanisivik would be feasible as a bunkhouse community for eight years (Watts, Griffiths and McQuat Limited 1973). However, with government assistance for townsite construction, Nanisivik could open as a more permanent operation for twelve to fifteen years, offering significant employment and economic benefits to the region and particularly the community of Arctic Bay (Department of Indian and Northern Affairs 1976). The feasibility study thus recommended that MRI pursue and finalize discussions with the government to help finance this venture (Watts, Griffiths and McQuat Limited 1973).

While officials in the Department of Indian Affairs and Northern Development (DIAND) viewed MRI’s proposal as complementary to the department’s objectives, archival material reveals that some analysts in the Department of Energy, Mines and Resources (EMR) questioned the economic profitability of the project and felt that the feasibility of Nanisivik had been overstated by Watts, Griffiths and McQuat Limited (see Gibson 1978). A review undertaken by EMR in 1974 concluded that there was no domestic need for lead or zinc in Canada, nor any other political or economic reason to exploit the Nanisivik deposit at that point in time (Jean-Paul Drolet 1974). Furthermore, the suggested level of government investment at Nanisivik—\$8.8 million in non-

recoverable grants and \$7.9 million in recoverable loans—was unprecedented in comparison to the direct support received by other much larger, low-risk developments in Canada’s north such as the Pine Point Mine (ibid.). Indeed, the need for government involvement in financing the townsite was questionable, as MRI had suggested that the company was prepared to develop a bunkhouse without government participation (Hickling-Partners Inc. 1981).

In addition to the dubious feasibility of the Nanisivik mine, there was some opposition to the construction of a townsite at Nanisivik. Though the consultants responsible for the feasibility study had suggested a permanent townsite would extend the life of the mine and maximize the benefits of Nanisivik to the Inuit, the local community of Arctic Bay wrote letters to Watts, Griffis and McQuat Limited, indicating their interest in the project but also registering their opposition to the construction of a new town, instead favouring the improvement of Arctic Bay (Gibson 1978). One letter stated:

We, the Settlement Council of Arctic Bay, would like to voice our strong objection to the construction of a town being planned for Strathcona Sound. At no time were the residents of this settlement, or this council, ever consulted as to the desirability of having a town built at Strathcona Sound (Levi Kalluk [1975], in Gibson 1978, 157).

Given the willingness of MRI to finance a bunkhouse and Inuit opposition to the construction of a townsite, the government’s interest in financing a townsite supposedly for the benefit of the Inuit workforce was “puzzling” to consultants at that time (Hickling-Partners Inc 1981, 15).

Though the economic feasibility of the mine was uncertain and a purpose-built townsite at Nanisivik was unwanted by the community of Arctic Bay, the government granted financial support for Nanisivik on the basis of “anticipated employment benefits for north Baffin region Inuit and experience benefits for future Arctic mining ventures” in line with an envisaged “industrial revolution” of the Baffin Region (Gibson 1978, 50; see also Hickling-Partners 1981). In particular, one DIAND memorandum stated that “the project would provide employment opportunities for Inuit in the region suffering from significant under- and unemployment” (Memorandum to the Cabinet 1974, 45). At a time when Inuit communities were experiencing declining markets for traditional commodities, rising costs of imported goods and a lack of access to money to purchase new hunting equipment, the government saw the Nanisivik mine as an opportunity to provide wage employment to the Inuit (‘Reasons for the Importance of Wage Employment to the Eskimo Economy’, no date). One report commented that:

In the greater context of the Canadian mining industry the Nanisivik mine is not a large project but it is a significant one in terms of northern development...it will offer them [native people] an alternative to hunting, trapping and carving, an option hopefully not totally alien to their culture but one which will adapt itself to the culture, and to which they in turn can adapt (Department of Indian and Northern Affairs 1976, 6).

Previous mining projects in the Arctic such as the Rankin Inlet Nickel Mine (as well as construction projects at the DEW line) had introduced Inuit to wage-labour for the first time (Boulter 2011), and government officials championed this transition as a success despite the short lifespan of such projects (Memorandum to the Cabinet 1974). Archival

material dating from the 1970s highlights that potential Inuit employment in future industrial ventures such as the Strathcona (Nanisivik), Polaris and Baffinland mining projects was a priority (for more detail see files on 'Eskimo Employment' in the Alexander Stevenson Fonds, NWT Archives), and a number of industrial oil operations also hired Inuit labourers who commuted from their home communities to earn 'windfall cash' (Wenzel 1983; Grant 2010). The oil exploration company Panarctic Oils, for instance, had employed some Inuit labourers from Arctic Bay prior to the opening of the Nanisivik mine, and a social impact study completed on behalf of DIAND concluded that this employment had been economically beneficial to the Inuit (Gourdeau 1973). Other government reports claimed that, after visiting numerous communities across the north, up to 50% of the workforce at Nanisivik could be made up of Inuit from Arctic Bay, Clyde River, Pond Inlet, Igloodik and Hall Beach (Strathcona Sound Project, no date; see also Memorandum to the Cabinet 1974).

However, some government officials questioned the need to develop a mine for the benefit of the Inuit. One EMR memorandum stated that the "employment of Inuit for a period of at least 14 years is the main, and probably only significant objective for the federal government financial support of this project" (Jean-Paul Drolet 1974, 18), yet also noted that "the proposed level of support appears high in comparison to the number of native peoples who may receive benefit from the project" (*ibid.*, 5). As well, critics within the Territorial and Social Development Branch of DIAND argued that "existing unemployment was not, or at least not yet, a serious enough problem to warrant risking repetition of the boom-bust experience of the Rankin Inlet mine" (Gibson 1978, 43).

Nonetheless, most DIAND analysts considered Inuit employment as the most advantageous aspect of the proposed project (Gibson 1978).

The desire to introduce Inuit to industrial wage-labour also fed into the government's vision of Nanisivik as a project to test the feasibility of operating in the Arctic. Beyond the provision of employment for Inuit in the region, various archival sources suggest that the government viewed Nanisivik as an opportunity to industrialize northern Baffin Island and test the feasibility of operating in the Arctic. At a speech in Frobisher Bay in 1974, the Minister of Indian Affairs and Northern Development Jean Chrétien described Nanisivik as a "pilot Arctic mining venture involving many new concepts" and hailed Nanisivik as "a model for future mineral developments in the Arctic" that sought to ground-proof new technologies, fine tune Arctic operations and introduce Inuit to an industrial lifestyle (Chrétien [1974] in Gibson 1978, 220). In his speech, Chrétien emphasized that this venture provided an opportunity to develop Canadian shipping in the Arctic, and through rigorous scientific study become a working model of technological innovation and engineering triumph (Chrétien [1974] in Gibson 1978; see also Yates 1975).

In government reports and correspondence evaluating the feasibility of the project, a strong nationalist rhetoric underlay visions of Nanisivik as an experimental venture. For an Interdepartmental Working Group on the Strathcona Sound Project, it was of utmost importance that the mining company at Nanisivik was Canadian³³ and that the mine only

³³ MRI had a 77.5% stake in the venture, backed by Metalgesellschaft A.G. of Germany and Billiton B.V. of Holland who each held a stake of 11.25% (Gibson 1978). MRI was 80% Canadian-owned, and the government viewed the level of Canadian ownership of the Nanisivik project as acceptable.

used Canadian shipping vessels and equipment to benefit other Canadian industries (Interdepartmental Working Group on the Strathcona Sound Project 1974, 93). Echoing this economic nationalism, an article written by A.B. Yates, director of the Northern Policy and Program Planning Branch, summarized the advantages of Nanisivik to Canada:

The venture provides significant benefits to Canada: the Inuit will receive maximum possibilities for training and employment; maximum use of Canadian materials will be made, where competitively available; the project provides a major opportunity to develop Canadian shipping in the Arctic; and the mine project will, through rigorous scientific study, act as a working model of technological, sociological, environmental and local economic interaction in the Far North (Yates 1975, 71).

Additionally, an evaluation of the Nanisivik proposal by the Northern Program Planning Division of DIAND stated that the mine would provide the government with royalty and corporate tax revenues (Northern Program Planning Division 1974, 102).

While the mine was supposed to bolster the Canadian economy, a memorandum from Chrétien to the cabinet described how the development of a townsite was also intended to secure Canadian sovereignty in the north (Memorandum to the Cabinet, 1974). Six years prior to the completion of Nanisivik's feasibility study, Panarctic Oils had been established as an exploration company in 1967 with federal government assistance, in response to America's growing interest in the Northwest Passage and increased American investment in offshore oil leases (Grant 2010). Similarly, this memorandum detailed how the development of a mine at Nanisivik was envisaged to

maintain Canadian control of resource development in the Arctic, and increase the population there, thus offering a “method of maintaining Canadian sovereignty and security in the North” (Memorandum to the Cabinet 1974, 54). Despite local opposition to the construction of a townsite at Nanisivik, a consultant’s report produced on behalf of DIAND suggested that the government’s involvement was largely based on the desire to construct a permanent community at Nanisivik (Hickling Partners Inc. 1981). Together, the level of Canadian control of the mine company, the construction of a new community, and development of resources in the High Arctic was seen by DIAND officials to not only improve living standards and promote Inuit participation in the Nanisivik mine, but also to contribute to “Canada’s political and economic sovereignty in the nation’s Arctic regions” (Northern Program Planning Division 1974, 102). Clearly, the mine was not simply an economic venture, but government involvement in this industrial project was also based on a territorial logic of power that sought to ensure that the Nanisivik mine fulfilled a variety of geopolitical-economic objectives: an explicit example of the co-production of capital and the state.

Despite the questionable economic feasibility and employment benefits of the Nanisivik mine, the government entered into the Strathcona Agreement with MRI in 1974. Deemed a progressive and unprecedented approach to northern resource development, the Agreement sought to enact the government’s commitment to the well-being of northerners (Gibson 1978) and “optimize experience benefits obtainable from this pilot Arctic mining venture” (Cabinet Committee on Government Operations 1974, 10). The Agreement was signed by the Minister of Indian Affairs and Northern

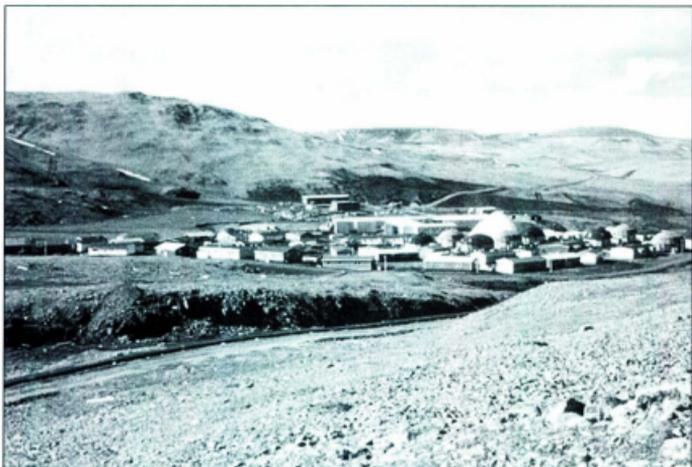


Figure 8. Nanisivik [Photo taken by Bob Wilson]. CREDIT: NWT Archives/Northwest Territories. Dept. of Public Works and Services fonds/G-1995-001: 1379



Figure 9. Nanisivik [Photo taken by Bob Wilson]. CREDIT: NWT Archives/Northwest Territories. Dept. of Public Works and Services fonds/G-1995-001: 2845

Development, the President of MRI and a local witness by the name of I. Attagutsiak ('Strathcona Agreement' in Gibson 1978). Under the Agreement, the government invested \$18.3m into townsite development (Figures 8 and 9), a dock and airstrip in return for an 18% stake in the company and representation on the company's board of directors (Department of Indian and Northern Affairs 1976). In return, MRI pledged compliance with the government's social, environmental and economic objectives for the north (ibid.). One key objective of the Strathcona Agreement was to ensure that Inuit workers comprised 60% of the workforce at Nanisivik. The Agreement also sought to ensure that the environmental impacts of mining were minimized through the completion of environmental studies and reclamation activities (e.g. BC Research 1975; Hatfield and Williams 1976; Reedyk 1987). Other conditions of the Strathcona Agreement included:

Provisions of vocational training for northern residents, comprehensive environmental studies and planning, preference for the use of Canadian material and equipment and Canadian shipping, company exploration programs to increase ore reserves and possible further processing of mine concentrates in Canada (Department of Indian and Northern Affairs 1976, 50).

