Chapter 8
Not All Black and White: The Environmental Dimension of Arctic Exploration

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Abstract The modernist narrative of human progress noticeably shifted under the climate change paradigm, which brought into the Arctic discourse both slow long-term processes resulting in shifting biophysical properties of the entire planet and rapid tipping events and their effects onto its nature and people. While literature abounds with images of mythical opposition between the Arctic nature and the industrial advances of the increasingly resource-dependent world, the lessons learned from the decades of exploration are often taken matter-of-factly. This chapter explores the modern environmental history of polar exploitation and probes for ways in which changing representations of the Arctic environment have shaped our interactions with it. While taking stock of regulatory, political and attitudinal shifts is an important thought experiment, the overall lesson is that the 'catching-up', action-before-knowledge approach may not hold up in the future.

Keywords Arctic exploration · Environment · Extractive industries · Cleanup · Preservation

8.1 Introduction

Human and technological 'triumph' or 'disaster' in the Arctic, true to Kipling's words, are both 'impostors' when it comes to nature. The modernist narrative of human progress noticeably shifted under the climate change paradigm, making popular in the discourse both slow long-term processes resulting in shifting biophysical properties of the entire planet and rapid tipping events and their effects onto nature and people. In Latour's words: "what could have been just a passing crisis has turned into a profound alteration of our relation to the world" (Latour 2018, p. 9). Yet, 'not-going' and 'not-doing' (and maybe even not talking about the Arctic) is what tends to escape political imaginaries these days. But is there not more than one side to this story? There have been examples of not only proactive but

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also reactive actions towards the Arctic environment in the past few decades, including the Central Arctic fishing moratorium (Hoag 2017) and the cleanup schemes throughout the circumpolar North. Can this age of renewed Arctic interest reset the clock and set a higher environmental standard and level of responsibility over economic advances in the North? While there is no zero risk human activity and no such thing as safe industry, it is important to take heed of what has been achieved and the 'special treatment' for the Arctic across North America and Eurasia.

The Arctic of the twentieth century was a place of active exploration and retarded environmental regulation—the understanding of environmental impact that human activities in the northern latitudes and beyond would have on the biophysical properties would be the result of the many years of observation, scientific work, and civil and political action that succeeded rather than preceded the Arctic boom. From *Raubwirtschaft* of whaling, sealing and fishing (e.g. Allen and Keay 2001), via the gold rush and destructive mining, to discoveries of biological adaptations of Arctic biota, biophysical role of the Arctic in regulating the climate, to recently found cold-water coral reefs and biodiversity of polar ecosystems, and, finally, to realisation of irreversibility of anthropogenic interference, the new "cold rush", discussed in earnest about a decade ago, has taken a more measured pace than initially anticipated (see e.g. Young 1985; Sale and Potapov 2010; Troubetzkoy 2011). The Arctic environment, together with economic feasibility, technological capability, and political climate, played an important part in slowing down what was meant to be the 'race' for the Arctic resources.

In the atmosphere of more acute environmental alertness, it has become commonplace for researchers and the public alike to prioritise the risks over achievements (see e.g. Ellis 2010; Rosen 2017; Cózar et al. 2017; etc.). The overwhelming rhetoric on the Arctic with emotionally charged jargon of urgency and doom (see e.g. Wadhams 2017; Rosen 2017) as well as the alarming imagery (e.g. Conkling et al. 2013) may and probably has already created a hiatus between internal and external views of the Arctic—that of those who live and work there and of those who observe, manage it or would suffer from its effects from afar. Ignoring the steps taken to prevent, account for and counteract anthropogenic disturbances in the High North in the past several decades is comparable to refusal to acknowledge the hard-earned lessons of what has been and what should not be done.

The Arctic environment was in many ways collateral to the political, military and economic expansion of the post-war era. Yet, through trial and error, research and balancing of the environmental and social priorities, the twenty-first century just may be a different chapter to the Arctic story. This chapter will look at historical cases pertaining to resource exploration in the twentieth century and their ecological damage. Also concrete examples of retroactive and preventive, remedial actions that have been taken to tighten the governance framework across the national and international jurisdictions of the Arctic states are taken into account. While the author recognises that there is no safe industry and that the Arctic environmental problems transcend climatic borders, this chapter nonetheless serves as a useful exercise to highlight the learning curve within environmental awareness and conservation that the development in the Arctic has helped shape.

