

A higher level of civilisation? The transformation of Ny-Ålesund from Arctic coalmining settlement in Svalbard to global environmental knowledge center at 79° North

Research Article

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Abstract

This article provides an historical account and analysis of the repurposing of Ny-Ålesund from Arctic coalmining settlement to Norwegian-administered international research base in Svalbard. Three levels of analysis are employed to explain the settlement's transformation and its rising geopolitical significance, focusing primarily on the period of rapid internationalisation and expansion of scientific activities starting in the late 1980s. The local level examines Norway's efforts to maintain effective occupation of greater Kongsfjorden by promoting research, underpinned by the economisation of the area's near-pristine natural environment as a non-extractive resource for science; the global level applies the concept of telecoupling to consider the role of events and processes at larger spatial scales that facilitated Ny-Ålesund's transformation; and the "glocal" level explains how the interaction of Norwegian and global actors in the locality of Ny-Ålesund have collectively shaped the community's institutions over some 30 years. The article also reflects on recent policy changes signalling more assertive Norwegian administration and greater coordination of research in Ny-Ålesund.

Introduction

"What happens in the Arctic doesn't stay in the Arctic" has become a cliché among those interested in Arctic affairs. Through examining the recent history of arguably the most globally linked community in the Far North, this article aims to demonstrate the converse also holds true: that events and processes at larger spatial scales have strongly influenced particular Arctic locations. The convergence of the global and the local in a former coalmining settlement in Svalbard has, moreover, produced a synthetic "glocal" history for a place where an array of states, individuals and institutions have sought to conduct scientific research, exercise sovereignty, and/or secure legitimacy as Arctic stakeholders.

This article provides an historical account and analysis of the repurposing of Ny-Ålesund from coalmining settlement to vibrant international base for scientific research and environmental monitoring. As a community and economic system centred on natural science, Ny-Ålesund today helps sustain Norway's effective occupation of Svalbard, a High Arctic archipelago under Norwegian sovereignty through the 1920 Svalbard Treaty, by facilitating a permanent Norwegian presence along Kongsfjorden on Spitsbergen island's Brøgger Peninsula. Under administration of Kings Bay Kull Compani AS—fully state owned since 1933—coalmining constituted Ny-Ålesund's main activity from its 1916 founding until 1962 when an explosion killed 21 miners, precipitating the "Kings Bay Affair" that brought down the government. Mining activities were terminated the following year, and the community of some 200 inhabitants evacuated (Hanoa, 2016).

Since evacuation—and especially from the late 1980s—Ny-Ålesund has undergone a fundamental transformation. From 1720 research days registered in 1990 (Sander, Holst, & Shears, 2006), activity increased to over 13 000 overnight stays by scientists in 2016, with an equal number by support staff and other visitors (Kings Bay, 2016). Rather than exploiting the adjacent Zeppelinfjellet's coal seam, another form of extraction has become the primary local industry: mining data and knowledge from the atmospheric, marine and terrestrial systems of greater Kongsfjorden. Ny-Ålesund offers an opportunity to study the reinvention of an Arctic coalmining community, radically repurposed as a site of scientific activity that also serves to enroll other states in maintaining Norwegian sovereignty over Svalbard, while providing the former an Arctic foothold.

Gaining insight into Ny-Ålesund's emergence as a centre for global climate research—and node of contemporary Arctic geopolitics—is a highly relevant research task at a time when various actors are striving to shape the region's future. Scientific activity in Ny-Ålesund, where

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10 states today maintain research stations, is a form of informal diplomacy (Grydehøj, 2014) and a primary means for non-Arctic countries to assert Arctic stakeholder status, facilitating their participation in regional governance bodies (Paglia, 2016; Roberts & Paglia, 2016). The period of Ny-Ålesund's transformation here analysed encompasses—and is deeply intertwined with—the two socio-ecological and geopolitical state changes (Young, 2010) that took place in the Arctic since the late 1980s, during which the region has become an area of significant international interest.

Norway's sovereignty over Svalbard has been maintained through effective occupation and long-term administration of the archipelago, including the previously coal-based settlements Sveagruva and Longyearbyen (Pedersen, 2017). The latter began diversifying its economic base in the early 1990s with the establishment of UNIS (Misund, Aksnes, Christiansen, & Arlov, 2017). The decline of coal and ascendancy of research and education in Longyearbyen were affirmed by a 2016 government white paper (Norway, 2016), which also elevated the role of the Norwegian Polar Institute (NPI) in Ny-Ålesund, mandating the transfer of Kings Bay AS—which owns and administers the settlement—from the Ministry of Trade, Industry and Fisheries (MOI) to the Ministry of Climate and Environment (MOE).

With coalmining relegated to industrial history, Ny-Ålesund's reinvention and embrace of research as the primary enterprise provides a useful precedent for Norway's post-coal and increasingly science-centric Svalbard policy. The success of the socio-economic model developed over almost 30 years can, as elaborated below from the perspective of multiple participants in this highly internationalised process, largely be explained by the opportunities for most stakeholders—the Norwegian state, other countries and research institutes, even individual scientists—to derive scientific, geopolitical and/or professional benefits from the transformation.

Methodology

Theories presented below are each associated with one of three scales of analysis that structure this study of an Arctic post-industrial transformation processes. In addition to providing an account of Ny-Ålesund's contemporary history, it also seeks to shed light on how, why and under what circumstances settlements established for resource extraction are repurposed for other activities. Empirical sources include Norwegian government reports and policy documents; literature on Svalbard and the Arctic; and a series of oral histories and written interviews with key Norwegian and international actors. A 2013 study visit provided valuable first-hand observations on Ny-Ålesund's built environment, surrounding natural systems, and scientific work of researchers.

Multiple-scale analysis

The history of Ny-Ålesund's transformation involves drivers and actors operating at multiple spatial and political levels, and with differing purposes, which converged in the common project of creating an international scientific community in the High Arctic. This article therefore utilises three levels of analysis—local, global and glocal—to explain how the former industrial mining community of Ny-Ålesund evolved into a highly organised and increasingly institutionalised base for diverse scientists studying Arctic and global environmental change. The analysis focuses mostly on the period that ensued in the late 1980s, when Norwegian authorities began to actively encourage and facilitate the establishment of research stations managed by national polar institutes.

The “local” level entails efforts by Norway—as Svalbard's sovereign authority—to maintain effective occupation of Ny-Ålesund following coalmining's abrupt end. Largely motivated by geopolitical concern over Soviet/Russian activity in Svalbard (Arlov, 2011; Barr, 2003), many fundamental changes became manifest in the settlement's economic system. From industrial coalmining to international scientific research, Ny-Ålesund's socio-economic basis shifted from a logic of resource extraction to environmental preservation, which facilitates extracting uncontaminated data and knowledge from natural systems. Essential to this process was a radical reinterpretation of “natural resources”. As coal was in earlier periods socially constructed as a natural resource by actors favouring a mining future for Svalbard (Avango, 2014), the past 30 years has seen undisturbed nature promoted as the foundation of economic activity. The analysis of local drivers in Ny-Ålesund's transformation applies the “economisation” concept (Çalışkan & Callon, 2009) to explain how a landscape portrayed as “near-pristine” became the primary asset on which Norway constructed a research-based economy.

The internationalisation and escalation of activity in Ny-Ålesund during the late 1980s and early 1990s was concurrent with new conceptions of the Earth as an integrated system, and the emergence of climate change and polar ozone depletion as major political issues. It also coincided with the rapid expansion of globalisation after the Cold War. To distinguish external processes from Norway's activities in Svalbard, the “global” level of analysis incorporates broader political, economic and scientific developments that greatly enhanced international interest in the Arctic, in turn motivating non-Arctic states to pursue a permanent presence in Ny-Ålesund. Brief histories of national stations are provided in the “global” section, which applies a lens of telecoupling (Liu et al., 2013) to comprehend the global processes, events and interactions that were instrumental in the settlement's transformation. The telecoupling concept encompasses environmental, socio-economic and geopolitical connections that connect distant locations—including human and natural systems—through inter-spatial communication, globalisation flows and Earth system processes (Liu et al., 2013; Lenschow, Newig, & Challies, 2016; Paglia, 2018).