Evidently, many of the stipulations written into the Strathcona Agreement reflected the prevalent nationalist rhetoric adopted in government correspondence. The government assumed a prominent role in the development of Nanisivik, and was highly influential in ensuring that the mine left only positive legacies from this Arctic experiment.

Though the Strathcona Agreement was intended to safeguard the local community and some government documents³⁴ claimed that the community of Arctic Bay was consulted at every stage of the mine's development, other sources suggest that Inuit were often overlooked during the feasibility study and drafting of the Strathcona Agreement (Gibson 1978). Perhaps one of the most dramatic stories of Inuit exclusion from these initial decision-making processes was described at a public hearing in July 2002, in which the Mayor of Arctic Bay Joanase Akumalik explained:

In the middle of June 1974 two Inuit men from our community were invited to a party. One of those men was Issiah Attagutsiak. He was my uncle. The other was Levi Kudlook. He was the mayor.

Neither of them could read or understand English. They thought they were going to a dance and to have some food. When they got to the party they were asked to sign a paper agreeing to something. They did not know what they were agreeing to.

The document they were agreeing to was signed by the Minister of Indian Affairs and Northern Development at that time and the President of Mineral Resources International Limited. It created a mine called Nanisivik Mines Ltd. The document they agreed to is called the Strathcona Agreement. That Minister is now the Prime Minister of Canada - the right Hon. Jean Chretien. They were told at the time that the agreement they agreed to at that long ago party, would be translated into Inuktitut and provided to them. Nobody in our community has ever seen a translated copy of the Strathcona Agreement.

³⁴ According to government documents, the community of Arctic Bay was fully consulted during the development of the Nanisivik mine, and the government worked with the Baffin Region Inuit Association to make recommendations as to how the benefits of the project could be maximised (Department of Indian and Northern Affairs 1976).

Today 28 years later we are talking about the closure of the same mine. We do not know how much the company has made from ore from the mine over those 28 years. We do not know how much the Government of Canada has received from mineral royalties over those years. We do not know how much the Government of Canada, the Government of Northwest Territories and now since 1999, the Government of Nunavut, has spent on infrastructure in Nanisivik townsite in the past 28 years. All we know is that Arctic Bay did not receive many of the benefits that the Nanisivik townsite received (Hamlet of Arctic Bay Working Group 2002, 1).

Drawing striking parallels to David Harvey's notion of 'accumulation by dispossession' (Harvey 2003), Akumalik's narrative describes the dispossession of lands and resources from native peoples in the interest of capital accumulation, where the government and the mine company were the key beneficiaries. A copy of the Strathcona Agreement (in Gibson 1978) confirms that Attagutsiak signed the Agreement as a witness, but does not detail the circumstances under which the Agreement was signed.

Despite opposition to the building of a townsite at Nanisivik, the bulk of construction work had already begun by 1974. Large numbers of Inuit workers were employed during this construction phase and three training programs for Inuit were established by MRI (Department of Indian and Northern Affairs 1976). The mine began production in October 1976, comprising west and east open pits at each end of the ore body, and horizontal shafts in the middle as well as satellite open pits (Stewart 1998). The mine deployed the "drill and blast" method using jumbo drills, remote scoop trams and haulage trucks (CanZinco 2004). Mined sulphide ores were crushed underground, and the

crushed ore was moved to the surface using a conveyor system (CanZinco 2004). At the mill, these ores were mixed with lime, then ground and added to water to form a slurry (Stewart 1998). Lead and zinc were then separated during a flotation process, and the subsequent concentrates were shipped to the USA and Europe for smelting (see Figure 10) (Department of Indian Affairs and Northern Development 1978; Stewart 1998). The mine typically employed 200 people during its operation, and a purpose-built townsite including a school, church, post office, recreational centre, dining hall and housing supported those who worked at the mine (CanZinco 2004). Inuit from Arctic Bay as well as several other communities were employed by the mine, and the population of Nanisivik eventually reached approximately 300 (Wenzel 1983; Bowes-Lyon 2006).

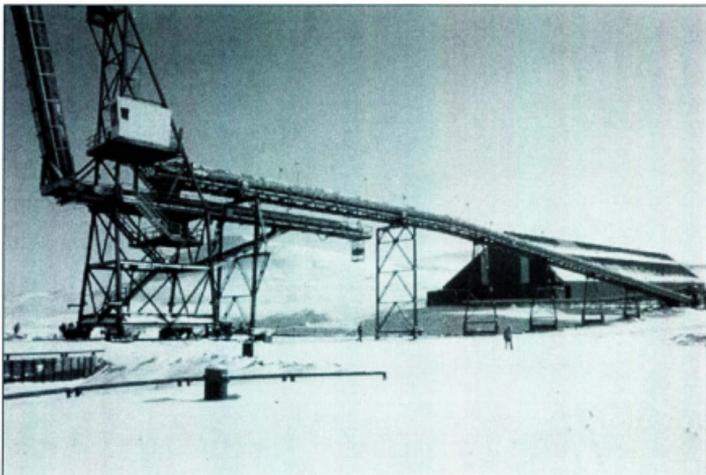


Figure 10. Ore Storage Shed & Loading Facility - Nanisivik [Photo taken by Dan Mandin] CREDIT: NWT Archives/Northwest Territories. Dept. of Public Works and Services fonds/G-1995-001: 1514.

Highlighting the successes of Nanisivik as an Arctic experiment, CanZinco (the owner of Nanisivik during the closure period) described how the mine company had heroically overcome the harsh Arctic environment, not only to make a feasible mining operation, but also to develop important infrastructures such as the deep-sea port and the first jet airport in the region:

Nanisivik was Canada's first mine north of the Arctic Circle and pioneered many practices, which paved the way for other northern developments. There were things that we perfected in Nanisivik are being done in other operations today and are only being done because they were perfected at Nanisivik. During the feasibility and financing stage, many would-be supports said that obstacles imposed by the harsh climatic conditions and the remote location would make the operation fail. The proof is in the pudding. But despite this, the project went ahead. The first deepwater port in the Canadian Arctic was built at Nanisivik. And with the closure of Polaris mine, it will be the only facility of its type in Nunavut. The first jet airport in the region was constructed at Nanisivik, and this continues to provide a vital transportation link between northern locations and the south. More than 50 kilometres of all-season roads were built, which included a 32 kilometre link between Arctic communities, Arctic Bay and Nanisivik, and included a link between Arctic Bay and the airport. An entire townsite was built. Not a camp, but a townsite. Shared accommodations, rooms for the employees, private homes for families, both Inuit and Southerners; a fully integrated school teaching the first language Inuktitut, French and English; an all-denominational church, a nursing station, an RCMP station, a fire station, post office, rec centre with a full gymnasium, swimming pool. No small task (Bob Carreau in NWB 2004a, p13-16).

From the perspective of CanZinco, Nanisivik succeeded in the role for which it was intended. Nanisivik not only profitably produced ores, but produced technical innovations and had engineered a modern community in the far north. As well as successfully constructing important infrastructures at Nanisivik, a harmonious community thrived at the townsite according to CanZinco:

In what was constructed to be a physical townsite, a place to house mine employees and their families, grew into a community in all sense of the word. Nanisivik, a place where people were mining, became a place for people to achieve personal objectives. Many people got their start in Nanisivik, they earned a handsome wage, they learned trades or skills that they could take with them to other projects. People came together as a community. Some brought their families, had babies, raised and schooled their children...Children were integrated in the school, Inuit and Qadlunnaq. Southern children studied culture inclusion in their classroom, learned how to scrape a seal skin, sew duffel mittens, light a kudluk and hear great stories from the Elders. And many adults learned the traditions of our Inuit neighbours, and in doing so, developed a love and respect for the land. People came forth to Nanisivik for a few years and stayed for 10 or 15 or even 20. And by these measurements, the Nanisivik project was a success, and we shouldn't forget that (ibid.).

Other sources confirm that the mine was beneficial to some local residents. In recent public meetings held in Arctic Bay, many community members expressed their gratitude toward the mine for providing employment which helped the Inuit to develop skills and provided cash to purchase hunting equipment (Brubacher & Associates 2002; see also Wenzel 1983). Though industrial wage-labour increasingly displaced the traditional

economy, some Inuit understood the mine and the cash-economy as simply bringing about change rather than cultural loss. In a socio-economic impact study, one Inuit interviewee commented that “money is the same as food here. Nowadays we work hard to get money. When I was young we worked very hard to get food [from the land]. It’s the same thing” (Brubacher & Associates 2002, 13). These comments suggest that some local people adapted to the industrialization of Nanisivik and that the mine also provided many opportunities for the community of Arctic Bay.

In spite of these positive assessments of Nanisivik’s success as a pilot project in providing significant local benefits, other documents reveal criticism of how the development impacted the local community. When the mine did open, the target to employ a workforce comprised of 60% Inuit workers was never met and instead typically only 20-25% of the workforce was Inuit. In the final year of the mine’s operation this figure dropped to 9% (Brubacher & Associates 2002). Early government correspondence suggests that officials were highly concerned that Inuit employment levels were unsatisfactory. As a result the Nanisivik Training and Employment Advisory Committee (TEAC) comprising of company, government and community representatives was established to monitor Inuit employment at the mine. In meetings held by TEAC it was evident that efforts were being made to accommodate and train Inuit employees, but one letter from the Director of the Department of Program Planning and Evaluation in the Northwest Territories recognised “a resistance on the part of mine officials to extending the range of employment opportunities to native labour” (Creery 1979, 7). Another letter from an Employment Training Officer in Frobisher Bay commented that Inuit “turned

their noses at Nanisivik” because of a lack of food from the land, no sense of a traditional community and the difficulties in adapting to an industrial wage-economy from the traditional lifestyle (Brintnell 1978, 43; see also Hickling-Partners Inc 1981). Those who did work at Nanisivik found that they had little time to spend in their home communities or sufficient time to undertake traditional pursuits, often resulting in absenteeism (TEAC 1978; 1979; 1980; see also Wenzel 1983).³⁵ Recent socio-economic impact studies confirm that many of the Inuit who were employed at Nanisivik had fewer opportunities to spend time on the land, and suggest that, like other northern communities, Arctic Bay had become increasingly dependent on paid employment rather than traditional economic activities (Brubacher & Associates 2002; Bowes-Lyon 2006).³⁶ These instances of alienation from traditional activities are hardly surprising given that the Nanisivik mine was intended from the offset to incorporate Inuit labour into the wage-economy. In a preliminary evaluation of the employment situation at Nanisivik, the failure to employ higher levels of Inuit labour led consultants Hickling-Partners to conclude that “the mine has not succeeded in the role for which it was intended – as an experimental prototype” (Hickling-Partners 1981, 36).

In summary, Nanisivik was designed in part to offer numerous social and economic benefits to northerners, and the Canadian government appeared committed to maximising these benefits, with varying levels of success, through the Strathcona Agreement. While MRI’s fundamental objective was to produce profit from the Nanisivik

³⁵ An anthropological study of Inuit commuter workers from Clyde River suggests that the expectation to remain on-site for six-week periods was too long (Wenzel 1983).

³⁶ Another key problem that these studies highlight is the impact of the introduction of alcohol to Arctic Bay. Many Inuit community members attribute marital problems and family breakdown to the introduction of alcohol by the mine (Brubacher & Associates 2002; Bowes-Lyon 2006).

mine, the government saw Nanisivik as an opportunity to industrialize north Baffin Island, incorporate Inuit into an industrial workforce and pioneer technologies to aid future resource development in the Arctic. Though Nanisivik was often cast as an experiment to test the feasibility of mineral development in the north, a territorial logic of power was clearly at play: the government's financial support for Nanisivik was approved on the basis that the mine would strengthen other Canadian industries and help secure Canadian sovereignty in the far north. Nanisivik was co-productive of capital and the state in the sense that Nanisivik functioned as much an expansion and enforcement of government objectives for the north as it was an economic project. Evidently, a political reading of Nanisivik's development is important in underlining the interlinking geopolitical-economic functions this Arctic industrial site was intended to fulfil.