8.2 Changing Paradigms: Climate Change and Arctic Agency

In 2009, Barry Zellen wrote that despite steadfast predictions dating back to 1970s and 1980s, the age of the Arctic had not arrived but, with the advent of climate change, it was once again imminent (Zellen 2009). Almost 9 years later, we find ourselves in a situation where the Arctic age may still be around the corner or as distant as about three decades ago when Oran Young pointed at the North as "a strategic arena of vital significance to both of the superpowers" (Young 1985, p. 160). The Arctic, though affected by rising temperatures (see e.g. NOAA Arctic Report Card 2016) (Richter-Menge et al. 2016) remains a challenging destination for economic colonisation.

Climate change has shifted the paradigm not only in the academic field, affecting questions asked and methods applied to study this particular part of the world. The region has been incorporated in the legal, governance and public discourse of global affairs (e.g. Christensen et al. 2013). Jamieson (2011, p. 39) writes,"[t]he very idea of climate change involves a particular paradigm – call it the 'stability/change' paradigm". What this dual dynamic meant for the Arctic was an increased level of economic and political activity and the sense of environmental and social responsibility, set against various degrees and sources of uncertainty. Its recognition came as a paradigm of the earth-humanity relationship tipped and shifted towards a more limited and finite view of the planet and a more significant anthropogenic impact onto the natural environment than previously conceived (see e.g. Finger 2016; Körber et al. 2017).

The understanding of the Arctic has been transformed into the plurality of its past, present and future dimensions: from the nineteenth to early twentieth century's 'Arctic sublime' (e.g. Loomis 1977), to the resource base and political chessboard of the second half of the twentieth century, to the space unsettled and de-objectified through climate change paradigm shift, a place for international cooperation and dialogue, an unpredictable and disruptive force that may have far-reaching consequences.

Moreover, the Arctic space has been assigned with an agency, as an ability of the environment to exert force onto and influence the human-nonhuman interactions therein. For instance, modelling results showed that by the mid-twenty-first century near-surface permafrost in the Northern hemisphere may shrink by 15–30% with seasonal thawing increasing by 50% or more in the northernmost locations. This would affect a significant part of the 25% of land territory of the Northern hemisphere underlain with permafrost (Anisimov and Reneva 2006) while the multi-year sea ice is predicted to retreat (Notz and Stroeve 2016). The inherent dynamism of the physical Arctic is affecting the way the region is approached and interpreted by both economic and political actors. This new unravelling agency is inseparable from the interactions between societies and the polar region as it materialises through them as a space of action or inaction (e.g. fishing moratorium vs. offshore drilling).

A distributional concern over fragility of the Arctic nature, bordering on paternalism, has become a mainstream opening remark for politicians, experts, corporate spokespeople and scientists alike (e.g. Rosen 2017; Putin 2017; Equinor 2018). The extent of Arctic agency varies from a mere risk factor for economic exploitation and development to active force affecting the rest of the world through atmospheric fluxes (for instance, short climate forcers, e.g. methane emissions from thawing permafrost (e.g. Sand et al. 2016)), shifting thermoregulation between the sea and the air (e.g. melting multi-year ice and its consequences—changes in the weather, extreme events, etc.), declining biodiversity and loss of habitats (e.g. a shifting isotherm, etc.), transboundary oceanic pollution affecting fish stocks from the Pacific to the Atlantic (see e.g. AMAP 2017), indirectly affecting the climate through extracted hydrocarbons. The Arctic cryosphere, for instance, was described to constitute four tipping points with global catastrophic potential (Lenton et al. 2008; Nuttall 2012; Wadhams 2012; Young 2012), including: the ice cover with its albedo effect; the effects of methane release both on land and in the sea; acidification of the Arctic Ocean; and changing ocean currents. And while the tipping point model is not unchallenged, the picture these predictions paint is rather powerful. Emmerson in *The Future History of the Arctic* (Emmerson 2010) defined the Arctic as nature's frontline, on the one hand, and a 'storehouse' of things to be discovered and researched on the other, evoking a notion of Pandora's box.