The dynamic late 1980s period of global change when the new incarnation of Ny-Ålesund emerged also gave rise to the term “glocal”. Coined in 1990, glocal entailed the interplay of forces at multiple scales and corresponded with attempts to connect the local and global in environmentalist thought and action (Roudometof, 2015). Similar to telecoupling's concern with interaction across space, “glocalisation” as applied here examines the convergence of distant forces that shaped a distinct community of locally engaged international actors. The analysis employs social and heuristic perspectives: the former focuses on the emergence of glocal institutions embodying the interaction of a broad array of actors, while the latter considers Ny-Ålesund a “truth spot” (Sörlin, 2011) where global environmental change is revealed.

Although each of these three levels of analysis provides a distinct perspective and line of empirical investigation, they should not be seen as strictly independent of one another. In some cases, key actors operated on multiple levels to transform the settlement and facilitate the convergence of the local and global, fostering the glocal institutions that are a defining characteristic of contemporary Ny-Ålesund. Following separate presentations of local, global and glocal perspectives—including sub-sections that address particular aspects of the three levels—the analysis section assesses the distinctive qualities that have set Ny-Ålesund apart from other areas of Svalbard. The conclusion considers future prospects for

Ny-Ålesund in the wake of the major 2016 government white paper, which entails substantial changes in the organisation and structure of the community.

Local factors

Norway's efforts to maintain effective occupation entered a new phase in the late 1980s. A 1986 Ministry of Justice white paper emphasised Norwegian scientific activity in Ny-Ålesund (Norway, 1986). By 1991, however, its primary function as a base for *international* research received official recognition in a MOI white paper on developing commercial activity in Svalbard (Norway, 1991), issued at a time when Norway was exploring strategies to diversify Svalbard's economy due to declining coal prices, which had precipitated a "coalmining crisis" (Arlov, 2011). Ny-Ålesund's emerging economic system became based on Kings Bay providing fee-based services and accommodation for foreign institutions that, by signing long-term leases on research stations, recognised the state-owned company's authority. This mutually beneficial system enhances Norway's sovereignty and financially supports Norwegian administration.

Ny-Ålesund's new purpose was reaffirmed in the 1993 MOE white paper *Norwegian Polar Research* (Norway, 1993), although it is worth noting that the settlement's repurposing was first articulated in the 1991 policy document on Svalbard's *economic* development. The re-designation entailed that all other human activity would be subordinate to scientific research, which required undisturbed natural systems. The economisation of the local environment was underpinned by an assemblage of policies and legislation, large investments in critical infrastructure and scientific installations, and recasting Ny-Ålesund's surroundings as a pristine wilderness (despite evidence to the contrary, cf. Kruse, 2016), climate reference area and natural science laboratory. The robust research-based economy Norway constructed soon supplanted the somewhat static NPI-Kings Bay arrangement that defined community activity until the early 1990s.

Transitional period 1967–1989

Ny-Ålesund's post-mining era had until then included two science-based ventures that initiated the settlement's new direction. During the European Space Research Organisation (ESRO) period (1967–1974), the Royal Norwegian Council for Scientific and Industrial Research (NTNF) constructed and operated the Kongsfjord Telemetry Station on behalf of the ESRO. The other was the 1968 establishment of a field station by NPI, which had since the early 1960s been eager to establish a facility in Ny-Ålesund, given the existing infrastructure that supported a community of 200–300 inhabitants (Barr, 2003; NPI, 2003). ESRO and NPI ensured that Norwegian nationals could effectively represent the country's interests around Kongsfjorden (cf. Schild, 1996)—a major concern after the 1962 crisis. Rolf Tamnes (1992) considers the latter a tipping point that led to Norway adopting a much more active political posture in Svalbard, where the Soviet Union in the early 1960s maintained three settlements with a total population over twice that of Norway's. NPI director Tore Gjelsvik played a key role in convincing the government to repurpose Ny-Ålesund for science by insisting the telemetry station be situated there rather than Longyearbyen—ESROs initial preference when it approached Norway in 1964 (Tamnes, 1992). The return of activity to Ny-Ålesund—financed by ESRO and administered by NTNF—enabled NPI to establish its first station in the "Yellow House", a coalmining-era family residence, staffed by

two technicians performing seismic and radiation measurements. The station was moved in 1981 to a late 1950s miners' barrack, where it remained until construction of Svedrup Station in 1999 (Barr, 2003).

Conducting highly visible field research to demonstrate Norwegian sovereignty is a longstanding NPI imperative (Bones, 2013). Similarly, NPI has since as early as 1962 directed scientists and institutions of other nations to existing Norwegian settlements (Bones, 2013; Machowski, 1995). This remains the goal of MOE and the Research Council of Norway (RCN), which cites preserving the natural environment and maintaining control over development of research in Svalbard as motivations for concentrating foreign stations to Ny-Ålesund and Longyearbyen (Norway, 1993, 2018; RCN, 1998). The strategy dovetails with Norwegian narratives of enlightened environmental governance over Svalbard and overarching policy objectives, consistently stated in white papers issued since the mid-1980s, including maintaining Norwegian communities, preserving Svalbard's (ostensibly) pristine wilderness, enforcing sovereignty and upholding Svalbard Treaty compliance (cf. Norway, 2009, 2016).

Largely motivated by geopolitics, activity in Ny-Ålesund shifted in the 1960s from coalmining to scientific research and entered a new, internationalised phase in the late 1980s. These developments entailed a *de facto* socio-economic transition. Since the adjacent coal seam no longer represented a recoverable resource due to domestic politics (Arlov, 2011; Grydehøj, 2014), the settlement's source of economic value became its Far-North geographical position that attracted ESRO, and the surrounding High Arctic natural systems that interested NPI and, later, foreign polar institutes. This foundation has underpinned—and financially supported—Norway's geopolitical imperatives: ESRO funding, channeled through NTNF, which assumed responsibility for Ny-Ålesund's infrastructure, allowed NPI to establish and operate its research station (NPF) in a high-cost location considered remote even compared to Longyearbyen (Barr, 2003).

The consequential ESRO period, including NPFs founding, established a new economic rationale for maintaining a permanent Norwegian community. The high-latitude geographical position and near-pristine nature became exploitable natural resources and thus objects of economisation. Ny-Ålesund's new incarnation, and the future of the settlement itself, was however cast into doubt with the 1974 withdrawal of ESRO and its critical infrastructure subsidisation. The government questioned whether operating a station in Ny-Ålesund could be justified economically, given the possibility of more cost-effective research in Longyearbyen (Schild, 1996). Given Norway's demographic deficit vis-à-vis the Soviet Union in Svalbard, MOI was able to rebuff suggestions of abandonment by appealing to geopolitics, calling for "a continued Norwegian presence in Ny-Ålesund" (Schild, 1996). Gjelsvik again played a key role, convincing the government that NPI was the only viable long-term actor (Barr, 2003; Siggerud, 1993). Norway thus retained its presence through NPF, with the state incurring the settlement's full cost.

For some 15 years following ESROs departure, scientific activity remained modest (O. Rogne, personal communication, 14 May 2017). By the late 1980s, Norwegian authorities—emboldened by receding tensions with the Soviet Union (Tamnes, 1992)—began promoting Ny-Ålesund to foreign polar institutes as a High Arctic research site. Enhancing its attractiveness followed two paths, both grounded in supplying and safeguarding amenities embedded in the local landscape: creating a built environment conducive for science, including the requisite communications, instrumentation and accommodation, and protecting the nearby natural

environment—recast as a reference site and near-pristine natural science laboratory—from activities disruptive to research (cf. Norway, 2018). These two dimensions are presented below to analyse local drivers behind Ny-Ålesund's transformation into an economically viable international research base supporting Norwegian policy objectives.