3.4 The Closure of Nanisivik

After twenty-six years of profitable production the Nanisivik mine closed in September 2002 (Figure 11), prompted by a depression in the price of zinc. In response to stringent regulations surrounding mine closure, a number of third-party scientific and technical consultants were hired by both the Government of Nunavut and CanZinco to assess the environmental impact of mining and examine the adequacy of the closure and reclamation plan for Nanisivik. The closed minescape became a medium of scientific experimentation, subjected to scientific enquiry that extracted environmental data from the mine site, produced scientific knowledge, and valued the cost of reclamation. This involved generating objective, authoritative and neutral knowledge to legitimize different claims about the environment and verify contesting valuations of the cost of reclamation.

Far from an unproductive space after closure, this section outlines the on-going ways Nanisivik continued to be productive (and co-productive of valuations, of knowledge and of science) after the mine's operations ceased. This section describes the closure of Nanisivik using a variety of contemporary documents, first explaining how the community and government response to Nanisivik's closure called for rigorous scientific investigation to inform the closure and reclamation effort. This section then describes how scientific knowledge was used to legitimize contested valuations of the cost of reclamation, focusing on disputes surrounding the cost of an engineered tailings cover, an example characteristic of the co-production between valuations (of the cost of reclamation) and scientific knowledge at Nanisivik.



Figure 11: Ore storage shed during closure [Photo by Kathleen Parewick, 2006].

The closure of this pioneering Arctic development project presented significant challenges to the government, CanZinco, and community alike.³⁷ Residents of Arctic Bay expressed concern about the destiny of the Nanisivik townsite and the level of community involvement in reclamation activities. No one knew whether other economic activities could be undertaken at Nanisivik, and concerns grew over the environmental impacts of mining (such as soil and water contamination, and the disposal of tailings waste) at Nanisivik. After the decision to close the Nanisivik mine was announced in October 2001, numerous public meetings were held to discuss how the closure and environmental reclamation plan would be developed, providing a forum in which the community of Arctic Bay aired their views.³⁸ In these public hearings community members expressed concern about the impacts of mining on local wildlife and the land upon which they depended for hunting. Some residents voiced concern about the impact of acid mine drainage on ringed seals, while others suggested that shipping at Nanisivik scattered narwhal (NWB 2002b; 2004a). Kunuk Oyukuluk explained in one public hearing how wildlife had been impacted by mining at Nanisivik:

In early spring, when it was still March or May, when there is still ice, they would break the ice. And because it is our wildlife area -- and so my concern is that seals, we rely on the seal meat; and they have a breeding ground on the ice, that the ship went through the breeding ground of the seals. And in July when Arctic Bay residents were out Norwhale

³⁷ Prior to announcing the closure of the mine in November 2001, CanZinco, had filed an application to the Nunavut Water Board to extend mineral extraction to an east satellite ore body (NWB 2001a), indicating that closure was premature and largely unplanned. Indeed, the mine's management had anticipated mine closure sometime between 2005 and 2006 but was forced to close early due to the low price of zinc (NWB 2002c). CanZinco experienced an operating loss of \$20.3 million in 2001 compared with an operating profit of \$15.7 million in 2000 as a result of a depression in the price of zinc (NWB 2002a).

³⁸ Public hearings were held as a requirement of the Nunavut Waters and Nunavut Surface Rights Tribunal Act [section 52] to hold public hearings in the event of a change in the terms of a licence.

[Narwhal] hunting, the ship also went through the hunting ground, the hunting area. And during the Norwhale [sic] hunting, Norwhales would be scattered away by the ship. So every year they did that through the ice ... So I need more help so that our generation -- next generation, that they will have to have food to eat. And because we were brought up from the country food, so -- and they are best food and makes you stronger, and we will be weaker population on other kinds of food (Kunuk Oyukuluk in NWB 2004a, 121).

These environmental impacts had explicit cultural implications for the Inuit of Arctic Bay. In a similar narrative, Moses Akumalik described how this environmental change impacted traditional lifestyles:

I'm not trying to look big but we were living off the land when we were young. Now children when they grow up will lean more towards the civilized life as opposed to the nomadic life. In 1978, the ships would come in to load concentrate and they break the ice. Hunters lost their machines that were on the ice. That's why I'm asking for compensation because there have been impacts... They should thank the community for supporting their mining activity for all those years. A public apology with a thank you in money would be good. More than 20 skidoos were lost and all of their hunting equipment (Moses Akumalik in NWB 2002b, 44).

As this quote suggests, some community members raised concerns regarding the cultural and environmental impacts of mining to request an apology from the mine company.³⁹

Moses described how, despite co-operating with the mine, the community had been

³⁹ For instance, one resident stated in a public meeting: "I want some kind of an apology, I guess, from the company because they did -- they did their own activity without considering what the Arctic Bay community wants. And, you know, they didn't even ask the community how they feel about their activity, whether to, you know -- Arctic Bay residents were concerned that -- they were anxious for an apology, I guess, and they all just leave the area without apologizing to us..." (Mucktar Akumalik in NWB 2004a, 100).

detrimentally affected by it and called for the community of Arctic Bay to be compensated:

For 28 years of the mine life, every Christmas we received small baskets of fruits and never opposed Nanisivik although during their work, they would change the landscape. I want the community of Arctic Bay to get \$2million as compensation for destroying the area. The old and new owners should help the community of Arctic Bay by giving the community \$2million (Moses Akumalik in NWB 2002b, 15).

While some community members requested monetary compensation, others called for compensation in the form of old furnishings and equipment from the Nanisivik townsite or employment in future reclamation activities.⁴⁰ In whatever form, these requests for an apology embodied justice: justice for harming the land, justice for impacting hunting activities, and justice for transforming the Inuit way of life. By exposing the dispossession of land and resources, and the economic and cultural hardships experienced by the residents of Arctic Bay during the development of Nanisivik, mine closure hearings evidently represented a critical forum in which residents fought for justice.

The closure of Nanisivik was also an important time for the Government of Nunavut to ensure that the voices of the community were heard and make sure that the impacts of mining were properly dealt with. Whereas the Nanisivik mine established at a time when the Canadian government fostered the northward expansion of capital and the

⁴⁰ For instance “a resident stated that he wanted Inuit to be in the closure activities. Moreover, he felt that the company should provide some sort of gift to the community of Arctic Bay. He suggested that a relocated building would be a good gesture. This would be seen as an apology for breaking the land at Nanisivik.” Another “resident stated that he would like to see equipment and furniture given to Inuit from the mine site as there were persons who have never gained from the mine” (NWB 2004b, 3).

state, Nanisivik closed in 2002 amid a tightening regulatory regime. Across Canada, government departments now “temper their promotional mineral-related activities by acknowledging the need to ensure adequate environmental protection measures are in place and that attention is paid to the socioeconomic health of affected communities” (McAllister 2007, 86). Indeed, the newly formed Government of Nunavut was aware that many companies had, in the past, abandoned northern mining projects without dealing with the environmental impacts of these activities, and conscious that the livelihoods of aboriginal northerners had been severely affected by changes to the environments on which they depend (INAC 2002).

The ‘Mine Site Reclamation Policy for Nunavut’, introduced in 2002, was important in regulating the reclamation of Nanisivik. With the creation of “the new territory of Nunavut and, with it, the expectation that Inuit would become the managers of their own destiny” the Mine Site Reclamation Policy for Nunavut attempted to empower northern communities and provide “the Inuit a ‘clean slate’ to develop the kind of resource management regime they want to take with them into the new millennium” (INAC 2002, 2). Whereas in the past, the costs associated with environmental degradation had been largely externalized by mine companies and paid by the government, the Mine Site Reclamation Policy for Nunavut sought to “reduce the environmental liability that falls to government to the greatest extent possible” by applying the “polluter pays principle” (INAC 2002, 2). Through the use of security bond arrangements written into water licenses, land leases and other regulatory instruments, this landmark policy made

mine companies fully financially liable for the costs associated with reclamation (INAC 2002).

At Nanisivik this meant that a water license administered by the Nunavut Water Board (NWB) set the terms of reclamation, and the Board assumed the primary responsibility for regulating and enforcing reclamation efforts. The federal government, already occupied with remediating other abandoned mines it had inherited, sought to ensure that Nanisivik did not become another financial liability and a security bond was established at the time of Nanisivik's closure to ensure that CanZinco paid the costs of reclamation (INAC 2002; see also Duxbury 2002). Although the Strathcona Agreement had stipulated that the mine company should undertake reclamation activities after closure,⁴¹ the security bond arrangements put in place after the closure of Nanisivik largely reflected the guidelines outlined in the Mine Site Reclamation Policy for Nunavut (INAC 2002). As part of the security bond arrangements, CanZinco, the NWB, and other intervening parties⁴² present at public hearings had to agree on the value of the bond, based on the projected costs of reclamation. Initially, Indian and Northern Affairs Canada (INAC) suggested that reclamation would cost \$27,536,028, while CanZinco's consultants estimated reclamation would cost \$9,224,608, a figure almost three-times lower than that estimated by INAC (Breakwater 2002; CanZinco 2002). A proliferation of

⁴¹ As part of the Strathcona Agreement, the mine company at Nanisivik was required to provide a \$500,000 bond to ensure compliance with the terms of the Agreement (Gibson 1978). At the time of Nanisivik's closure, the water licence and security bond administered by the Nunavut Water Board was the primary means by which the reclamation of Nanisivik was regulated.

⁴² Interveners included representatives from: CanZinco and Breakwater, the Nunavut Water Board (NWB), the Department of Indian Affairs and Northern Development (DIAND, which later changed its name to Indian and Northern Affairs Canada (INAC)), the Government of Nunavut (GN), the Department of Fisheries and Oceans (DFO), Environment Canada (EC) and of course, the community of Arctic Bay.

studies undertaken by government scientists, and more frequently scientists, engineers and technical consultants working for private environmental consulting firms, sought to provide an authoritative basis for resolving the dispute over the cost of reclamation. These studies examined the extent of soil contamination, tested the stability and impact of tailings, contributed toward various Environmental Site Assessments and the Human Health and Ecological Risk Assessment (HHERA), and measured the level of contamination of the townsite infrastructure (CanZinco 2004). Ironically performing one of the functions for which it was originally designed in the Strathcona Agreement, the Nanisivik minescape became a space of scientific investigation: soil samples were collected, water quality monitoring stations were established and various field projects initiated.

For CanZinco, this scientific knowledge was important in determining the amount of money the company would have to pay for reclamation. Consequently, both the government and CanZinco hired their own scientific experts to ensure that the knowledge produced was accurate and rigorous. In one study, the Government of Nunavut hired consultants EBA Engineering to conduct a soil sampling program to determine the extent of contamination at Nanisivik – research that cost over \$49,000 (EBA Engineering 2003). Because of the high costs involved in the event that the townsite had to be destroyed due to contamination, CanZinco also hired privately owned environmental consulting firm Lorax Environmental Services. Lorax observed the work of EBA, and represented the interests of CanZinco by collecting duplicate samples following the same methodology as EBA (Dillon 2003).

The government and CanZinco alike claimed that using a variety of expertise resulted in greater confidence in the success of closure and reclamation activities at Nanisivik. For instance, a community newsletter, produced by the NWB to instill public confidence in the closure process at Nanisivik, commented that:

Because of the multi-party participation and the significant amount of effort expended in the HHERA [Human Health Ecological Risk Assessment] review process, concerned parties have become more confident that the information presented in the HHERA is scientifically sound and protects the interests of local persons and the environment (Duxbury 2003a, 1).