While 'danger' and 'change' are widely resonant in the academic literature, romanticism of polar exploration can still be found in a public domain (e.g. Christensen et al. 2013). More recently, a focus on the role of science and technology in the production of knowledge about the environment of the Arctic has undoubtedly become more pertinent (see e.g. Doel et al. 2014; Wormbs and Sorlin 2017). The interpretative shift and 'production of Arctic futures' has been largely due to "the reality of anthropogenic climate change, and the concomitant sense that the Arctic is about to undergo significant and uncertain changes" (Avango et al. 2013, p. 432). It is as important to monitor feedback loops of such shifts in perception within physical interactions between men and the Arctic environment. And while acknowledging dominant discourses, some ambivalence in Arctic paradigms should not be discounted—nature can still be seen as both "an attraction and a nuisance, there to be admired and enjoyed, or alternatively overcome and exploited, whichever seems more immediately appropriate" (Pryde 1991, p. 250) keeping the way to the past and the future equally open.

8.3 Modern History of the Arctic: Nature of Exploration and Exploration of Nature

Looking at the environmental history of Arctic exploration in the twentieth century, industrialisation and colonisation, ecological negligence, pollution and degradation were prominent. But not without its lessons. First discoveries of the planetary-scale

human impact on the environment date back to at least the 1950s when the Arctic haze phenomenon was first observed (it was, however, only studied in the 1980s (Shaw 1995; Quinn et al. 2007)) coinciding with major resource discoveries and exploration across the circumpolar North. The main culprits of the general atmospheric pollution were the Soviet Union and North America. Organic toxins and trace metals, originating from the south as well as burgeoning northern industrial centres, were detected in the Arctic soil, air and biological material (Oehme and Ottar 1984; Pacyna and Oehme 1988.). Although discovery of oil prompted interest and funding in Arctic ecology, initially studies focused on small-scale practical issues of oil spills and trail damage (e.g. Walker 1996). The late 1980s and 1990s saw an emergence of comprehensive studies of the effects of the extractive industry, restorative ecology and south-north atmospheric fluxes as well as climate change in the high latitudes.

Such belated response does not only reflect the logic of its times, but also poses a question as to the extent of change in the present day approach towards the Arctic nature. But do we just think differently or do we act differently, too? The history of Arctic exploration has been similar across the East and the West despite their political differences, but have lessons been learned and actions taken to reverse this trend of delayed responsibility across the circumpolar world? At first, we will look at the industrial and military activities that took place across both hemispheres in the twentieth century as well as their environmental lessons. Then we will look at present day activities aimed at remediating and restructuring the relations between the society and the environment in this particular part of the world.

The bellwether of Arctic extractive activities, the gold rush of 1890s in Canada and early 1900s in Alaska (e.g. Alaska's Juneau mine or Canada's Klondike gold rush), started and finished abruptly leaving behind abandoned settlements, waste and devastated creeks. "To get at gold […] miners took whole ecosystems apart" (Morse 2009, p. 91). Both Alaska and Yukon are to date dotted with sites of historical gold mining awaiting to be assessed and cleaned. Management of tailings, waste produced after ore extraction, was not regulated until the 1960s —70s, closure plans or reclamation standards for ore mining industry were not in existence either.

Later, also Canada's uranium mines produced waste-related problems: tailings were deposited directly onto land or dumped into lakes, while the understanding of environmental and health effects of long-term radiation was unregulated until after the 1970s (Clement and Stenson 2002). Canada's Port Radium (in operation from 1931 to 1960), called 'Village of Widows', and Rayrock mine are notorious examples of environmental neglect of former industrial practices. Remediation works in both sites did not begin until the 1980s and carried on through 2000s. Other non-ferrous, precious metals and minerals mines, including asbestos, in the North of Canada and Alaska deployed similar approaches to waste and tailings management on their sites and shared a similar fate of abandonment and belated remediation (e.g. Silver Bear mining complex (1960–1980s) in NWT).