Built environment

Kings Bay AS

Kings Bay is the institutional embodiment of Ny-Ålesund's built environment. Fully nationalised in 1933, the former coalmining company remains owner of nearly all property and 295 km² of land around Kongsfjorden, and is responsible for maintaining cultural heritage within the community's building stock. It risked dissolution in the 1962 accident's political aftermath, and its future was again called into question in 1983 and 1990, with government proposals to transfer the company's duties to the Longyearbyen-based state-owned mining company Store Norske. Kings Bay's board argued that with Norway's sovereignty over Svalbard based on international law, which puts a premium on permanence and traditions, institutional change would weaken Norway's position (Hanoa, 2016). Presenting itself thus as a *de facto* cultural artefact symbolising continuity in Norway's effective occupation, Kings Bay convinced the government it represented an indispensable geopolitical resource. Relocating its headquarters from Oslo to Ny-Ålesund in October 1990, the company's evolution into a specialised service provider—including technical support, repurposing buildings and construction of customised scientific infrastructure—was a major development in the settlement's transformation from underutilised post-industrial site to thriving international research base (M. Loonen, personal communication, April 2016; R. Neuber, personal communication, April 2016).

Kings Bay's full embrace of science followed a period when other revenue schemes, for example, servicing fishing boats, were pursued in parallel to its primary responsibility as NPIs landlord. According to Odd Rogne, NPI director 1983–1992, Kings Bay's board initially blocked Ny-Ålesund from being fully developed into a research base, as the other economic activities were considered incompatible with science. The company eventually saw opportunity in research as NPF attracted more scientists and specialists requiring accommodation. A key to increasing activity was Rogne's agreement with the Governor for borrowing Bell 212 helicopters to transport scientists between Ny-Ålesund and Longyearbyen (personal communication, 14 May 2017).

Once internationalised, research days—a metric of activity and basis of Kings Bay's business model—rapidly rose from 1720 in 1990 to 11 886 in 1997 (Sander et al., 2006). Besides room-and-board, other income sources include air transport and freight, equipment rentals, safety courses, and rental of conference and laboratory facilities. Through payments for such services, the international scientific community fulfills a similar function to ESRO, providing a degree of financial support for Norway's effective occupation. Stimulating international demand for access to Ny-Ålesund—and the valuable scientific information the area offers—has thus been a high Norwegian priority.

Norway officially recognised the repurposing of the settlement through white papers issued by MOI in 1991 (Norway, 1991) and MOE in 1993 (Norway, 1993) that proclaimed Ny-Ålesund a place for science. Kings Bay's statutes were amended in 1996 to reflect this new purpose, stating that the “company's operations shall particularly aim to provide services to and promote research

and scientific activity, and to develop Ny-Ålesund as an international Arctic natural sciences research station” (Norway, 1999). “Kull Compani” (Coal Company) was removed from the company's name in 1998, and experienced research administrators were added to the board (Norway, 1999). More recently, Kings Bay's industrial legacy was further obscured—and its present function made more apparent—with its 2017 transfer from MOI to MOE.

Under Kings Bay's management, most interventions to maintain a permanent Norwegian presence take place within Ny-Ålesund's built environment. Physical manifestations assume two main forms: preserved and repurposed coal-era structures; and infrastructure and installations built specifically to facilitate research and accommodate scientists. Two purposes can be perceived in Norwegian authorities' efforts: to preserve the settlement's cultural heritage value—a normative position and priority signalling continuity in Norway's effective occupation—and increasing Ny-Ålesund's attractiveness as a High Arctic base for cost-effective research.

Cultural environment

After Ny-Ålesund's evacuation, the mining area was razed without regard for the industrial artefacts that had characterised the community. Mine entrances and coal-related infrastructure were burnt down or blown up, and the mining area bulldozed (Governor of Svalbard, 1999). Despite that much of today's building stock dates from the late 1950s/early 1960s modernisation period (Reymert, 2016), the settlement assumed a very different appearance post-demolition, according to Thor Siggerud (1993) who first visited Ny-Ålesund in 1960 and led NPI activities there 1964–1992. The initial disregard for cultural heritage to some extent continued into the early 1990s, as coal-era structures were sometimes incinerated rather than repurposed (Governor of Svalbard, 2008). Cultural heritage and environmental legislation enacted in 1992 (which defined structures pre-dating 1946 as automatically protected cultural monuments) and 2002 rendered Ny-Ålesund Svalbard's largest concentration of (29) protected buildings. The town hence became recognised as a valuable cultural environment that should retain its historical character as a Norwegian Arctic mining settlement (Governor of Svalbard, 2008; Norway, 2009), entailing limits on future expansion.

During Ny-Ålesund's incipient internationalisation in the late 1980s, the existing built environment was considered a challenge and an opportunity (O. Rogne, personal communication, 14 May 2017). Although difficult to maintain and make productive use of the dozens of vacant wooden buildings, these could be repurposed to accommodate research institutes interested in establishing stations. Coal-era buildings symbolise continuity of Norway's effective occupation and have become revenue-generating assets for Kings Bay, which prioritises repurposing old structures over new construction (Governor of Svalbard, 2008). Examples include the German–French Koldewey Station, among the first foreign stations in Ny-Ålesund, occupying the 1919 mining office; and the most recently established national facility, India's Himadri Station, housed in a 1917 barracks that was converted to a school-house in the late 1950s (Governor of Svalbard, 2008).

Infrastructure

Ny-Ålesund's modern infrastructure and scientific installations represent a crucial aspect of its attractiveness. Incentivising research institutes to establish stations in Ny-Ålesund rather than field sites in Svalbard's wilderness, or other Arctic locations,

supports Kings Bay's business model and conforms with Norway's goal of concentrating activity to existing settlements. MOI—the dominant and best-financed ministry active in Svalbard (Arlov, 2011)—invested 150 m NOK in infrastructure 1990–1997 (Norway, 1999). Construction of Zeppelin Observatory atop Zeppelinfjellet demonstrated Norway's commitment to research in Ny-Ålesund. Inaugurated in 1990, the Observatory, which was replaced with an upgraded facility in 2000, is owned by NPI, with the Norwegian Institute for Air Research (NILU)—active in Ny-Ålesund since the 1970s maintaining time series data on atmospheric phenomena and long-range pollutants—coordinating scientific activity. Additional installations include wet and dry labs inside most stations; shared facilities, for example, the repurposed miners' bathhouse *Gruvebadet* where Italy and India maintain atmospheric monitoring instruments; and Kings Bay Marine Laboratory, which led to a sharp rise in research activity following its 2005 opening. Recent investments include the Light Sensitive Observatory, and the Metrology and Calibration Laboratory.

Convenient High Arctic access is a key advantage emphasised by Norwegian authorities for attracting researchers to Ny-Ålesund. Establishing fixed-wing aircraft flights in 1989 (Hanoa, 2016) facilitated the influx that followed. The settlement's landing strip—built during the ESRO period (Tamnes, 1992)—was upgraded in 1996 and 2005, and quay rebuilt in 1992 (Thuesen, 2005). Norway has continued investing in amenities and critical infrastructure such as sewage treatment, power generation, fibre-optic cable and the canteen—the community's primary social node. Beyond improving communications and providing facilities for cost-effective research, an ongoing motivation for investments in Ny-Ålesund's built environment is reducing the collective environmental footprint, as presented in the 1998 and 2006 EIAs (Sander et al., 2006; Shears, Theisen, Bjørdal, & Norris, 1998).

Natural environment

“For the Government it is important that research conducted in Ny-Ålesund consistently exploits the area's unique character as a clean natural science laboratory. The special features and natural advantages of Ny-Ålesund and the Kongsfjord area must be exploited in the best ways possible.” – *Strategy for research and higher education in Svalbard* (Norway, 2018).

The emergence of science as an industry capable of sustaining a year-round community enabled Ny-Ålesund's natural environment—including Kongsfjorden and the Brøgger Peninsula—to be economised in a new and non-extractive manner, as the area's glaciers, tundra, biodiversity, clean air and fjord system became income-generating resources exploited by natural science. In contrast to industrial exploitation of Zeppelinfjellet's coal seam, the settlement's socio-economic lifeblood until 1963, “extraction” under the current regime is knowledge and data through research and monitoring. The Kongsfjorden International Research Base (KIRB) that emerged in 1991 (NySMAC, 2013) embodies international demand for Arctic research that underpins the Kings Bay-managed economic system. The symbiotic relationship between scientific community and repurposed coal-mining company is a lasting result of the surge in international research that greatly surpassed Norwegian activity at NPF before 1990.