In many cases, however, the various scientific studies produced an increasing number of disparate conclusions which, in turn, produced new problems rather than solving old ones. The HHERA, for example, was in fact one of the most contested documents precisely because of its multi-party participation. The HHERA was written by consultants Jacques Whitford to inform clean-up objectives, a requirement under the terms and conditions of the water license. In order to complete the risk assessment Jacques Whitford used soil metal data for copper, lead and zinc in samples collected by Nanisivik Mines Ltd during exploration activities in 1985 (Jacques Whitford 2003). However, many peer review comments critiqued this methodology, arguing that using background data after mining had commenced did not measure natural levels of metals prior to mining in 1976 (Dillon 2003). Additionally, reviewers recognized that in the absence of cadmium background data Jacques Whitford employed Ontario Typical Range values, deemed completely inappropriate for a High Arctic location (Dillon 2003). The Nunavut Water

Board hired Dillon Consulting to specifically provide a resolution to these divergent and conflictual comments and claims of various parties regarding the HHERA and “provide recommendation on the correct approach” (Dillon 2003, 1). Throughout its report, Dillon commented on the lack of methodological transparency and the use of incorrect methodologies, remarking that “it can, and should be a straight forward and transparent process that can be easily followed by all reviewers” (Dillon 2003, 1). In this example, disputes over scientific methodology resulted in the need to hire third party scientific and technical consultants to adjudicate between correct approaches and generate an accurate cost estimate for the security bond.

The depth of an engineered tailings cover was perhaps the most contentious issue during Nanisivik’s reclamation, and an issue that demonstrates how scientific knowledge-making was central to determining the cost of reclamation at Nanisivik. The tailings at Nanisivik were the material by-product from the extraction and transformation of ores into lead-zinc concentrates. Describing the generation of tailings waste, Bob Carreau from CanZinco stated that:

...tailings are the material that you pull from the underground. 90 percent of that material is considered waste, that there's no economic value. When we pulled the rock out, about a million tonnes a year from the mine, 90 percent of that rock would be waste. It would have no economic value. It's been ground up, that was our process, and our flotation process used reagents, chemicals to recover the saleable product, and the rest of the material would go out to tailings. So tailings are the ground rock, ground like beach sand,

and it was deposited here for 26, 27 years. Almost 15 million tonnes of material were deposited out here (Carreau in NWB 2009).

Within these tailings, *Thiobacillus* bacteria catalysed the transformation of reactive sulphide minerals to generate acid mine drainage⁴³ as part of an oxidation reaction. Even long after mining, these tailings continued to produce acid mine drainage - described as “poison water” by the community (NWB 2009) - that the community and government viewed as harmful to the surrounding environment. For instance Elder Leah Oqallak commented in two public hearings that: “so snow bunting, little bird landed on the tailings and it died right away, and it got -- I got scared that I saw the bird die, so that’s why it is my big concern” (NWB 2004a; see also NWB 2002b).

As part of progressive reclamation efforts undertaken during Nanisivik’s operation, a field monitoring program from 1990 investigated how acid mine drainage could be mitigated. Research conducted on behalf of Nanisivik Mines indicated that *Thiobacillus* bacteria catalysed the production of metals at a slower rate at lower temperatures (Kalin 1987; Elberling and Kyhn 2001; Elberling 2001; Elberling 2005). The field monitoring program sought to test the optimum conditions under which freeze-up of the tailings would occur using “test cell” covers (BCG 2003). Shale covers were constructed of varying levels of compaction and saturation, with thermocouples and frost gauges used to monitor temperatures. It was hoped that constructing a cover over the tailings at Nanisivik would thermally insulate the exposed tailings and promote freeze-up

⁴³ Acid Mine Drainage (AMD), also known as Acid Rock Drainage (ARD), refers to the outflow of acidic water containing high concentrations of heavy metals from mining wastes exposed to oxygen (for more detail see Elberling and Kyhn 2001; Elberling 2001; Elberling 2005).

(CanZinco 2004). Once incorporated into the permafrost regime, these freezing conditions would reduce oxygen diffusion to make contaminants inert, preventing the contamination of surface water (NWB 2002b; CanZinco 2004; BCG 2003). The extreme Arctic climate thus offered a natural method by which acid mine drainage could be prevented; in the words of CanZinco, this “reclamation work [was] focused on utilising the natural conditions to provide for the secure, long-term closure of the mine” (CanZinco 2004, page ix).

Data from this field monitoring program, in combination with other studies conducted during the closure of the mine, were critical to informing the design of the engineered design cover that would limit acid mine drainage. Data collected by CanZinco indicated that ‘test cell 1’, constructed from shale without compaction or saturation, had an average thaw depth of 0.92m (BCG 2003; CanZinco 2004). To ensure that the tailings would remain frozen even under worst-case climate warming scenarios, geothermal models predicted thaw of 1.0m in a one year period in the event of an extreme weather scenario (1 in 100 year warm event) and thaw of 1.22m at the end of 100 years under a global warming scenario (BCG 2003). Whereas worst-case climate scenarios predicted by the Intergovernmental Panel on Climate Change (IPCC) and the Panel on Energy Research and Development (PERD) estimated warming of 3.5°C to 4.5°C respectively, CanZinco’s modelling assumed a change of 5.5°C as a contingency to mitigate against thaw (NWB 2002b; Nanisivik Mine 2002). Based on the test cover results and geothermal models, CanZinco asserted in its 2002 ‘Mine Closure and Reclamation Plan’ that a 1.25m cover depth was sufficient, comprising 1.0m of shale and 0.25m of armour surfacing.

Throughout the closure and reclamation process, however, much debate surrounded the depth, and thus cost, of the engineered tailings cover proposed by CanZinco. Some Arctic Bay residents asserted that the cover should have been 10m deep at the dock area and 5m deep at the industrial site, areas (correctly) perceived as the most contaminated (NWB 2004b). Though the rationale behind these estimates is unclear from the archival record, public hearing transcripts reveal the community saw the tailings depth as an important issue and asserted that the hamlet was disappointed by the lack of information they had received regarding the tailings. In one hearing, the Mayor of Arctic Bay Joanase Akumalik explained:

In the past we know that there was monitoring happening of the water and the tailings pond and even the air. We have also been aware of tailings monitoring devices that have not worked for long periods of time. We have not received the results from these activities. It is important that the local people in Arctic Bay become fully involved in this long term monitoring work and be trained to undertake this activity. It is important that the local people trust the results of these activities (Hamlet of Arctic Bay Working Group 2002, 2).

This quote suggests some residents felt excluded from these scientific activities during Nanisivik's closure, in similar ways that the community felt marginalized during the mine's opening. To rectify this, some residents hoped that the community could observe the reclamation work undertaken at Nanisivik. An elder commented that:

There should be someone observing when you are burying the tailing so that they can share their story and the information that they observe. Back in 1959 I was working for the Bay store. We used to hide things from the Manager before they came to the store so that the Manager would know it was a good store. I want someone there to observe the burying of tailings. If you tell me straight [it] will not contaminate the people and environment, I will believe I won't mind if you cover it. It is a concern without someone telling me that it won't have impact on my life. I want someone to observe. There will be work for Arctic Bay residents to work on the clean-up but when you are covering the tailings I want someone too. I want to see the picture of the tailings on the side of it. I'm serious here. People are serious here. We should ask all kinds of questions here (Leah Oqallak in NWB 2002b, 43).

Rigorous monitoring was important for many residents to trust that the impacts of mining on their health and livelihoods had been offset.⁴⁴ As well, these recommendations positioned community members as independent observers who could fill employment positions during reclamation and confirm whether work was being conducted correctly (NWB 2004b). One resident, for instance, “hoped that reclamation would take longer to provide more training and employment opportunities for Arctic Bay residents” (NWB 2004b, 3). Indeed, there were hopes that the failure of the 60% Inuit employment target

⁴⁴ As well as a feeling that local residents had been excluded from these reclamation activities, some community members called for more scientific studies to be completed and highlighted the environmental risks they faced. For instance, Tommy Tatatuapik said: “As a resident of Arctic environment, I know that it is possible, even in the winter to drink water from underground. I understand the plan and I think it is a good plan but the weather is always changing. The plan is risky. Water will continue to generate even when it is frozen. Our land is run by nature. No one can control the freezing and thawing. Water will come from below ground even when it is frozen” (Tommy Tatatuapik in NWB 2002b, 7).

set by the Strathcona Agreement would provide the impetus for significant Inuit employment during reclamation activities⁴⁵ (Arctic Bay 2004).

While the cover depth issue was important for the health and well-being of the residents of Arctic Bay, it was equally important for CanZinco in determining the amount the security bond would total – a figure subject to dispute between CanZinco and the Nunavut Water Board. On behalf of INAC, Brodie Consulting initially estimated that a cover depth of 1.75m was required, based on the fact that one of the test cells had experienced thawing to a depth of 1.59m (Brodie Consulting 2002). Brodie later suggested that a 1.5 cover depth was required, still costing \$1.25 million more than CanZinco's 1.25m estimate (Nanisivik Mine 2002; NWB 2002a). These cover depth estimations were of utmost importance to CanZinco, as they represented significant sums of money needed to pay for the surface covering – at the very least \$1.25 million was at stake.

CanZinco asserted the legitimacy of its estimate by presenting its cover depth as a 'scientifically sound' estimate. CanZinco stressed that a depth of 1.25m was sufficient to keep the tailings frozen by highlighting that the data input into the geothermal model was

⁴⁵ Finding employment for community members was a common theme in public meetings after the closure of Nanisivik. While the community, government agencies and CanZinco sought to provide employment to local people in remediation activities undertaken at Nanisivik, these efforts were unsuccessful. The GN initially developed three training packages: Heavy Equipment Operator (HEO), Heavy Equipment Mechanic (HEM) and Personnel and Financial Administrative Skills (Duxbury 2003c). The GN estimated that this scheme would cost \$1.4 million and suggested this could be paid by multiple government agencies and CanZinco. While CanZinco stated it would be easier, quicker and cheaper to hire an independent contractor, CanZinco agreed that the extra costs could be shared among those who supported this training approach (*ibid.*). In the end, however, the government agencies were unable to raise sufficient capital, the scheme fell through and contractors from the south were hired.

more conservative than the estimates used by world-renowned scientific panels such as the IPCC. Emphasizing the authority of scientific fact it deployed, CanZinco declared:

We have calculated with the warming effect, so that's calculated in there. Global warming, as you mentioned, is a concern, and so we had, as I mentioned, included modelling that takes the worst-case scenario that Environment Canada offers you now over the years, we include that in the mine. And like any engineering we do, that's the best you can do, it has to be based on some scientific data, and that is based on *sound scientific data* (*emphasis added* Bob Carreau in NWB 2004a, 118).

As this quote suggests, the scientific method not only produced knowledge about the environment, but this method in itself was presented (by non-scientific bodies such as CanZinco) as an authoritative and reliable source for the production of knowledge.

Indeed, CanZinco heavily relied on arguments based in notions of scientific expertise to validate its estimate and protest against the valuations made by Brodie Consulting and the community. Throughout the closure and reclamation period at Nanisivik, CanZinco had urged the intervening parties to use “good science to come up with the best answers” (Bob Carreau quoted in NWB 2002b, 26). In public hearings CanZinco introduced scientific and technical consultants as “independent and outside professionals” (NWB 2002c, 3), neutral parties, external to the politics of reclamation and without bias. This is not to say that one estimate was more accurate than another, but rather CanZinco sought to *present* its rationale as ‘scientifically sound’ to legitimize its estimate of the cost of the cover depth. For instance, CanZinco wrote in one letter to the NWB that:

The intervening parties who are saying 1.25m is insufficient are not supporting this with any concrete information. They are *simply* and quite *arbitrarily* saying that they *intuitively* assume that 1.25 metres is not enough, and more cover should be added. If the intervening parties are able to take their *rationale* for additional coverage, at the very least a *meaningful technical* debate could ensue, and CanZinco is confident that it would prevail. CanZinco is currently at a disadvantage, though, where it presents scientifically defensible information and the only rebuttal is ‘we want more’ (*emphasis added* Nanisivik Mine 2002, 3).