Meanwhile, in the Soviet Arctic coal mining in Pechora Coal Basin since 1930s and nickel smelting in Kola and Taymyr peninsulas since 1939 have been major sources of local soil and atmospheric pollution (see e.g. Zhulidov et al. 2011; Kovalchuk and

Hardinge 2002; Jaffe et al. 1995). Built by convict labourers with few if any environmental regulations in place, all sites have been subject to retroactive plans of action to remediate and reverse accumulated and continuous damage to the regional environment (e.g. Norilsk Nickel 2017 Sulphur project).

Unlike many other sources of pollutants, oil was recognised as a potential source of contamination early on—formally in the 1954 International Convention for the Prevention of Pollution of the Sea by Oil (in force from 1958). International law as well as the environmental movement developed also in response to major oil spills (e.g. Torrey Canyon in the English Channel in 1967, Santa Barbara oil spill in 1969, Exxon Valdez oil spill in 1989) and the Arctic to a certain extent reaped the benefits of a maturing international and national regulatory framework for oil extraction and shipping as well as budding environmental activism. Scholars, too, kept emphasising the high degree of uncertainty related to oil spills in terrestrial and marine environments of the Arctic from as early as the 1960s (e.g. Dunbar 1968; Clark and Finley 1982) and vouched for precaution.

The first commercial oil production in the American Arctic began in the USA in 1977 and centred around the Prudhoe Bay oil field on Alaska's North Slope. The oil fields of the North Slope are the largest single source of US oil and also one of the most studied environments in North America as a result of the US National Environmental Policy Act (NEPA) of 1970 (Maki 1992). With many monitoring programmes studying the effects of oil production on the biota of the North Slope, it was possible to establish the baseline conditions and conduct impact assessments for subsequent mediation (Herlugson and Parnell 1996).

The Soviet Union started search for oil and gas in the polar regions in 1930s (Ust Port, Taymyr) but major field discoveries were not made until late 1960s and production began in late 1970s. This pioneering approach to northern industrialisation often implied ad hoc solutions and in situ engineering. Only basic environmental data, such as water and fuel consumption, was collected at the time. Associated infrastructure and unique environmental dangers were not taken into account, including off-road vehicle trails causing snow compaction and long-term damage to vegetation, effects related to construction of roads, industrial facilities, pipelines, seismic exploration or drilling. Direct disturbance to wildlife habitat and indirect through noise, vibration, pollution and other was not accounted for either.

While Norway was a pioneer in offshore hydrocarbon production in the northern seas, there have been no offshore platforms in Norway above the Arctic Circle until fairly recently (Snøhvit, 71.6°N 21°E, started production in 2006). In Canada exploratory offshore drilling began in the Beaufort Sea and Mackenzie delta in the 1970s after thorough research on the potential impact of the oil spill (Beaufort Sea Project Reprints) but was abandoned for economic reasons. In the USA first offshore exploration wells were drilled in the Chukchi Sea in 1989–1990 with oil production beginning in 2001. But exploration was abandoned in 2015 by Shell. The Obama administration announced in 2015 new lease conditions of exploration in Chukchi and Beaufort Seas as well as cancelled future auctions of Arctic offshore leases. Offshore exploration in the Arctic followed technological, environmental and political lessons of drilling in more southern areas with environmental

activism playing a significant role (e.g. Fort Bragg in 1988) in ensuring safer operation and preventing blowouts, spills and tanker collisions that had cost the industry in millions of production losses, cleanup expenses as well as public confidence (Sabin 2012).

Another controversial source of historical pollution in the Arctic has been anthropogenic radiation which was mainly the result of atmospheric nuclear weapons testing between 1945 and 1980, particularly those in Novaya Zemlya, an Arctic archipelago (Stone 2015; Kirk 1996). After the 1963 Limited Test Ban Treaty which recognised the impact of the atmospheric fallout onto the environment and public health and the 1996 Comprehensive Test Ban Treaty, the share of anthropogenic radiation in the Arctic has significantly decreased.