Following the inauguration of the first three non-Norwegian stations, the 1993 MOE white paper mandated Ny-Ålesund's development into a leading international research and monitoring station, with other human activities having to cease or adapt to conditions necessary for this purpose (Norway, 1993). This

entailed keeping environmental impacts at very low levels to maintain near-pristine conditions, with the area's inherent natural qualities—situated between atmospheric air masses and long-range oceanic currents that render it a key location for global climate science—guiding research and monitoring activities (Norway, 1993, 2018; RCN, 1998, 2019).

Environmental legislation and the establishment of protected areas date to 1973–1974, when Norway was expanding control over Svalbard (Avango & Roberts, 2017). The government began promoting protection of Svalbard's unique wilderness as a pillar of Norwegian policy in the mid-1980s, reaffirmed in subsequent white papers (Norway, 1986, 1999, 2009, 2016). With the growing importance of science and the internationalisation of research, MOE in 1995 issued a white paper on environmental protection in Svalbard that further articulated Norway's preservationist agenda (Norway, 1995). The 2002 Svalbard Environmental Protection Act—following 1992 cultural heritage legislation—brought natural and cultural history values together into a single legal framework privileging conservation and protection of pristine nature over other interests, while allowing appropriate commercial activities in some locations (Avango & Roberts, 2017; Norway, 2002).

As this policy regime protects natural systems that represent laboratories for research, environmental legislation is interdependent and intertwined with Norwegian objectives, policies and initiatives that promote science as a favoured activity in Svalbard. The 1991 MOI white paper and subsequent policy pronouncements (cf. Norway, 1993, 2018; RCN, 1998) elaborate both the goals of enhancing environmental protection and developing natural science research. The major expansion of science necessitated that research also be regulated by environmental policies. The 1995 MOE white paper established environmental and ethical guidelines for science in Svalbard, and RCN in 1998 created Svalbard Science Forum (SSF), which today manages the Research in Svalbard database, to coordinate research and minimise its environmental footprint by, for example, reducing duplication. Following a 1998 Environmental Impact Assessment that exposed significant effects of increased scientific activity, the government mandated Ny-Ålesund become a “green” research station consistent with Norway's objective of Svalbard remaining an almost untouched wilderness (Norway, 1999).

From the new Ny-Ålesund research strategy for the next decade (RCN, 2019), Norwegian authorities now refer to the settlement's primary objective as “sustainable research production”, based on environmental protection and effective scientific practices. In addition to the inherent association of “production” with a form of socio-economic activity, the strategy also applies the economic metaphor of “limited resource” to describe the “essentially untouched natural surroundings” that research requires, and thus underpins the socio-economic-scientific basis of settlement life.

Global factors

The period during which Ny-Ålesund underwent rapid internationalisation was a time of geopolitical upheaval and institutional innovation in the Arctic region. *Glasnost* and *Perestroika* in the Soviet Union had created a political space for greater cooperation among countries of the circumpolar north, epitomised by Mikhail Gorbachev's famous 1987 Murmansk speech that specifically identified the Arctic as a zone where peace could be advanced through scientific collaboration. The Cold War had prevented the successful scientific cooperation of the Scientific Committee for Antarctic Research (SCAR) from taking root in the Arctic, which had been a

theatre of superpower confrontation. Within networks of non-governmental scientists, however, interest for international cooperation on Arctic research remained strong (Nilsson, 2009).

Easing east-west tensions created an opportunity for greater coordination of Arctic research. During a 1986 SCAR meeting, senior scientific officials of Arctic states initiated discussions that led to the founding of the International Arctic Science Committee (IASC) four years later (Rogne, 2015). With many of the same actors involved in the new organisation's emergence, scientific cooperation under IASC was modelled on SCAR (Bones, 2016). This transfer of institutional knowledge from the southern to northern polar region represents one example of social telecoupling that shaped the governance of Arctic science and, as elaborated below, had significant influence on Ny-Ålesund's evolution into an international research base.

The IASC formative process was further motivated by climate change, an issue attracting heightened attention among political leaders as well as scientists in the late 1980s and becoming institutionalised through the founding of the Intergovernmental Panel on Climate Change in 1988. The importance of the Arctic as a bellwether and driver of a changing climate—increasingly understood as a global system—was gaining greater recognition, yet high-latitude climate data for global circulation models remained scarce (Wormbs, Döscher, Nilsson, & Sörlin, 2017). Arctic science became integrated into the Earth system science movement that emerged in the mid-1980s. The 1987 International Arctic Global Change Workshop was pivotal in incorporating Arctic research into the International Geosphere-Biosphere Programme—the movement's central organisation, founded the same year—and was instrumental in the establishment of IASC (Seitzinger et al., 2015).

Evolving global interest in the Arctic within a global context thus coincided with the new paradigm of the Earth as an integrated system, the emergence of climate politics, and increased international attention to environmental issues, exemplified by the 1987 UN report *Our Common Future*, the first IPCC report in 1990, and the 1992 Rio summit and founding of the UN Framework Convention on Climate Change (Wormbs et al., 2017). An Arctic analogue to global-level institutionalisation was the Rovaniemi process that led to the Arctic Environmental Protection Strategy—forerunner to the Arctic Council—and itself an indirect outcome of IASC talks, initially sparked at a meeting held in Ny-Ålesund (Rogne, 2015).

The founding of IASC represented a significant accomplishment of science diplomacy in a region attracting greater interest during the Cold War's waning days. While IASC enhanced the status of Arctic research, it also caused contention. Several non-Arctic states were dissatisfied with the preeminent position afforded to the eight states with Arctic territory. Germany, France, the Netherlands and the United Kingdom, through several unusual diplomatic interventions, lobbied for full IASC membership, contending they should have equal access to Arctic research based on the principle of scientific openness (Hacquebord, 2015). Although differences were eventually resolved, the politicised process exposed the relatively weak position of non-Arctic states in their limited ability to assert their stake in Arctic affairs. Moreover, while the founding articles granted automatic IASC membership to Arctic countries' scientific organisations, they stipulated that participation by non-Arctic states was contingent upon engagement in "significant Arctic research". IASC therefore stimulated a new demand, political as well as scientific, for Arctic research among mid-latitude states.

An international bridge to Ny-Ålesund

The IASC planning process was chaired by NPI Director Odd Rogne, who had an extensive personal network of polar officials through his long association with SCAR. He thus occupied a unique position, able to connect the institutionalisation of Arctic science at the international level with the opportunities for non-Arctic states to conduct research in Ny-Ålesund. During IASC negotiations, several non-Arctic states approached Rogne seeking advice on where research stations could be established (cf. H. Yoshioka, personal communication, 21 July 2017; O. Rogne, personal communication, 14 May 2017). Ny-Ålesund's amenities and accessibility, as well as terms of the Svalbard Treaty allowing signatory states equal access, provided Rogne with "selling arguments" for convincing fellow directors to initiate research programs there. Political interest in establishing Arctic research stations thus provided already-existing polar institutes the opportunity to quickly increase staff and infrastructure to expand into the northern polar region (cf. H. Yoshioka, personal communication, 21 July 2017; O. Rogne, personal communication, 14 May 2017).

Germany

Other senior NPI officials also promoted Ny-Ålesund. Rogne's predecessor, Tore Gjelsvik, had strong ties to Germany's polar science establishment, serving in the Alfred Wegener Institute's (AWI) *Wissenschaftlicher Beirat*. In 1982, AWI's director visited Ny-Ålesund to explore possibilities (O. Rogne, personal communication, 14 May 2017). Although AWI scientists occasionally conducted fieldwork out of NPF, it was not until later that decade that German scientific activity became permanent. In 1988, NPI invited AWI to conduct atmospheric measurements, and atmospheric physicist Roland Neuber was sent to study stratospheric ozone depletion at NPF. The recent discovery of the ozone hole over Antarctica motivated him to investigate whether ozone depletion was also occurring in the northern polar region (R. Neuber, personal communication, April 2016).