In this quote non-scientific estimates are cast as arbitrary and intuitive, whereas scientific expertise is meaningful and rational. In this way, CanZinco often appealed to the notion that “modern science established itself as an institution specialized in the production of knowledge about material reality, in which political and religious powers have no legitimate competence” (Pellizzoni 2010, 469). CanZinco’s deployment of ‘sound scientific data’ reflects Stephen Bocking’s suggestion that those in industry are often “enthusiastic promoters of scientific authority, appealing consistently to ‘sound science’ as the only reliable basis for decisions” (Bocking 2004, 23). Again, this is not to say that the science behind each estimate was correct (or incorrect), but rather that this discourse inscribed science with the power to adjudicate and validate competing claims over reclamation, in such a way that at times delegitimized non-scientific estimates suggested by the community.⁴⁶ This illustrates how CanZinco-sponsored research not only produced an *economic* valuation (of the cost of reclamation), but necessarily reproduced the

⁴⁶ Indeed, some residents were disappointed that suggestions they made in public hearings were not acted upon (Bowes-Lyon 2006).

authority of science: an explicit example of the way the closed Nanisivik mine was a site for the co-production of valuations (of the cost of reclamation) and scientific knowledge that legitimized these valuations.

After many meetings and much technical debate between the intervening parties, it was agreed that a 1.25m cover depth would be appropriate, the security bond was finally set at \$17.6 million, and CanZinco's closure and reclamation plan was approved in 2004. It had become increasingly clear that the Nanisivik townsite and infrastructure would have to be demolished, as efforts to find alternate uses for the site were unsuccessful and contamination proved a costly problem. Many buildings had exceeded their life span and those still in useable condition required as much as \$50 million over four years for renovation⁴⁷ (NWB 2004a). Though the townsite was demolished, CanZinco sold the mill, concentrate storage facility, power generation installation, conveyors and ship loading equipment to Wolfden Resources (owners of a property in Nunavut) who, in return, performed environmental clean-up on the area that the mill and storage facilities were located⁴⁸ (Young 2003). After reclamation was completed in 2008, the security bond was reduced to \$2 million to cover a five year post-closure monitoring

⁴⁷ Housing officials at the Government of Nunavut also estimated that it would cost over \$900,000 to move a single house from Nanisivik to Arctic Bay (NWB 2004a volume 2).

⁴⁸ A theoretical note on 'value' and 'valuation' is necessary here. In this subsection, I have argued that scientific knowledge was important in informing valuations of the cost of reclamation. Here, it is worth mentioning that surplus-value was extracted from the minescape after closure, albeit in a different form (data rather than ore), by private consultants and scientists contracted by the mine company or government. Furthermore, Wolfden's 'purchase' of some of Nanisivik's mine equipment for which payment was made through reclamation activities suggests that some of Nanisivik's infrastructure did continue to have both a use-value and exchange-value after the closure of the mine. In this sense, the Nanisivik minescape was not only co-productive of scientific knowledge and valuations (of the cost of reclamation), but was productive (in the classic sense) of surplus-value.

period. CanZinc estimated in a 2009 public hearing that the company had spent \$17 million, and Wolfden had spent \$12 million on reclamation at the site (NWB 2009).

In sum, after the closure of the mine, Nanisivik became a landscape of data production: scientific and technical consultants were hired from several external engineering firms, and technological infrastructures were erected to mine data from the environment. The intervening parties appealed to scientific expertise to help inform how the Nanisivik mine was going to be reclaimed after the mine closed. It was also important to the government and community of Arctic Bay that these studies were rigorous and properly dealt with the environmental legacies of mining at Nanisivik. These efforts not only generated scientific knowledge about the environment at Nanisivik, but the intervening parties cast this knowledge as being neutral, external, and unbiased – the most reliable knowledge for determining the cost of reclamation. Efforts to legitimize scientific knowledge concurrently legitimized valuations of the cost of reclamation. I view this as an example of the ‘on-going-ness’ of production at Nanisivik, as the seeming unproductive and degraded minescape became the site of the (co-)production of valuations, knowledge and science.

3.5 Conclusion

In one public hearing after the closure of the Nanisivik mine, some residents of the nearby community of Arctic Bay delivered a eulogy-like commemoration to a personified Nanisivik:

In some ways, it's sad for me because it was a town for a long time, and we were working there, and we were friends with the people that I worked with, and Inuit from our communities were there too. And when you, one of your family member dies, it looks like you're losing some of your family members even the non-Inuit there were -- they too were your friends... It was emotional for me that I could still feel the life in that building, and I even said one time that I seem to be not -- like I remember the people there, John Ingiatuq and others that were there, and I remembered how they were, so it was emotional for me (Mr. Oqituq in NWB 2009, 184).

The closure of Nanisivik was deemed a natural milestone in its lifespan. In the productive phase, the mine extracted ores as well as economic value. Once the mine's operation halted, it seemed, the mine had died. The mine was no longer productive. The ore deposit was no longer valuable.

This paper has argued against the idea that a mine's lifecycle is a linear production process dictated solely by economic variables, using a vast collection of archival and contemporary documents to describe two different ways in which the Nanisivik was co-productive. First, this paper has argued that Nanisivik was designed to be co-productive of capital and the state. Through a political reading of archival documents relating to Nanisivik's establishment and operation, this paper has suggested that the mine was developed as a pilot project that, in its very nature, sought to test the feasibility of operating in the far north. The government's involvement largely followed a territorial logic of power which sought to support MRI's capitalist logic while reinforcing the Canadian economy and strengthening the nation's presence and influence in the Arctic.

Evidently, the mine was not designed to produce economically valuable ores alone, but rather fulfilled objectives dictated by the Canadian government, that together, would secure Canadian sovereignty in the north and produce an industrialized Inuit workforce. In this sense, the capitalist and territorial logics of power were intertwined and co-productive of geopolitical-economic objectives.

This paper has also argued that the Nanisivik mine was a site where scientific knowledge and valuations of the cost of reclamation were co-produced after its closure. The community of Arctic Bay and the newly formed Government of Nunavut sought to ensure that the impacts of mining at Nanisivik were properly dealt with, by hiring ‘third party’ scientific and technical consultants to adjudicate between different valuations of the cost of reclamation. The independent, outside, authoritative and value-free character of this scientific knowledge occupied a unique position in its power to adjudicate between competing claims reclamation (cf. Bocking 2004; Sarewitz 2004; Horowitz 2010). Supporting the notion that the distinction between science and politics is blurred because each depends on the other to legitimise their claims (Pellizzoni 2010; see also Bocking 2004; Jasanoff 2006), Nanisivik demonstrates how scientific knowledge and economic valuations of the environment were co-produced: efforts to legitimize the authority of scientific knowledge on reclamation concurrently legitimized economic valuations of the Nanisivik minescape. Far from an unproductive, valueless or useless space after its closure, the Nanisivik minescape continued to perform some of the functions for which it was originally intended.

Together, these two examples of the way the Nanisivik was co-productive demonstrate that production is not just a linear process that generates valuable commodities, but can fulfil political functions and generate non-economic products. Through illustrating the ways in which the Nanisivik minescape was co-productive during its operation and after its closure, this paper has asserted that production is complex, multifaceted, and on-going – and often linked to the cultural, (geo)political and environmental importance of sites in the Arctic. As an experimental prototype for future resource development ventures in the Canadian Arctic, the story of Nanisivik provides important insight into historical-geographical processes of capitalist production at this pioneering site, and is suggestive of the possible geopolitical-economic motives and environmental legacies of mining at similar sites in the Arctic currently undergoing industrialization.

3.6 Chapter 3 Bibliography

Primary Sources and Government Documents

B.C. Research (1975) *Lethal and sublethal bioassays on tailing from Nanisivik Mine ore*. Prepared for Strathcona Mineral Services. Project 1552. Progress report no. 3.

BCG Engineering (2003) *Engineering Design of Surface Reclamation Covers*. [Accessed January 2012 from:

[ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/3%20TECH/10%20A%20and%20R%20\(G\)\(J\)/2004/G3%20Final%20Closure%20Plan/2004%20Final%20AR%20plan/G.4%20Cover%20Report/G.4%20Report/G.4%20Cover%20Report%20Final.pdf](ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/3%20TECH/10%20A%20and%20R%20(G)(J)/2004/G3%20Final%20Closure%20Plan/2004%20Final%20AR%20plan/G.4%20Cover%20Report/G.4%20Report/G.4%20Cover%20Report%20Final.pdf)].

Breakwater (2002) *Letter from Breakwater to NWB regarding security bond arrangements*. [Accessed April 2011 from:

<ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914\Admin#\hearings\hearings\2002\hearing\post\hearing\submissions\BWR>].

Brintnell, L. (1978) 'Memo to File regarding Nanisivik' in *TEAC Meetings*, Northwest Territories Department of Economic Development and Tourism fonds, NWT Archives, G2002-004 box 38 file 5 Part 2.

Brodie Consulting (2002) *Nanisivik Mine: Reclamation Cost Estimate*. Prepared for Indian Affairs & Northern Development, Water Resources Division by Brodie Consulting Ltd, June 2002. [Accessed April 2011 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/2%20ADMIN/3%20SUBMISSIONS/2002%20Renewal/DIAND/](http://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/2%20ADMIN/3%20SUBMISSIONS/2002%20Renewal/DIAND/)].

Brubacher & Associates (2002) *The Nanisivik Legacy in Arctic Bay: A Socio-economic Impact Study*. Prepared for Department of Sustainable Development, Government of Nunavut.

Cabinet Committee on Government Operations (1974) 'Record of Committee Decision: Strathcona Sound Project' in *Northern Development*, Mineral and Metal Commodities Branch Registry Files, Library and Archives Canada, RG21 Acc 1996-97/723 box 10 file 1.50.15.3 vol. 5.

CanZinco (2004) *Final Closure and Reclamation Report*. [Accessed January 2012 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/3%20TECH/10%20A%20and%20R%20\(G\)\(J\)/2004/G3%20Final%20Closure%20Plan/2004%20Final%20AR%20plan/G.4%20Cover%20Report/G.4%20Report/](http://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/3%20TECH/10%20A%20and%20R%20(G)(J)/2004/G3%20Final%20Closure%20Plan/2004%20Final%20AR%20plan/G.4%20Cover%20Report/G.4%20Report/)].

CanZinco (2002) *Public Meeting at Arctic Bay Exhibit 2: presentation by CanZinco on the abandonment and reclamation plan*. [Accessed April 2011 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/2%20ADMIN/4%20HEARINGS/2%20HEARING/2002%20Renewal/Exhibits%20Undertakings/](http://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/2%20ADMIN/4%20HEARINGS/2%20HEARING/2002%20Renewal/Exhibits%20Undertakings/)].

Chrétien, J. [1974] 'Speech notes for the Honourable Jean Chrétien Minister of Indian and Northern Affairs at the signing of the Nanisivik Mine Limited Agreement' in Gibson, R. (1978) *The Strathcona Sound Mining Project: a case study in decision making*. Science Council of Canada No. 42.

Creery, R. A. (1979) 'Letter to M. Klein, Acting Director of the Northern Economic Branch, Department of Indian Affairs and Northern Development' in *TEAC Meetings*, Northwest Territories Department of Economic Development and Tourism fonds, NWT Archives, G2002-004 file 36 box 6.

Department of Indian Affairs and Northern Development (1978) *Annual Report 1978*.

Department of Indian and Northern Affairs (1976) *North of 60: Mines and Mineral Activities 1976*. Mining Division, Northern Non-Renewable Resources Branch.

Department of Indian Affairs and Northern Development (1974) *North of 60: Mines and Mineral Activities 1974*. Mining section, Oil and Minerals Division, Northern Natural Resources and Environment Branch.

Department of Mines and Resources (1948) *Annual Report 1948*. Edward Cloutier: Ottawa.

Department of Mines and Resources (1947) *Annual Report 1947*. Edward Cloutier: Ottawa.

Department of Mines and Technical Surveys (1953) *Annual Report 1953*. Edward Cloutier: Ottawa.

Department of Northern Affairs and National Resources (1961) *Mining in the North*. Resources Division, Northern Administration Branch.

Dillon (2003) *Dillon Consulting Final Assessment*. [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914\Admin#\General\2003>].

Duxbury, P. (2003a) *November Community Newsletter*. [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914\Admin#\General\2003>].

Duxbury, P. (2003b) *April Community Newsletter*. [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914\Admin#\General\2003>].

Duxbury, P. (2003c) *Site visit and community consultation report*. [Accessed April 2011 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914\Admin#\General\2003\Nanisivik community outreach](ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914\Admin#\General\2003\Nanisivik%20community%20outreach)].