Industrial expansion in the northern frontiers of the Arctic rim in the twentieth century was not the only practical lesson in environmental impacts in polar regions. Overfishing, trophy and unsustainable hunting, population rise and increased use of carbon-based fuels, 'alien' materials, expansion of settlements and towns, mass consumerism, increase in minor spills and leaks throughout the circumpolar north—all have been written in the environmental history of the region. "Regrettably, history must deem the 1970s and 1980s as decades of net environmental losses. This is equally true in both the United States and the Soviet Union, where striking parallels exist in the context of environmental problems" (Pryde 1991, p. 291). At the same time, Arctic and other remote environments became a deciding factor for a global effort to regulate the chemical pollution by persistent organic pollutants (POPs) (UNEP 2001). And there has undoubtedly been a silver lining found in increased environmental cooperation, such as the Arctic Council, the Barents cooperation, the Russian-Norwegian oil spill response regime, or the OSPAR Commission, to name a few. Moreover, environmental regulations have been tightened in all countries and regions involved in the above-mentioned activities, while environmental awareness has grown significantly. Above all, a shift in the paradigm from conquest to safeguarding nature and internalising costs related to preventive environmental management has occurred.

8.4 Return to the Arctic

Since the late 2000s, governments and major hydrocarbon operators, infrastructure and shipping companies have invested billions to explore resources and opportunities of the Arctic coast, outer continental shelf and the Arctic waters.

All Arctic Ocean states published and recently updated their Arctic strategies. All of them pledged, in one form or another, responsible development and protection of the Arctic nature:

- Norway: stronger focus on energy and the environment (Norway's High North strategy (2006) and Arctic strategy (2017)),
- Denmark: "development with respect for the Arctic's vulnerable climate, environment and nature" (Denmark's Strategy for the Arctic 2011–2020 (2015)),

- Finland: leading the way in sustainable development and "combating climate change and mitigating its impact" (Prime Minister's Office 2013),
- Canada:"social and economic development" and "protecting the North's environmental heritage" (Government of Canada 2009), in 2017: sustainable economies and "conserving Arctic biodiversity through science-based decision making" (Trudeau's Towards a New Arctic Policy Framework),
- Russia: comprehensive social and economic development, environmental security, science and technology development (Russia's Strategy of Arctic Development and National Security (Russian Federation 2013)),
- USA: responsible stewardship, sustainable development of economic and energy resources, providing for future US energy security (US National Strategy for the Arctic Region (The White House, 2013) and Strategy (2017)).

All of the states stressed the importance of protecting the fragile natural environment and acknowledged uncertainties pertaining to the changing climate. Some, e.g. USA and Norway, made attempts to toughen regulations in oil and gas operation safety and environmental protection in the Arctic. Indeed, the Norwegian government commissioned a report on the current state of environmental protection in the petroleum industry, which was published in 2017 and will serve as a basis for new measures (Norwegian Oil and Gas Association 2017). Others are still working on the legal and regulatory framework in their Arctic region: the Russian authorities, for instance, have been deliberating on the comprehensive Arctic law since 2012, but such a document regulating social, economic and environmental relations in the Russian Arctic and affirming the region's special status is yet to be approved.

In politics, as in economy, change seems to be the only constant—oil prices, investment climate, administrations and even regimes change and what is deemed status quo in the Arctic rarely abides. The most recent example is former US president Barack Obama's plan to 'permanently' ban sales of new offshore rights in the Chukchi and Beaufort Seas that is now being revised by the Trump administration. In April 2017, Trump signed an America-First Offshore Energy Strategy executive order to extend offshore oil and gas drilling to areas in the Arctic in direct contradiction to Obama's offshore drilling plan (White House 2017). The USA has recently reviewed its environmental standards in order to tighten regulations for future exploratory drilling in the Arctic waters (US Department of the Interior 2016). Similarly, Canadian Arctic policy under its previous prime minister, Stephen Harper, who was in office between 2006 and 2015 (see Lackenbauer and Dean 2016) sought to "unleash the tremendous potential of this region" (ibid., p. 13) whereas Trudeau's 5 year ban on new licensing in Arctic waters intended to symbolise a pro-environmental shift in Canada's northern policy. But with Northwest Territories' premier Bob McLeod and Alaska's senators openly speaking for expanded oil and gas development in their respective regions and against central policies Alaska: Senators move to revoke Obama's offshore drilling ban of April 2017, it is clear that the American Arctic future will be contingent on the balance of power between south and north and the continuous interpretation of risks and benefits (CBCNews 2017; Offshore Energy Today 2017).