Neuber's postdoctoral project marked the beginning of the permanent AWI presence in Ny-Ålesund. Discussions to establish a research station began almost immediately after. By autumn 1990, Koldewey Station became operational, with the official inauguration—attended by senior scientific and government officials of Norway and Germany—on 10 August 1991. It initially served two main purposes: to advance NPI-AWI cooperation, and investigate the new concern of polar ozone depletion. Research soon broadened to include marine biology, interested in effects of increased ultraviolet radiation on underwater ecosystems. Atmospheric and marine research remain pillars of Koldewey's substantial scientific activity, with ozone superseded by climate change as the overarching issue around which research projects are organised (R. Neuber, personal communication, April 2016).

The bi-polar nature of Neuber's research exemplifies the telecoupling that influenced Ny-Ålesund's internationalisation. Not only were his research interests connected over great distance, but the spatial logic of AWI also illustrates important institutional telecouplings. Like many polar institutes, AWI was founded, in 1980, to pursue Antarctic science in accordance with the Antarctic Treaty System (ATS), which requires member states to conduct substantial research there. With polar institutes already in place, expanding research to the Arctic was a natural extension of ongoing operations.

The Netherlands

Another telecoupling that contributed to Ny-Ålesund's transformation involved migratory birds. A colony of barnacle geese—a species migrating between northern Europe and Svalbard—suddenly established itself in Ny-Ålesund in 1982. NPI scientist Gustav Mehlum invited other ornithologists in his international network to collaborate on researching the colony. This included University of Groningen's Rudolf Drent, who Mehlum encouraged to establish a long-term research program in Ny-Ålesund, which NPI was by the mid-1980s intent on developing into an international research base (M. Loonen, personal communication, April 2016; G. Mehlum, personal communication, 29 June 2017).

Maarten Loonen first visited Ny-Ålesund in 1989. That summer, Wildfowl and Wetlands Trust (WWT)—a British NGO that manages a wintering area for barnacle geese at Caerlaverock, Scotland—“ringed” 140 geese in Ny-Ålesund to monitor migratory behaviour. Linking with WWT and supported by Mehlum and NPI, Loonen returned in 1990 to begin doctoral training under Drent. Illustrating the then-informal management of Ny-Ålesund, Loonen's accommodations included an empty hut (“Klondike”, later burnt down), and the top floor of the former schoolhouse—arrangements based on an unwritten understanding with Kings Bay (M. Loonen, personal communication, April 2016; G. Mehlum, personal communication, 29 June 2017).

As the settlement's administration became increasingly formalised by the mid-1990s, Kings Bay director Monica Kristensen Solås insisted Loonen lease the newly renovated “London 2” hut. It has since 1995 housed University of Groningen/Netherlands Arctic Station that today includes all four London huts (built 1912), relocated to Ny-Ålesund in the 1950s from Ny-London—a settlement on Blomstrandhalvøya island in Kongsfjorden where Northern Exploration Company maintained a marble quarry 1911–1920. The Dutch station's institutionalisation includes a significant bipolar and political component, receiving funding since 2002 from a consortium of five ministries tasked with supporting Antarctic research underpinning Dutch ATS membership. As the Netherlands became more interested in Arctic matters, pursuing Arctic Council observer status, part of the polar research budget was re-directed to support the Ny-Ålesund station through University of Groningen's Arctic Centre.¹ Still managed by Loonen, the station contributes to Arctic Council working groups CAFF, AMAP, SDWG (M. Loonen, personal communication, April 2016; G. Mehlum, personal communication, 29 June 2017).

Japan

Between 1983 and 1988, Japan conducted seven scientific expeditions to Svalbard, including three in Ny-Ålesund, with logistical and scientific support from NPI and its directors Gjelsvik and Rogne (Tatsumi, 1990). Japan identifies the 1990 founding of IASC, and its admittance with five other non-Arctic states at the January 1991 inaugural meeting in Oslo, as a turning point in Japanese Arctic research (JCAR, 2017). In conjunction with Japan's IASC entry, an Arctic Environment Research Center was created within the National Institute of Polar Research (NIPR). Through contact during the IASC formative process, Rogne recommended to his Japanese counterpart, NIPR General Director Takao Hoshiai, that Japan establish a research station in Ny-Ålesund. Hoshiai saw several advantages: demonstrating Japanese presence and conducting High Arctic research in a community far removed from anthropogenic pollutant sources; availability of logistical support from Kings Bay and NPI; and, from a

legal standpoint, the terms of the Svalbard Treaty (H. Yoshioka, personal communication, 21 July 2017.). The two directors on 21 January 1991 signed the “Agreement of Cooperation on Japanese Arctic Research in Ny-Ålesund” facilitating the founding of NIPRs Rabben Station (Shibata, 2015), housed in an ESRO-era building from which Japanese scientists research, for example, atmospheric physics, snow and ice dynamics, terrestrial and marine ecology (JCAR, 2017).

United Kingdom

The UK has been active in Ny-Ålesund since 1965, initially through geologist Brian Harland's Cambridge Arctic Shelf Programme that rented “Barrack 1” (built 1917, intentionally incinerated 1973) and then moved to one of the “Swedish barracks” (built 1945)—colloquially called “Mexico”—in 1973 (Reymert, 2016). Harland had the previous year launched Cambridge University Spitsbergen Expeditions, bringing geologists to remote parts of Svalbard. Nick Cox first accompanied Harland in 1978, and assumed expedition leadership from 1987 to 1992 (Cox, in Kings Bay, 2016). Britain's institutional presence was enhanced in 1991 through the National Environment Research Council, which rented rooms in “Amsterdam” (built 1962) until its new-built station “Harland Huset” was completed in May 1992 (Kings Bay, 2016). Operated by British Antarctic Survey, the facility today provides a platform for diverse scientific disciplines, with Cox serving as longstanding station manager. Funding was recently extended until 2028, demonstrating the long-term outlook and significance of the station as a basis for British presence and research in the Arctic (Foreign and Commonwealth Office, 2018).

Italy

Like most nations present in Ny-Ålesund, Italy's engagement with polar research was primarily focused on Antarctica—motivated in part by ATS membership—prior to the 1997 founding of Stazione Dirigibile Italia. The new-built station was constructed on a site cleared of the “Siberia” barrack (Reymert, 2016). The station's driving force was Roberto Azzolini, the Italian National Research Council's representative on the European Polar Board (V. Vitale, personal communication, April 2016). Beyond its scientific and logistical advantages, Ny-Ålesund was the obvious choice for an Italian Arctic station due to Italy's historical ties to the settlement through Umberto Nobile, who designed and piloted two airships—*Norge* and *Italia*—that departed from Ny-Ålesund on North Pole expeditions in the 1920s.

Italy's most prominent contemporary contribution is the Amundsen-Nobile Climate Change Tower (CCT), a 30-m multidisciplinary mast equipped with instruments measuring interactions between water, air, ice and soil. The idea for the tower arose at a 2007 meeting in Lillehammer between representatives of Norway's and Italy's research councils. Atmospheric scientist Vito Vitale saw the tower as a way to reduce research costs through automated data collection—continuously transmitted via fibre-optic cable—hedging against uncertain future funding. It also serves a symbolic function, complementing the airship tethering tower, a cultural monument on the settlement's outskirts. CCT has also fostered inter-station collaboration with South Korea, which has even spilled over to Antarctica, where the countries' stations are 10 km apart (V. Vitale, personal communication, April 2016).

France

France's scientific activity dates to the early 1960s when glaciologist Jean Corbel constructed a "French camp" along Kongsfjorden 5 km east of Ny-Ålesund. Recently modernised, Corbel Station today serves as a clean air laboratory (NySMAC, 2013). In 1999, France established a permanent station inside the settlement, occupying the miners' barrack where NPI had been based before construction of Svedrup Station, with Bernard Lefauconnier—who had researched glaciers around Brøgger Peninsula since 1982, including eight years on behalf of NPI—serving as Rabot Station's first manager (*Ny-Ålesund Newsletter*, November 1999).