- Duxbury, P. (2002) *Community Newsletter*. [Accessed April 2011 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20%20Remediation/1AR-NAN0914\Admin#General\2002 newsletter](ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20%20Remediation/1AR-NAN0914\Admin#General\2002%20newsletter)].
- EBA Engineering Consultants Ltd. (2002) *Soil sampling program report*. [Accessed April 2011 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20%20Remediation/1AR-NAN0914\Admin#hearings\hearings\2002 hearing\post hearing submissions\GN](ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20%20Remediation/1AR-NAN0914\Admin#hearings\hearings\2002%20hearing\post%20hearing%20submissions\GN)].
- Gibson, R. (1978) *The Strathcona Sound Mining Project: a case study in decision making*. Science Council of Canada No. 42.
- Government of the Northwest Territories Baffin Region (1982) *Baffin Community Economic Planning Handbook*. Department of Economic Development and Tourism.
- Gourdeau, E. (1973) 'The Social Impact of Panarctic's Employment Policy in Arctic Bay and Pond Inlet' in *Employment*. Alexander Stevenson fonds, NWT Archives, N1992-023 box 31 file 2.
- Hamlet of Arctic Bay Working Group (2002) *Submission to the Nunavut Water Board*. [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20%20Remediation/1AR-NAN0914/2%20ADMIN/4%20HEARINGS/2%20HEARING/2002%20Renewal/Exhibits%20Undertakings/020726NWB1NAN9702%20Exhibit11-Submission%20of%20Hamlet%20AB%20Wrkg%20Group-English.pdf>].
- Hatfield, C.T. and Williams, G.L. (1976) *A summary of possible environmental effects of disposing mine tailings into Strathcona Sound, Baffin Island*. Hatfield Consultants Limited Arctic Land Use Research Program (Canada) [Sponsor].
- Hickling-Partners Inc. (1981) *Evaluation of the Nanisivik Project*. Written for Canada Department of Indian Affairs and Northern Development.
- Indian and Northern Affairs Canada (2002) *Mine Reclamation Policy for Nunavut*. Minister of Indian Affairs and Northern Development Ottawa, 2002.
- Interdepartmental Working Group on the Strathcona Sound Project (1974) 'Minutes of the second meeting of the Working Group' in *Strathcona Sound*, Mineral and Metal Commodities Branch Registry Files, Library and Archives Canada, RG21 Acc 1996-97/723 box 11 file 1.50.15.3 vol. 4.

Jacques Whitford Environment Limited (2003) *Human Health and Ecological Risk Assessment: Nanisivik mine, Nunavut. Report to CanZinco Ltd.* [Accessed January 2012 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/3%20TECH/10%20A%20and%20R%20\(G\)J/2004/G14%20HHERA/030130NWB1NAN0208%20HHERA%20Main%20Report%20IEDE.pdf](ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1ARNAN0914/3%20TECH/10%20A%20and%20R%20(G)J/2004/G14%20HHERA/030130NWB1NAN0208%20HHERA%20Main%20Report%20IEDE.pdf)]

Jean-Paul Drolet (1974) 'Memorandum regarding the Strathcona Sound Project from the Assistant Deputy Minister to the Deputy Minister of Mineral Development, Department of Indian Affairs and Northern Development' in *Strathcona Sound*, Mineral and Metal Commodities Branch Registry Files, Library and Archives Canada, RG21 Acc 1996-97/723 box 11 file 1.50.15.3 vol. 3.

Kalin, M. (1987) *Ecological engineering for gold and base metal mining operations in the Northwest Territories*. Environmental studies no. 59. Ottawa, ON.

Kalluk, L. (1975) 'Arctic Bay Protests Strathcona Townsite' in Gibson, R. (1978) *The Strathcona Sound Mining Project: a case study in decision making*. Science Council of Canada No. 42.

Memorandum to the Cabinet (1974) 'Strathcona Sound project' in *Strathcona Sound*, Mineral and Metal Commodities Branch Registry Files, Library and Archives Canada, RG21 Acc 1996-97/723 box 11 file 1.50.15.3 vol. 3.

Nanisivik Mine (2002) *Letter from Nanisivik mine to Thomas Kudloo of NWB regarding public hearing outcomes*. [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/Admin#hearings\hearings\2002%20hearing\post%20hearing%20submissions\BWR>].

Northern Program Planning Division (1974) 'Evaluation of proposal by Mineral Resources International Ltd to develop a lead-zinc mine at Strathcona Sound' in *Strathcona Sound*, Mineral and Metal Commodities Branch Registry Files, Library and Archives Canada, RG21 Acc 1996-97/723 box file 11 1.50.15.3 vol. 3.

Nunatsiaq Online (2012) "Canada's North digs in for the good — and bad — of a mining boom" by Bradley Bouzane and Chantal Mack [accessed August 2012 from: http://www.nunatsiaqonline.ca/stories/article/65674canadas_north_digs_in_for_the_good_and_bad_of_a_mining_boom/].

Nunatsiaq Online (2003) "Arctic Bay residents want details on Nanisivik health risks" by Jane George [Accessed April 2011 from: http://www.nunatsiaqonline.ca/archives/30905/news/nunavut/30905_05.html].

Nunatsiaq Online (2002a) "Nanisivik owner wants more time to post \$17.6 million bond" by Jim Bell [Accessed April 2011 from: http://www.nunatsiaqnews.com/archives/nunavut021101/news/nunavut/21101_04.html].

Nunatsiaq Online (2002b) "CanZinco heading for showdown with NWB?" by Jim Bell [Accessed April 2011 from: http://www.nunatsiaqonline.ca/archives/nunavut021108/news/nunavut/21108_01.html].

NWB (2009) *Nunavut Water Board Hearing RE: Nanisivik mine type a water license renewal and amendment application. Official Public Hearing Transcripts*. February 2009 [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/2%20ADMIN/4%20HEARINGS/2%20HEARING/2008%20Hearing/>].

NWB (2004a) *Nunavut Water Board final closure and reclamation of the Nanisivik mine. Official Transcripts of public hearing*. June 2004 [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/2%20ADMIN/4%20HEARINGS/2%20HEARING/2004/>].

NWB (2004b) *Public hearing meeting notes*. [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/2%20ADMIN/4%20HEARINGS/0%20GENERAL/2004/>].

NWB (2002a) *Reasons for decision for Licence Application for the Closure and Reclamation of the Nanisivik Mine filed by CanZinco Limited*. [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/4%20LICENCE/2%20DECISION/021010NWB1NAN0208%20FINAL%20Reasons%20for%20Decision-OEDE.pdf>].

NWB (2002b) *July 2002 Public Hearing Minutes* [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/2%20ADMIN/4%20HEARINGS/2%20HEARING/2002%20Renewal/PH%20July%2022-24,%202002/>].

NWB (2002c) *Public Meeting at Arctic Bay Exhibit 1: opening remarks by Bill Heath, vice-president of CanZinco*. [Accessed April 2011 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/2%20ADMIN/4%20HEARINGS/2%20HEARING/2002%20Renewal/Exhibits%20Undertakings/](http://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/2%20ADMIN/4%20HEARINGS/2%20HEARING/2002%20Renewal/Exhibits%20Undertakings/)].

NWB (2001) *Mine closure and application amendment*. [Accessed April 2011 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/2%20ADMIN/0%20GENERAL/2001%20Extension/](http://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/2%20ADMIN/0%20GENERAL/2001%20Extension/)].

Postmedia News (2012) "Mining boom to drive economic growth in Canadian North" by Chantal Mack [accessed August 2012 from: <http://business.financialpost.com/2012/03/14/mining-boom-to-drive-economic-growth-in-canadian-north/>].

'Reasons for the Importance of Wage Employment to the Eskimo Economy (no date) in *Employment of Eskimos*, Alexander Stevenson fonds, NWT Archives, N1992-023 box 31 file 3.

Reedyk, S. (1987) *Profiles of Baffin communities affected by closure of the Nanisivik mine & a summary of the impact of closure on the communities*. Canada, Indian and Northern Affairs Canada, Mining Management and Infrastructure Division.

Smith, P. (2002) *Fax from DIAND to Breakwater regarding security deposit, with attachment: Northwest Territories Waters Act*. [Accessed January 2012 from: [ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/3%20TECH/2%20SECURITY/2002/020808NWB1NAN0208%20DIAND%20to%20BWR%20Security%20Required-ILAM.pdf](http://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/3%20TECH/2%20SECURITY/2002/020808NWB1NAN0208%20DIAND%20to%20BWR%20Security%20Required-ILAM.pdf)]

'Strathcona Sound Project' (no date) 'Draft: Strathcona Sound Project in *Employment*, Alexander Stevenson fonds, NWT Archives, N1992-023 box 29 file 6.

Stewart, D. (1998) *Review of aquatic studies related to Nanisivik Mine, Baffin Island*. Arctic Biological Consultants, Winnipeg, MB for Department of Fisheries and Oceans, Iqaluit.

TEAC (1980) *TEAC Meetings in Northwest Territories* Department of Economic Development and Tourism fonds, NWT Archives, G2002-004 box 38 file 5 pt. 2.

TEAC (1979) *TEAC Meetings in Northwest Territories* Department of Economic Development and Tourism fonds, NWT Archives, G2002-004 box 36 file 6.

TEAC (1978) *TEAC Meetings in Northwest Territories* Department of Economic Development and Tourism fonds, NWT Archives, G2002-004 box 38 file 5 pt. 1.

Waldie, P. and Sopinski, J. (2011) 'Cover Story: Arctic Promise,' *The Globe and Mail, Report on Business*. Saturday May 14th 2011.

Watts, Griffith and McQuat Limited (1973) *Feasibility study of the Strathcona Sound Project*. Volume 1.

Yates, A. (1975) *Nanisivik - place where things are found - example of government-industry cooperation in far north*. CIM Bulletin.

Young B. (2003) *Memo: Wolfden Resources: massive sulphide discovery at High Lake*. [Accessed April 2011 from: <ftp://nunavutwaterboard.org/1%20PRUC/1%20INDUSTRIAL/1A/1AR%20-%20Remediation/1AR-NAN0914/Tech\10 A and R\2003>].

Works Cited

Aschmann, H. (1970) The natural history of a mine. *Economic geography* 46: 172-189.

Bocking, S. (2004) *Nature's Experts: Science, Politics, and the Environment*. Rutgers University Press: New Brunswick.

Bowes-Lyon, L. (2006) Comparison of the socio-economic impacts of the Nanisivik and Polaris Mines: sustainable development case study. MSc Thesis, University of Alberta.

Boulter, P. (2011) The survival of an Arctic boom town: socio-economic and cultural diversity in Rankin Inlet, 1956-63. MA Thesis, Memorial University, St. John's, Newfoundland.

Bridge, G. (2004) Contested Terrain: Mining and the Environment. *Annual Review of Environment and Resources* 29: 205-259.

Bridge, G. (2000) The social regulation of resource access and environmental impact: production, nature and contradiction in the US copper industry. *Geoforum* 31 (2): 237-256.

Damas, D. (2002) *Arctic Migrants/ Arctic Villagers: The transformation of Inuit settlement in the Central Arctic*. McGill-Queens University Press: Montreal and Kingston.