In 2014, Greenland called its mining resources a pivot of the nation's economic development in its Oil and Minerals Strategy (Government of Greenland 2014). Greenland's recent 'resource rush' was largely spurred by its political independence from Denmark, newly found sovereignty over subsoil resources and subsidised revenue losses that followed the home rule of 2009. The predicted hydrocarbon boom has not however materialised as commercially viable hydrocarbon deposits are yet to be found. Notwithstanding, a large part of the island remains unexplored and new discoveries are possible.

On the other side of the Atlantic, after tumultuous 1990s that saw a slowdown in industrial exploration in the northern frontiers as well as re-writing of laws, including those on nature. The 1984 Decree on "Increased environmental protection in the areas of High North and marine areas adjacent to the northern coast of the USSR," which was discontinued after the collapse of the Soviet Union with no alternative up until present day serves as an example. The Arctic reappeared on Russia's domestic agenda in the late 2000s (Russian Federation 2008, 2013). The objective was to pick up where the Soviets left off and industrialise the North through development of hydrocarbons and other terrestrial and marine natural resources and develop the Northern Sea Route. While financial struggles of such projects are not too dissimilar to those in other Arctic states, geo-economic and technological limitations have been a significant factor in the Russian Arctic since 2014 onwards. Thus, offshore exploration has been affected by sanctions, dissolved partnerships with foreign investors, lack of own corporate resources and technologies. In 2016 the government imposed a moratorium on 20% remaining undistributed offshore licences, while the other 80% are held by two state-owned companies, Gazprom and Rosneft, that are to resume exploratory works in the EEZ in 2017–2019.

While exploration in the Arctic can hardly be called fixed in time and place and uniform throughout the region, what has been consistent across political discourse of the Arctic states was that, regardless of the development scenario, environmental prerogatives are resonant now more than ever in the history of the Arctic exploration. Or to use Lisa Murkowski's words: "This is not a choice between energy and the environment. We are past that" (cited in Siegel 2017). Similar rhetoric is present across the ocean, too, for instance, in Russia, its former minister of natural resources stated that "the Arctic is not only and not so much of economic importance. Now we have started considering 'feedbacks' and we understand that the Arctic is where climate is formed and unique ecosystems are preserved" (Donskoy 2017).

8.5 Arctic Cleanup and Preservation

Apart from Arctic-specific environmental regulation, there has been another trend, particularly recently in Russia, of remediating past environmental damage in the Arctic. Russia, similarly to the USA and Canada, inherited the North bearing scars of half a century long industrialisation, militarisation, and development of the Northern Sea Route, with disastrous effects in some areas (see e.g. Bruno 2010;

Josephson 2014). During the 1990s Siberia and the High North experienced a mass abandonment of its military bases, airports, mines, settlements throughout the North, as a result, piles of construction materials, fuel tanks, vehicles, buildings, cabins, communication and energy infrastructure as well as significant amounts of hazardous waste were left behind. In addition to terrestrial ruination, from 1964 to 1991 the Russian Arctic seabed was used as a burial ground for nuclear-powered submarines, nuclear reactors and other radioactive objects and about 17,000 containers with solid nuclear waste (Korolev 2016). The removal of nuclear waste from Russia's north-west coast has been under way for over a decade in collaboration with Germany, France and others.

The cleanup of the Russian Arctic first occurred in the context of the Barents cooperation (e.g. Sellheim 2012). Vladimir Putin picked up on it again in 2010 and it was reiterated in the Strategy of the Russian Arctic zone development through to 2020: "liquidation of the environmental damage caused by past economic, military and other activities in the Arctic Zone of the Russian Federation" (Russian Federation 2013). Since then 6 islands of Franz Joseph's land, north of Novaya Zemlya, Bely and Vilkitsky isles, town of Amderma, Kolguev island, Cape Schmidt of Wrangel island, New Siberian Islands and other sites have been or are still in the process of being cleaned of the accumulated historical waste (e.g. Spiridonova 2018). The costs are borne by the state and private sector donors.