South Korea

The eastern half of the barrack housing Rabot became Dasan Station when Korea Polar Research Institute (KOPRI) initiated activity in the settlement in April 2002, the same year South Korea joined IASC. The country's polar research program had begun in 1988 in Antarctica, and Korean scientists soon took interest in the Arctic to provide conjugate measurements from both polar regions, and later to investigate Arctic Ocean effects on the Far East. South Korea's first Arctic field research took place upon the Chinese icebreaker *Xuelong's* maiden expedition in 1999 in the Chukchi Sea. In searching for an Arctic location to establish a permanent laboratory for long-term measurements, KOPRI Director Yeadong Kim (personal communication, 4 November 2018) was aware that Japan maintained a station in Ny-Ålesund. He visited the settlement in October 2001 after contacting Kings Bay, which recommended the building that KOPRI still occupies.

China

China expressed interest in Ny-Ålesund since the mid-1990s (RCN, 1997), aware of opportunities as a Svalbard Treaty signatory (H. Yang, personal communication, October 2018). The 1999 *Xuelong* expedition peaked China's interest in complementing maritime with terrestrial Arctic research (RCN, 1997), leading to the opening of Yellow River Station in 2004, on the eve of China's "great leap" into polar affairs (Brady, 2017). For Yang Huigen, Yellow River's founding manager and currently Director General of the Polar Research Institute of China, Ny-Ålesund's situation on the same magnetic field line as China's Zhongshan Station in Antarctica—rendering them geomagnetic conjugates, facilitating simultaneous aurora observations—further enhanced the location's allure.

India

Among the main concerns motivating India's establishment of a research station in Svalbard were potential effects of teleconnections between the Arctic and Indian Ocean monsoon. The idea of Indian–Norwegian collaboration on Arctic research gained momentum in November 2006 when India's Minister of Science and Technology, Kapil Sibal, visited Norway, including NPIs Tromsø headquarters. Bilateral discussions continued in May and June 2007 with visits to Delhi by NPI Director Jan-Gunnar Winther, for an Antarctic Treaty Consultative Meeting, and Minister of Higher Education Oystein Djupedal, who also toured the Goa facilities of NCAOR—India's polar and oceanic research institute. Following India's first Arctic expedition—led by NCAOR Director Rasik Ravindra—that arrived in Ny-Ålesund in August 2007 in the midst of the 2007–2008 International

Polar Year, Sibal signed an MoU with NPI and inaugurated Himadri Station on 1 July 2008 (India, 2013; Sharma, 2007; Sivaramakrishnan, 2009).

European Union activity

The EU designated Ny-Ålesund a Large-Scale Facility (1996–2003); sponsored research programs ENVINET (2000–2003) and ARCFAC (2006–2010) (NySMAC, 2013) and supports much member-state science in the settlement, reflecting its long-term interest in Svalbard (R. Neuber, personal communication, April 2016).

Glocal factors

Through its many geopolitical entanglements, and numerous Norwegian government policies and investments, Ny-Ålesund has become a nexus of research institutes, scientific instruments and individual scientists that exert substantial agency in fostering a dynamic international community, that is, locally grounded yet global in scope. The convergence of Norwegian and global actors in the locality of Ny-Ålesund—which has no permanent inhabitants beyond those with several-year contracts with Kings Bay—encompasses two inter-related perspectives on glocalisation.² The first regards the constitution of the local through the participation of global actors in developing glocal institutions. The other entails the comprehension of global dynamics through observation of environmental phenomena at the local level in Ny-Ålesund's natural surroundings.

Constituting the local

Kings Bay and NPI are the two primary government authorities representing Norway's interests in Ny-Ålesund. They interact with the international research community in numerous ways, from weekly meetings convened by NPI to logistical support and equipment rentals provided by Kings Bay. Each also employs non-Norwegian nationals, such as Swedish atmospheric scientist Kim Holmén who from the late 1980s conducted research for Stockholm University, which maintains equipment at Zeppelin Observatory. Holmén joined NILU in 2003 and was later appointed Research Director at NPI, where in 2011 he became International Director through which he engages in various processes influencing Ny-Ålesund's development.

While with Stockholm University, Holmén served as chairman of the third institutional pillar of the community, where the global and local converge most clearly: Ny-Ålesund Science Managers Committee (NySMAC). Initiated in 1991 by NPI (Norway, 1993), which hosts the secretariat, NySMAC consists of all institutes with permanent operations in Ny-Ålesund. From 6 founding members, NySMAC has expanded to 18 participating institutes. Demonstrating the local–global dynamic, NySMAC meetings take place twice yearly all over the world in locations connected to the member institutes and in conjunction with Arctic Science Summit Week. Every second year, NySMAC arranges the Ny-Ålesund Seminar to deepen collaboration among scientists associated with the community, while promoting Ny-Ålesund to global audiences as a leading High Arctic research and monitoring location—another NySMAC mission (NySMAC, 2010).

At the time of NySMACs establishment, it had become apparent that coordination was required to manage the greatly increased activity around Kongsfjorden. As set forth in its Founding Articles (1994), Mission Statement (1997) and Charter (2013), NySMAC

serves a practical, social and normative function through aligning fieldwork to prevent interference between projects, promoting collaboration and friendship among stations, and formulating scientific and ethical goals for the collective research and monitoring activities of the community (NySMAC, 2013). What is more, NySMAC has over time gained a greater voice in the overall governance of Ny-Ålesund through providing advice and recommendations to Kings Bay (an observer to NySMAC), and has participated in important initiatives such as the environmental impact assessments of 1998 and 2006, while also producing its own environmental action plan (1997) and policies in areas such as safety (2003) and incident response (2004). Since 1997, NySMAC twice per year publishes the *Ny-Ålesund Newsletter*, a communication tool that fosters a sense of community through covering various research initiatives and other aspects of local life.

NySMAC has also engaged in larger political struggles over economic activities that threatened the near-pristine natural conditions the research base relies upon. Through written appeals and lobbying Norwegian authorities such as MOE and the Governor of Svalbard, NySMAC has had a hand in preventing mining a nearby gold deposit; pushed to prohibit trawling in Kongsfjorden and advocated banning heavy fuel oil (NySMAC, 2013). The fact that the international research community's positions have prevailed over other vested interests demonstrates the prioritisation of science and Norway's political will to enact and uphold policies protecting the natural environment that underpins Ny-Ålesund's economic system, for which NySMAC members are the primary customers. This symbiosis between environment, economics and international scientific research—together with the underlying Svalbard geopolitics that motivates large-scale investments by Norway, and attracts non-Arctic states to Ny-Ålesund—is a defining theme of the settlement's transformation since the early 1990s establishment of KIRB.

The Committee's commitment to scientific ideals of collaboration and environmental protection has been consistent over the course of its increasing institutionalisation. Although the symbolic importance of individual stations remains strong, the past decade has seen a significant shift towards deepening synergies across national stations. This process started in earnest in February 2004 with a meeting in Ny-Ålesund of the Interdepartmental Polar Committee, an influential forum for deliberating Norway's polar agenda. It decided that Ny-Ålesund's development as an international research base required guidance and greater cooperation among various stakeholders. With Ny-Ålesund veteran Fridtjof Mehlum in a leading role, RCN was tasked with developing a plan for organising science to fill disciplinary gaps and minimise redundancy in research. Considered a key partner in this process, NySMAC endorsed a proposal for RCN and NPI to develop a science plan for Ny-Ålesund (*Ny-Ålesund Newsletter*, July 2004).

In 2010, the emerging new paradigm was realised with the first Science Plan for the KIRB. Among its many points, it states that “KIRB will be a unified research facility where all nations, stations and projects work as one entity with common goals without compromising their identities and intellectual property rights”. The science plan also articulates the aspiration that research and monitoring conducted locally in Ny-Ålesund should advance scientific knowledge at the regional and global level: “KIRB science and institutions shall contribute **essentially** to climate research programs and international networks; notably the development of SAON, GAW, GCW and SIOS. Ny-Ålesund has a great potential for comparative bi-polar studies based on its broad measurement programs”, (emphasis in original) (NySMAC, 2010).