- Dickinson, M. (1992) *Whose North? Political Change, Political Development and Self-Government in the Northwest Territories*. UBC Press: Vancouver.
- Duffy, Q. (1988) *The Road to Nunavut: The Progress of the Eastern Arctic Inuit since the Second World War*. McGill-Queen's University Press: Montreal.
- Elberling, B. (2005) Temperature and oxygen control on pyrite oxidation in frozen mine tailings. *Cold Regions Science and Technology* 41: 121-133.
- Elberling, B. (2001) Environmental controls of the seasonal variation in oxygen uptake in sulfidic tailings deposited in a permafrost-affected area. *Water resources research*, 37, (1): 99-107.
- Farish, M. (2006) Frontier engineering: from the globe to the body in the Cold War Arctic. *The Canadian Geographer* 50: 177-196.
- Grant, S. (2010) *Polar imperative: A history of Arctic Sovereignty in North America*. D&M Publishers: Vancouver.
- Grant, S. (1988) *Sovereignty or Security? Government Policy in the Canadian North 1936-1950*. UBC Press: Vancouver.
- Harvey, D. (2003) *The New Imperialism*. Oxford University Press, Oxford.
- Horowitz, L. (2010) "Twenty years is yesterday": Science, multinational mining, and the political ecology of trust in New Caledonia. *Geoforum* 41: 617-625.
- Jasanoff, S. (2006) *States of knowledge: The co-production of science and social order*. Routledge: London.
- Kyhn, C. and Elberling, B. (2001). Frozen cover actions limiting AMD from mine waste deposited on land in Arctic Canada. *Cold Regions Science and Technology* 32: 133-142.
- McAllister, M. L. (2007) Shifting Foundations in a Mature Staples Industry: A Political Economic History of Canadian Mineral Policy. *Canadian Political Science Review* 1, (1): 73-90.
- Ogborn, M. (2003) 'Knowledge is power: using archival research to interpret state formation,' in Blunt, A., Gruffudd, P., May, J., Ogborn, M. and Pinder, D. (eds.) *Cultural Geography in Practice*. Arnold: London.
- Pellizzoni, L. (2010) Risk and Responsibility in a Manufactured World. *Science and Engineering Ethics* 16, (3): 463-478.

Richards, J. (Ed.) (2009) *Mining, society, and a sustainable world*. Springer: London.

Sandlos, J. and Keeling, A. (2012) Claiming the New North: Mining and Colonialism at the Pine Point Mine, Northwest Territories, Canada. *Environment and History* 18, 1: 5-34.

Sarewitz, D. (2004) How science makes environmental controversies worse. *Environmental Science and Policy* 7: 385-403.

Smith, N. (2008) *Uneven Development: Nature, Capital and the production of space*. University of Georgia Press: Athens and London.

Wenzel, G. (1983) The Integration of "Remote" Site Labor into the Inuit Economy of Clyde River, N.W.T. *Arctic Anthropology* 20, (2): 79-92.

CHAPTER 4

THESIS CONCLUSIONS

This study began as an attempt to understand what functions High Arctic mines performed and what they produced, both during their operation and after their closure. Using an array of primary archival documents, policy documents, corporate and government reports, scientific and technical studies, interview transcripts and secondary literature, this thesis has narrated the stories of mining on Svalbard and Nanisivik to ground different notions of ‘production’ using a historical geographic materialist approach. At a time when the Arctic is increasingly becoming a region of significant economic, environmental, cultural and political change and contestation, the histories of mine development at these two sites provide insight into the interlocking economic and geopolitical functions mineral production at these mines fulfil.

Aside from narrating mine development at Svalbard and Nanisivik – sites which are rarely discussed, if not completely absent from much literature in human geography, history and cognate fields – this thesis has also sought to contribute toward a broader body of literature in political economy. This is important because the reports of an Arctic mining ‘boom’ presented by the media (Waldie and Sopinski 2011; Nunatsiaq News 2012; Postmedia News 2012), the conceptual models of mining lifecycles produced in some academic fields (Ashmann 1970; Davis 2009), the schemas of mine production used by industry experts and government bodies (Richards 2009), and more broadly, some grand theories of capitalist production (Harvey 2006; Smith 2008) frequently suggest that

production processes are primarily organized around a profit-motive, while overlooking the geopolitics of such production processes. These discourses do not always account for the ways geopolitical objectives intersect with the production of minerals, nor the ways other economic (and non-economic) activities may revalorize moribund mining landscapes. Instead, operating costs, mineral prices, capital investment, ore quality and technology all determine profitability – and a mine’s lifecycle – according to the schemas used by mine companies and government agencies. Dictated by economic laws, unfeasible mining projects never begin and unprofitable mining projects soon end. We must remember, however, that these schemas do work. They do work to juxtapose productive landscapes against unproductive ones. They do work to position money as the sole measure of value. And they do work to naturalise the termination of capitalist production and make inevitable the dereliction of landscapes. The naturalisation of mining lifecycles produces an apolitical economy of mineral extraction. More fundamentally still, these schemas naturalise capitalism, and capitalism’s agency in producing value and ruination. Set within an increasing body of critical geographical and historical literature on mining, political economy, and resource geography, this thesis has attempted to challenge such apolitical representations by illuminating the (geo)politics behind capitalist production processes.

As the last two chapters indicate, the Svalbard and Nanisivik mines not only functioned as sites for the production of ores and economic value, but were also designed to fulfil a variety of interconnected state objectives. As well, these two chapters have illustrated that mine closure does not simply equate to the end of the productivity of

mining landscapes, but instead other activities may develop at these Arctic sites owing to their geostrategic, environmental or economic importance. By means of conclusion this final section synthesizes the key arguments made in each chapter, in relation to how these minescapes were functional and productive. Because I have already summarised the arguments made in each chapter elsewhere in this thesis, this conclusion provides a theoretical overview from the two sites. This conclusion is structured into two short sections. The first concluding section summarises how Svalbard and Nanisivik were co-productive of capital and the state according to geopolitical-economic objectives, and the second concluding section posits that these two mines continued to be productive (and co-productive) after their closure.

4.1 The Geopolitical Economy: Svalbard and Nanisivik as Sites of the Co-production of Capital and the State

The last two chapters have suggested that the production of minerals at Svalbard and Nanisivik was not driven by a profit-motive alone, but mine development and mineral production has been driven by interlocking economic, political and geopolitical objectives at each site. This thesis proposes that the Svalbard and Nanisivik mines functioned as sites of co-production: they not only generated valuable commodities, but the mines were themselves the products of capital's requirements *and* state policies. As stated in the introduction to this thesis, some geographic literature demonstrates that production involves generating a range of material and discursive, economic and non-economic things – and I have suggested that capitalist production can be better thought of as a co-productive process. Building on this idea, the evidence outlined below suggests how

Svalbard and Nanisivik functioned as sites for the co-production of capital and the state in accordance with interlocking geopolitical-economic objectives.

Though the mines at Svalbard and Nanisivik generated commodities circulated in the capitalist market that have been sold in exchange for money, the profitability of the minerals produced at these two sites was questionable or a secondary concern for the respective governments involved. Mining at Nanisivik was supported by the Canadian government in the form of grants and loans despite the dubious feasibility of the mine - demonstrating the willingness of the Canadian government to finance a potentially unprofitable operation (though the mine was profitable in reality). And at Svalbard, Store Norske has operated since 1916 yet only recently started to generate a substantial return. The Norwegian government increased its share in Store Norske to subsidize this unprofitable operation and keep the company afloat. Mining may never have begun at Nanisivik and Store Norske's mines may have closed long ago without significant financial support from the respective governments involved.

Various archival and contemporary documents show that state support of these mines by the respective Norwegian and Canadian governments was granted on the basis that these mines would achieve numerous political objectives. At Nanisivik, the very concept of establishing a mine in Canada's far north was informed by government objectives from the offset. Though the feasibility of the venture was questionable, the Nanisivik mine was seen by the Canadian government as a project that would industrialize northern Baffin Island, and in doing so, provide employment opportunities for many northern indigenous residents, pioneer new operating techniques in the Arctic,

and secure Canadian sovereignty in the north. Indeed, the Canadian government invested in the development of a townsite at Nanisivik based on these objectives, and government officials worked closely with the mine to ensure that these objectives were fulfilled through implementing the Strathcona Agreement. At Svalbard, early mining undertaken by many nations opportunistically exploited the most feasible and easily accessible coal seams. However, Norwegian mining after 1920 largely intended to consolidate the newly-formed Norwegian state through providing a stable source of coal within Norwegian territory at a time of international political conflict (particularly during the Cold War). Though Norway's motivations for sustaining coal mining on Svalbard have changed over time, maintaining Norwegian sovereignty over Svalbard remains one of the most important reasons for the continued production of coal by Store Norske. Together, state ownership of Store Norske and recent 'normalisation' efforts to develop Longyearbyen as a permanent family town, have been used to ensure that a Norwegian presence on Svalbard is maintained. Clearly, these two sites were never designed to be only productive of ores, but in reality functioned as sites co-productive of capital and the state.

By investigating the co-production of capital and the state at Svalbard and Nanisivik, several interesting theoretical insights regarding the geopolitical economy of these sites can be made. First, the products generated from mining at Svalbard and Nanisivik were not solely produced according to a capitalist logic of power, but were informed by a territorial logic of power as well. As already suggested in the thesis introduction, the very function of capitalist production is to generate useful commodities which can be sold in exchange for a profit. However both Svalbard and Nanisivik

demonstrate how this capitalist logic of power was not the sole imperative behind these projects, but in fact production was a (geo)political process that was financed, and at times organized, according to a territorial logic of power. At Svalbard, for instance, the production of coal not only generated a commodity and economic value, but the very physical act of extracting coal from the ground by a Norwegian-owned mine company exercised and actualized Norwegian sovereignty over Svalbard. Interview participants and corporate reports shared the sentiment that mining on Svalbard was productive in maintaining sovereignty, and that sovereignty was more important than profitability – demonstrating how profitability is not synonymous with productivity. Mining at Nanisivik not only produced lead-zinc concentrates, but co-produced the Canadian state through using Canadian ships and materials, and building a townsite that would help secure Canadian sovereignty in the north. Together, these two sites suggest how production does not fulfil economic functions alone in the capitalist system, but demonstrate how the interrelated economic imperatives and geopolitical objectives that drive production processes are closely intertwined and, at times, mutually constitutive.

Second, the Nanisivik and Svalbard minescapes are the material product of state investment and government objectives. In subscribing to the notion that landscapes are both produced and productive, this thesis has shown how the produced landscapes at these mine sites - their mining infrastructures, townsites, and the like - not only functioned as the means of the production of ores, but were themselves the material products of government investment and state objectives. Government financial support was provided at both sites on the basis that mining would help fulfil state objectives, and

it was important for both the Norwegian and (to some extent) the Canadian government that permanent mining settlements were developed at both sites. In this sense, state financial support did not just economically subsidize these ventures, but state support can be seen as an investment in geopolitical interests whereby the return on this investment was the continued (or enhanced) ability to assert sovereignty and fulfil particular political goals at these sites. So, the produced minescape at each site was not only productive of ores, but co-productive in the sense that it reproduced state territory and functioned as means of materializing interlocking geopolitical-economic objectives.

Clearly, commercial and political interests in mining at these sites have been closely tied, and the entanglement of these logics makes the very concept of 'production' as an economic process ambiguous. At these sites, the capitalist and territorial logics of power are important in explaining the state's role in assisting capitalist accumulation, while illustrating how these capitalist ventures themselves (re)produced state territory. In recognising that territorial and capitalist logics of power are blurred, the idiom of co-production captures the mutually constitutive and intertwining geopolitical-economic motives operating at Svalbard and Nanisivik. In line with literatures that demonstrate how production does not only generate economically valuable commodities but also produces nature, landscapes, states and the like, both Svalbard and Nanisivik reveal the importance of government material and ideological support in developing and sustaining mines at these High Arctic locations, and illuminate the close, and often inseparable connections between the co-production of capital and territory, and their respective logics. The idea that the historical development and operation of these two mines represents a co-

production of capital and the state may be useful for describing the geopolitical economy of other similar resource developments in the Arctic characterized by interlocking political and economic motives.

4.2 The On-going-ness of Production at Svalbard and Nanisivik after Closure

Much of the geographical literature reviewed in the introduction of this thesis suggested that capitalist production processes, and especially mineral production, are inherently unstable, if not outright contradictory. The boom-bust economies that characterize the exploitation of finite resources are often particularly precarious in peripheral regions where operating costs are high and opportunities for economic diversification limited. High risk, capital intensive projects in the Arctic, including the ventures at Svalbard and Nanisivik, are especially susceptible to global commodity price fluctuations as well as high costs resulting from their geographic location. Rather than conceiving mining as a linear process that will inevitably lead to closure, the last two chapters suggest that scientific activity has re-valued the closed Nanisivik minescape and revalorized some of the Norwegian mining settlements on Svalbard. This thesis proposes that both sites demonstrate how production is on-going – especially when we view production not as a process that only generates valuable commodities but as a process that co-produces other non-economic things such as scientific knowledge and state territory.