With its aim of fostering synergies and prioritising collective scientific results, the 2010 science plan—followed by the current 2015–2020 plan—encompassed another important initiative meant to organise and focus research in Ny-Ålesund. Namely, the four “Flagship Programmes”—Kongsfjorden System, Atmosphere Research, Terrestrial Ecosystem and Glaciology Research—launched between 2008 and 2011 through workshops convened by SSF where founding documents were drafted. Flagship Programmes are intended to “define core scientific foci for KIRB”, grounded in the natural systems surrounding Ny-Ålesund yet serving broader scientific concerns such as understanding the global dynamics of climate change (NySMAC, 2010). Each flagship is built upon an internal structure consisting of an inter-station scientific committee and leadership, and further organised around several work groups addressing specific research questions. The science plans and flagships reflect the growing trend towards international collaboration at the local level and hence greater institutionalisation of the glocal in Ny-Ålesund.

Comprehending the global

Despite coalmining-era environmental contamination, and current pressures such as cruise ship tourism and research-related activities (including town infrastructure), Ny-Ålesund is attractive to the international scientific community precisely because of the relative lack of present-day local disturbance to surrounding natural systems. The relatively pristine environment, with minimal ongoing pollution from proximate human activity, allows scientists to measure long-range anthropogenic effects and forcings that reach even remote locations where global environmental change becomes manifest.

Ny-Ålesund in this sense represents a “truth spot” akin to glaciers in Iceland, Greenland and Svalbard, and Tarfala Research Station in northern Sweden, where glaciologist Hans Ahlmann conducted long-term measurements before and after World War II to prove his theory of polar warming (Sörlin, 2011). Similarly, much research and monitoring around Ny-Ålesund utilises the local environment as a window and platform for observing and comprehending processes at the global level. Specialised scientific installations, for example, Zeppelin Observatory and Italy's CCT, are, for example, designed to capture data that contribute to modelling Earth system processes. Thus, the local environment—interesting in its own right for certain disciplines—is for many scientists secondary to larger spatial scale phenomena at work around Kongsfjorden.

The political analogue to Ny-Ålesund's scientific function as window into global environmental change is the circulation of international VIPs coming to witness the effects of global warming. Accompanied by senior Norwegian officials, visiting foreign ministers, U.S. senators and intergovernmental organisation elites—including, for example, Ban Ki-moon—are presented evidence of climate change such as retreating glaciers, and apprised of the international scientific activity facilitated by Norway. Ny-Ålesund thus enhances Norway's legitimacy and sustainability credentials and reinforces Norwegian sovereignty before leaders of the international community. The research base is further showcased internationally through the annual Ny-Ålesund Symposium, attracting senior officials from government, NGOs and industry.

Analysis

Without mentioning Ny-Ålesund in particular, Pedersen (2009) contends that external forces have historically represented the permissive cause for change in Svalbard, while the efficient causes can

be attributed to internal Norwegian drivers. Much of Pedersen's analysis of external forces centres on the Soviet Union and Russia—Norway's primary geopolitical competitor in Svalbard. Events such as *détente* in the 1970s and *glasnost* and *perestroika* in the 1980s' latter half allowed for more assertive Norwegian interventions, such as enacting restrictive environmental legislation and the building of the airport in Longyearbyen, and the incremental strengthening of Norway's rule over Svalbard. As to internal forces, Norway's governance of Svalbard has been largely driven by competing sectoral interests of, for example, MOE and MOI, which have favoured environmental protection and economic interests such as coalmining, respectively (Arlov, 2011; Pedersen, 2009).

Pedersen's two-pronged approach explaining change in Svalbard is similar to this article's analytical division of local and global drivers. Furthermore, themes such as competition between environmental and economic interests, the importance of international relations and the decline of the Cold War in enabling change are common to both analyses. The case of Ny-Ålesund, however, includes a broad range of specific factors that render its recent history distinct from Svalbard in general. It can be argued that the social, economic and political experiment conducted in the tiny High Arctic settlement is globally unique and transcends the various interests in Svalbard, with some actors aspiring for higher civilisational ideals of peace, knowledge and cross-cultural understanding (K. Holmén, personal communication, July 2013). Rather than focusing on solely Norwegian or global forces, an account of Ny-Ålesund's contemporary history must also consider the *glocal* dynamics that to a large extent characterise the community.

The pace and trajectory of change in Ny-Ålesund since the late 1980s has, unlike other areas of Svalbard, been relatively rapid and largely linear. Implementing policies to protect nature and recasting greater Kongsfjorden as a near-pristine natural science laboratory—rendering its natural systems a resource for research—underpinned the transformation. The full embrace of science as the social and economic foundation, and the recruitment of polar institutes that became paying customers of Kings Bay, led to a six-fold increase in research days from 1991 to 1996 (RCN, 1997). With some year-to-year fluctuation, the overall level of activity—including new stations, installations and other investments—has continued to expand. Repurposing Ny-Ålesund as an international research base has thus brought an unprecedented degree of stability to a settlement whose 100-year history is otherwise marked by major mining accidents and extreme coal price volatility that disrupted production and community development (Hanoa, 2016).

The external forces that facilitated this transformation reached much farther than Russia, encompassing, for example, the politicisation of the IASC founding process, the science diplomacy of non-Arctic states and the general increase in political, economic and scientific interest during the second Arctic “state change” of the mid-2000s (Young, 2010), as, for example, China, India and South Korea sought to enhance their status as legitimate Arctic stakeholders and become observers to the Arctic Council. Operating research stations in Ny-Ålesund served both the political imperative of establishing physical presence in the circumpolar north, and provided a platform for generating scientific knowledge on the Arctic environment and teleconnected Earth system processes at larger spatial scales. Regarding the latter, interest in the Arctic has tracked growing concern over global climate change since the late 1980s, a trend manifested in the international presence and scientific infrastructure of Ny-Ålesund.

A hallmark of Ny-Ålesund's transformation from coalmining settlement to thriving international research base—including the 1967–1989 post-industrial transition period of moderate scientific activity—has been Norway's ability to reconcile contradictions in its Svalbard policy. Maintaining robust Norwegian communities and preserving Svalbard's wilderness are acknowledged to be conflicting policy goals (Norway, 2016; OAG, 2007). The non-extractive economisation of Svalbard's nature, coupled with comprehensive environmental legislation and regulation of activities, has allowed Ny-Ålesund to become a socially and financially viable nexus of research and sustainability profiling, where economic development and environmental protection do not constitute a zero-sum game. This system also pays geopolitical dividends by enrolling states in exercising Norwegian sovereignty, as national institutes entering into contract with state-owned Kings Bay and abiding by local laws effectively affirm Norway's jurisdiction over Svalbard. This may prove important, as several states present in Ny-Ålesund, including France, Germany, the Netherlands and the United Kingdom, have opposed Norway on Svalbard Treaty issues (Pedersen, 2008).

While circumstances external to Svalbard constituted permissive conditions and internal Norwegian forces the efficient cause for significant change, the development of global stakeholders with local interests and sufficient agency to shape global ideals and institutions such as NySMAC represents a singular achievement of Ny-Ålesund. The glocalisation process encompassed the local and international in interaction: Norway's participation through legislation, administration, investments and scientific agenda setting, together with the particular research interests, professional experiences and personal ambitions of foreign scientists and institutes that made long-term commitments to Ny-Ålesund. Connected to home countries through employment and funding, these actors have contributed locally to the development of the community's social life, scientific output and the increasingly coordinated research agenda in the form of, for example, science plans and flagship programmes.