Though some mining still continues on Svalbard, the development of scientific research institutions and infrastructures from 1989 onwards has revalorized Svalbard's minescapes. This scientization of Svalbard's minescapes was prompted not only by

Norway's research agenda for the Arctic, but in response to an active effort to keep Norwegian settlements on Svalbard 'productive' should mining on Svalbard cease. Research institutions such as the Kings Bay Company and UNIS have developed using existing mining infrastructures, and complement efforts to diversify the Norwegian economy on Svalbard. Like Store Norske, the Kings Bay Company and UNIS are owned by the Norwegian government, and 'state ownership' policy documents reveal how these institutions are intended to help maintain the Norwegian control of resources on Svalbard and inform the future exploitation of resources in the Arctic. Through fulfilling various (interrelated) scientific, economic and geopolitical objectives, this scientific activity extends the geopolitical-economic functions performed by mining on Svalbard. The scientization of Svalbard's minescapes illuminates how the devaluation of Svalbard's minescapes is not an inevitable process, but instead the existence of physical mining infrastructures and persistence of geopolitical motives permitted the revalorization Svalbard's minescapes for scientific use.

During efforts to offset community experiences of mining at Nanisivik, many technical and scientific experts were hired by various government departments and the mine company CanZinco to inform how the mine was going to be reclaimed and at what cost. Owing to the high cost of reclamation, however, these valuations were subject to dispute between the government and the mine company, and each presented scientific evidence to substantiate their own valuations of the cost of reclamation. Efforts to legitimize the cost of reclamation concurrently legitimized the scientific knowledge mobilized by the different intervening parties at Nanisivik. Rather than deploying the

idiom of co-production to capture the connections between capital and the state, co-production has been mobilized in a second way to describe the mutual constitution of scientific knowledge and valuations (of the cost of reclamation), and to demonstrate how Nanisivik continued to function as a site of production after its closure.

Though these examples of the way scientific activity has manifest at each site are very different, both Svalbard and Nanisivik demonstrate how production can be viewed as an on-going process. By understanding production as generative of economic and non-economic things, scientific activity can be thought of as a process co-productive of knowledge, political objectives, state territory, capital and the like. At sites where scientific activity has developed in response to the environmental or geopolitical legacies of mining, or as a result of the special economic, geographical and environmental character of sites in the Arctic, this scientific activity often fulfils similar (or connected) objectives as mining, and questions notions of 'post-productivity' after mine closure.

Together, these various examples of co-production at Svalbard and Nanisivik suggest how production is not one single, linear process, but rather production is a complex and multifaceted process. This thesis concludes that the Svalbard and Nanisivik mines were not simply economic projects intended to produce ores and value, but were co-productive ventures in the sense that they reproduced state territory and fulfilled political, geopolitical or geostrategic objectives. The findings of this thesis also indicate that mineral extractive industries do not always operate on a linear timeline characterised by an operational phase followed by a closure phase. Rather, the geographical, geostrategic and environmental importance of these Arctic sites dictates the value, use

and lifespan of its minescapes. Clearly, understanding the political economy of production should not only focus on the economic dimensions of mining at these sites, but adopt a political reading that pays attention to various other objectives behind production processes. As such, I propose that scholars in geography, history and cognate fields should view production as a political, geographically-particular process by considering what political functions production fulfils in relation to the geopolitical, economic and environmental value of a specific site.

4.3 Chapter 4 Bibliography

Aschmann, H. (1970) The natural history of a mine. *Economic geography* 46: 172-189.

Davis, G. (2009) 'Extractive Economies, Growth, and the Poor' in Richards, J. (ed.) *Mining, Society and a Sustainable World*. Springer: London

Harvey, D. (2006) *The Limits to Capital*. Verso: London.

Nunatsiaq Online (2012) "Canada's North digs in for the good — and bad — of a mining boom" by Bradley Bouzane and Chantal Mack [accessed August 2012 from: http://www.nunatsiaqonline.ca/stories/article/65674canadas_north_digs_in_for_the_good_and_bad_of_a_mining_boom/]

Postmedia News (2012) "Mining boom to drive economic growth in Canadian North" by Chantal Mack [accessed August 2012 from: <http://business.financialpost.com/2012/03/14/mining-boom-to-drive-economic-growth-in-canadian-north/>]

Richards, J. (Ed.) (2009) *Mining, society, and a sustainable world*. Springer: London.

Smith, N. (2008) *Uneven Development: Nature, Capital and the production of space*. University of Georgia Press: Athens and London.

Waldie, P. and Sopinski, J. (2011) 'Cover Story: Arctic Promise,' *The Globe and Mail, Report on Business*. Saturday May 14th 2011.

APPENDIX

Appendix I: Consent Form Sample



Research project: “extracting and manufacturing value from abandoned High Arctic minescapes”

Researcher: Scott Midgley, Department of Geography,
Memorial University of Newfoundland

Introduction to the study

This research focuses on the economic and environmental legacies of mining in the Arctic. This research seeks to understand both the positive and negative impacts of mining in the Arctic, from the perspective of policy-makers, government officials, researchers, mine companies, remediation companies and environmental consultants.

I feel that you may be able to provide interesting insights into this topic given your professional capacity. I invite you to participate in a semi-structured interview in which I will ask you about the positive and negative impacts of mining, related to your expertise, experience and knowledge.

This form is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any other information given to you by the researcher. It is entirely up to you to decide whether to take part in this research. If you choose not to take part in the research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

Duration of the study and method used

I will carry out the interview at a time and location convenient to you. The interview will not last longer than 60 minutes. To help accurately represent your views I would like to tape record the interview. After your interview you will be able to review the transcript of your interview, and to add, change, or delete information from the transcripts as you see fit.

Protection of personal information and general interview guidelines

- The information obtained from the interview will be used strictly for this research.
- Interviewees can ask for the recording device to be turned off at any time and can have recorded statements removed from the recording.
- Information of a private nature will not be sought during the interview process and will not be published.
- Interview data files and transcripts will not be distributed, sold or disseminated in any way, though selected quotes may be used in a published essay or book, with permission.
- Interview subjects will have the right to view and comment on this material prior to publication.
- Interview subjects may consent to allow their names to be used in a publication or may choose to remain anonymous. Interviewees that choose to remain anonymous will be identified generically or through a pseudonym, and other personal identifiers (such as gender) will be avoided.

Duration of the conservation of personal information

Interview transcripts and audio files will be securely stored by the researcher for a minimum of five (5) and maximum of ten (10) years before being destroyed by deleting the electronic files and shredding any paper material that contains primary data (interview transcripts, field notebooks, etc.).

Right to refuse or withdraw

The participant will be able to withdraw from the research project at any time, without having to give a reason and will not suffer any kind of prejudice for doing so.

Consent statement

I _____ (name in block letters) freely consent to participate in the following aspects of the research project (check appropriate boxes):

<input type="checkbox"/>	conduct of an individual interview
<input type="checkbox"/>	identification of informant in publications or reports
<input type="checkbox"/>	digital recording and secure storage of the interview
<input type="checkbox"/>	transcription, printing and secure storage of the interview
<input type="checkbox"/>	use of interview material for research and publication purposes (related to the topic of the study as indicated above only)

Signature of participant _____

Date:

Signature of researcher _____

Date:

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-8368.

If you have any concerns, please contact Scott Midgley or his supervisor (see contact info below) who will do their best to answer your questions. If you have ethical concerns about the research, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at (709) 864-2861.

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Appendix II: Sample Interview Questions

Read and explain consent form

Thank you for participating in this interview. I am a student studying Geography at Memorial University of Newfoundland, in Canada, and I am doing a project about mining in the Arctic. This project seeks to understand both the positive and negative impacts of mining in the Arctic, from the perspective of policy-makers, government officials, researchers, mine companies, remediation companies and environmental consultants.

I am going to ask you a series of questions. Please answer the questions with as much detail as possible. Please answer the questions from the perspective of your job position within the institution you represent – this is very important. If you do not fully understand a question, I will be happy to explain the question in more detail. If you do not know the answer to a question, let me know and we will move on to the next question. And remember, you are free to end the interview at any time, ask for the tape-recorder to be turned-off, and free to request that an answer is not used in the research. Do you have any questions?

Warm-up questions:

1. To begin, can you explain your job role and area of expertise?

Questions on mining

2. The focus of my project is to look at the impacts of mine closure in the Arctic. What are the *environmental* impacts of mine closure on Svalbard?
3. The Russian and Norwegian mine companies are owned by their respective governments. What measures do these companies take to minimise the environmental impacts of mining on Svalbard?
4. What is the role of the Norwegian government and Governor of Svalbard in regulating the environmental impacts of mine closure?
5. Have the closed mines on Svalbard been remediated?
 - a. Who pays the costs of remediation?
 - b. Are external consulting, research or remediation companies employed?
6. What are the economic advantages and disadvantages of mining on Svalbard?

7. Does mining in Svalbard have a secure future? Is there a strategy in place for developing a post-mining economy at sites across Svalbard?
8. In my project, I am particularly interested in the impacts of mining at Pyramiden. How successful was mining at Pyramiden? Why did the mine at Pyramiden close?
 - a. What are the environmental impacts of mining at Pyramiden?
 - b. How are the environmental impacts at Pyramiden being managed?
 - c. Is Pyramiden being remediated? By whom? At what cost?
 - d. Have any scientific studies regarding the environmental impacts of mining been undertaken at Pyramiden?
 - e. Are there plans for developing new economic activities at Pyramiden?
 - f. How important is preserving the mining ghost town image of Pyramiden compared with developing new economic ventures there?
9. In my project, I am also interested in the impacts of mining at Longyearbyen. What are the economics advantages and disadvantages of mining at Longyearbyen?
 - a. What are the environmental impacts of mining at Longyearbyen and the surrounding area?
 - b. How are the environmental impacts being managed?
 - c. Has the environment around Longyearbyen being remediated? By whom? At what cost?
 - d. Have any scientific studies regarding the environmental impacts of mining been undertaken around Longyearbyen?
 - e. As mining has declined around Longyearbyen, tourism and science are becoming increasingly important to the economy at Longyearbyen. Do you think this is true?
10. The Arctic is becoming increasingly important as a resource base, causing sovereignty disputes between Arctic nations. Is mining a political project for Norway and Russia to assert sovereignty over Svalbard/ the Arctic? Is sovereignty more important than making profits?

Questions on environmental management and conservation

Mining in the Arctic can be damaging to the Arctic environment.

11. How is the Arctic environment being preserved through regulation on Svalbard, and how successful is it?
12. Why is the environment being preserved on Svalbard?
13. Is environmental preservation more important than successful mining activity on Svalbard?
14. Are there any economic benefits or costs to environmental preservation?
15. Some people suggest that mining on Svalbard was politically strategic. Do you think that environmental preservation is used by Norway or Russia in politically strategic ways? How?

Questions on cultural heritage

On Svalbard, much of the remains of past mining activity are classed as cultural heritage.

16. Why is cultural heritage preserved on Svalbard?
17. Are there any advantages and disadvantages of preserving cultural heritage?
18. Why is it important to remember past mining activity to the culture and history of Svalbard?
19. Is much money invested in the preservation of cultural heritage?
20. Some people suggest that mining on Svalbard was politically strategic. Do you think that cultural heritage is used by Norway or Russia in politically strategic ways? How?

Questions on scientific research

As mining activities on Svalbard have slowed down or stopped in some areas, new activities are being undertaken. For example, UNIS has been established and science in general is increasingly important to the economy on Svalbard.

21. Why was UNIS established? How important was the decline in mining activity to the decision to establish UNIS?
22. How important is UNIS and science in general to the economy on Svalbard? Who economically benefits from science? Who funds UNIS?
23. Does science inform mining operation policy and reclamation policy/ environmental policy/ cultural heritage policy?
24. Some people suggest that mining on Svalbard was politically strategic. Do you think that the establishment of UNIS was politically strategic? Do you think that science is used by Norway or Russia in politically strategic ways? How?

Interview wind-down

Confirm contact details

Other documents available?

Thank you for participating in this interview. I will send you an electronic copy of the consent form in an email.