Stakeholders benefiting from Ny-Ålesund's transformation include individuals whose careers have contributed to—and developed in tandem with—the evolution of the research base, the polar institutes of non-Arctic states that established a scientifically and politically expedient physical presence in the High Arctic, and the Norwegian state, for which Ny-Ålesund provides an anchor for its Svalbard policy and narrative of enlightened environmental governance. The ongoing research and long time-series data documenting local and global environmental change also makes science itself a stakeholder; likewise, to the extent that such knowledge can forewarn approaching Earth system tipping points, humanity as a whole has a stake in the scientific community.

Conclusion

Supplanting the industrial infrastructure once emblematic of an isolated coalmining settlement situated in Svalbard's wilderness, the instruments of diverse scientific research now deployed in Ny-Ålesund are indicative of the new economy constructed around Kongsfjorden over some 30 years. Based on extraction of data and knowledge, the economisation of the surrounding environment has allowed Norway to maintain effective occupation through creating conditions for international research, while pursuing science programs of its own. This arrangement has also generated highly visible construction projects in Ny-Ålesund's built environment that further demonstrate Norwegian sovereignty. That researchers from all over the world live and work

in structures, Norwegian miners once called home testifies to Norway's successful efforts to ensconce an international scientific community within a well-preserved cultural heritage site.

The scale of Ny-Ålesund's expansion and internationalisation may be approaching its limit. The main institutional actors in Ny-Ålesund, including Kings Bay, NPI and NySMAC, have demonstrated increasing reflexivity towards the impacts of research and limits of acceptable change to the local environment (cf. Sander, 2014), and an ambition to not expand the settlement's built environment. Another recurring concern is the level of Norway's involvement in facilitating and conducting research in Svalbard. Government reports in 2007 and 2016 noted absolute and relative declines in Norwegian research in comparison to increased international activity (Norway, 2016; OAG, 2007). Even as early as 1997, the leader of RCNs Polar Committee warned that Norway must avoid being reduced to a superintendent function over the considerable infrastructure it had financed (Skoie, 1997).

Ny-Ålesund's status as a place of international research is, however, not in question (Norway, 2016), and the *scope* of glocalisation may soon be expanding. The 2016 white paper, as well as the 2018 Svalbard research strategy (Norway, 2018), reiterates and amplifies the longstanding goal of deepening coordination and collaboration, with Norway taking the leading role in setting the scientific agenda, including as initiator and facilitator of the ambitious Svalbard Integrated Arctic Earth Observing System (Norway, 2018). More radically, the white paper signalled the government's intention for Ny-Ålesund to begin moving away from its *de facto* status as a community structured around national stations: "A gradual shift is also desired away from research stations located in separate buildings to centres thematically aligned with priority areas and equipped for shared use" (Norway, 2018, p. 79). With boundaries between stations reduced, such a move should, ostensibly, foster greater international collaboration at the local level. Although the shift towards coordination and common infrastructure has been an ongoing development in Ny-Ålesund, diminishing the practical and symbolic status of the individual stations represents a significant departure from the KIRB model that emerged in the early 1990s.

There are current indications of both the continued existence of nation-based stations and the collectivisation of research and further transition towards shared facilities. For instance, Japan's NIPR has long wanted to relocate its station from the airport to the settlement's centre. The wording of an announcement in the July 2017 *Ny-Ålesund Newsletter* on plans for a new station is telling: "Kings Bay has received ear-marked funds to start building a new research facility to serve, first and foremost, the Japanese researchers, but it will also be a common facility with rooms, laboratories and an observation platform for other researchers". (The new facility, opening in 2019, has subsequently been dubbed the "Terrestrial Lab", in which NIPR will rent space, according to the February 2018 *Ny-Ålesund Newsletter*.) Germany and France merged stations in 2003 to create scientific synergies and, on the political level, celebrate the 40th anniversary of the Élysée Treaty of friendship between the countries (R. Neuber, personal communication, April 2016). Discussions on the Netherlands joining the German–French station have also taken place, and interest exists for a new common facility that would congregate operations of all three states and demonstrate their status as a single research base (R. Neuber, personal communication, April 2016; M. Loonen, personal communication, April 2016).

Symbolism and political interests, parallel to scientific and practical concerns, thus remain salient factors in Ny-Ålesund's ongoing

evolution. Perhaps out of growing concern over potential misperceptions of Svalbard settlements as international spaces (Pedersen, 2017), the new research strategy specifies Ny-Ålesund "a Norwegian platform for international cooperation in world-class natural sciences research" (Norway, 2018, emphasis added). The increasingly collective scientific agenda proposed in the white paper, and reaffirmed in the Svalbard research strategy, will ensue with Norway as a more assertive host. The government also commissioned RCN to develop the Ny-Ålesund-specific research strategy to be implemented and overseen by NPI, described as:

a useful tool for assessing and allocating time and space in existing buildings and laboratories. It will also provide a basis and guidelines for long-term plans for further development of infrastructure, buildings and services in Ny-Ålesund. This will also form a basis for communicating clear expectations to all actors in Ny-Ålesund. (Norway, 2016, pp. 79–80)

Further demonstrating the ongoing shift, the newly released Ny-Ålesund research strategy refers to the "Ny-Ålesund Research Station" rather than KIRB—thus removing "international" from the community's collective designation (RCN, 2019). Moreover, some nations represented in Ny-Ålesund, particularly China, reacted negatively to restrictions in a circulated draft of the strategy, which, for example, reiterated policies limiting research to natural sciences (Rapp, 2019).

The 2016 white paper is also from a bureaucratic perspective another turning point in Ny-Ålesund's contemporary history. Both NPI and Kings Bay were once under MOI; the 2017 transfer of the latter to MOE—where NPI has been since 1979—signals the continued decline of remaining non-research-related economic interests such as cruise ship calls, in decline since the 2015 heavy fuel oil ban. While the transfer likely benefits the environment and strengthens certain scientific interests in Norway, it is unclear how severing ties to a commerce-centric ministry will affect the Ny-Ålesund socio-economic system. The assemblage of environmental and pro-science narratives, policies and infrastructures underpinning the economisation process remains firmly in place, yet the underlying bottom-line economic logic of MOI—which required Kings Bay to keep balanced books (OAG, 2007)—is somewhat less certain under MOE administration.

Norway's effective occupation of Svalbard is no longer tightly coupled to coal. In the geopolitical context of Sveagruva being abandoned and Longyearbyen facing an uncertain post-coal future (Pedersen, 2017), the relatively stable development of Ny-Ålesund as a Norwegian-controlled international research base represents an important anchor for Norway's sovereignty over Svalbard. The alternative economisation of the Kongsfjorden area's natural resources has proved to be a more sustainable model for maintaining a community in the High Arctic.

As this study has demonstrated, the telecouplings that have tied Ny-Ålesund into wider global networks and processes—environmental, scientific and geopolitical—represent a type of diversification that helped secure the settlement's social and economic basis as a place for "sustainable research production". Unlike coal, Arctic and global change research is a growth industry, as indicated by, for example, the 2017 Arctic Science Agreement, considered a milestone in science diplomacy (Berkman, Kullerud, Pope, Vylegzhanin, & Young, 2017). This is particularly true when science is the currency for political participation, as in the polar areas.

Thirty years after the Murmansk speech, Ny-Ålesund seems on the surface a microcosm of Gorbachev's idealised Arctic, a locality of peaceful scientific cooperation among a broad array of global actors. Although this appearance to some extent belies certain

tensions and other agendas—some coming to the fore in the context of the new research strategy—the scientific imperative of understanding the Arctic's role in global climate change, and the commitment of global stakeholders to the community's future, strengthens Ny-Ålesund's prospects for remaining relevant as an international research base and geopolitical asset for Norway as well as the non-Arctic states congregated there. Following the bureaucratic reorganisation and new research strategy for Ny-Ålesund—with MOE, RCN and NPI playing increasingly important and more decisive roles—the global dynamics between Norwegian authorities, foreign researchers and their institutes, and institutions such as NySMAC and the Flagship Programmes, will largely shape the governance and continued evolution of the settlement.

Notes

1 An arrangement brokered by former Arctic Centre Director Louwrens Hacquebord (Loonen 2016).

2 The German–French AWIPEV station contracts three year-round employees.

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