The term of 'accumulated environmental damage' was introduced to the Russian federal legislation in 2016 (Pravitelstvo Rossii 2016). By 2017 the Arctic regions of Russia carried out an inventory of sites of accumulated environmental damage classified according to the urgency of rehabilitation required and would expect to receive state funding for the removal and remedial works as part of the state 'road map' to free the Russian Arctic of accumulated pollution. While the 'road map' prioritised only 102 sites, Murmansk Oblast alone counted 149 objects of accumulated environmental damage, including illegal landfills, radioactive objects, military bases, etc. *Greenpeace* Russia made a list of 399 sites in the Russian Arctic ranging from metal scrapyards to radioactive wastelands to mining pits and landfills, which they submitted to the government in hopes of expanding the coverage of the programme (Greenpeace 2017).

Similar activities have been taking place in Alaska, where some of about 600 military installations were abandoned after the end of the Cold War, since the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, was enacted. Among such sites were:

- four remote radar stations in the North Slope region removed in 2014–2015 on behalf of the United States Air Force;
- Manning Point Formerly Used Defense Site (FUDS), where fuel, lubricant and oil drums were removed from the Jago river delta by D (USACE) in 2010–2011;
- DEW (Distant Early Warning) line sites (see more on research in Lackenbauer et al. 2005), including Kogru River;

– the cleanup of 136 Alaska test wells drilled prior to 1982 in the National Petroleum Reserve funded by the Bureau of Land Management (BLM) and the US Army Corps of Engineers between 2002 and 2015 (18 wells) and through Helium Act of 2013 up to 2019 (50 wells) (BLM 2013). That included nine wells drilled between 1940s and 1950s in Umiat area, considered one of the most polluted in the country (N.A 2001).

In the Canadian Arctic ongoing cleanup efforts date back to at least late 1990s and are partially driven by the political urge to restore the relations between the indigenous peoples and the federal authorities. Canada has had a long history of mining in the North; its abandoned, orphaned and legacy mines (e.g. Faro Mine, Giant Mine, Rankin Inlet, etc.) as well as other contaminated sites have only recently attracted political attention. Federal Contaminated Sites Accelerated Action Plan (FCSAP) was set up in 2005 to clean up and rehabilitate thousands of such sites throughout Canada. FCSAP has so far been divided into three phases spreading over 2005–2020 and was estimated to be worth CAN$3.5 billion in liability (Nunavut Tunngavik Incorporated Discussion Paper 2007).

In the Canada's Arctic territories (Yukon, Nunavut, Northwest Territories) the contaminated sites are addressed under the Northern Contaminated Sites Programme. The contaminated sites among others included DEW lines built in the Canadian North, mostly in Nunavut, in 1950s and jointly operated by the USA and Canada which were turned over to Canada in 1993. The sites were abandoned in the late 1990s and buildings, infrastructure, landfills, barrels, asbestos, fuel, contaminated soils, and PCBs were left behind. 21 of 42 have been scrapped and cleaned over almost two decades. The site at Cape Dyer on the east coast of Baffin Island took 9 years to clean up. Other cleanup sites included Cape Hooper, Cambridge Bay, Kugaaruk, and Cape Perry. The remediate works were partially funded by the USA.

Senator Douglas Roche wrote in 2000 that "The DEW Line stations were constructed in an era when there was little or no appreciation from non-native Canadians of just how fragile the Arctic ecosystem actually is" (Roche 2000). His remark, while referring to the American Arctic, is true for both Eastern and Western hemispheres. While a lot of the impacts would have been visible at the time of operation, the utilitarian mentality, the urgency of a cause, secrecy and lack of scientific understanding of chemical pollution have taken decades to find their way to policy and law-making of the USA, Canada and the USSR/Russia alike.

While in all the countries remediation and cleanup required considerable amount of state funding, the disruption of ownership in the USSR-Russia transition economy and bankruptcy of Canadian mining companies in the 1990s made it more difficult to enact the 'polluter pays principle'. In Russia some state-owned and private companies (Gazprom, Rosatom, Nornickel…) engaged with the cleanup and other ecological initiatives as part of their social responsibility strategy. Rosatom, for instance, signed an agreement with the Murmansk region government in 2014 to provide assistance in remediating and preventing past and present environmental damage: the sites of joint effort included temporary nuclear waste storage facility OAO 'TsS Zvezdochka' and solid nuclear waste facility 'Gremiha' as well as others.

Gazpromneft-Yamal, too, together with Yamal district administration carried out a large-scale cleanup on the Obe estuary coast.

In addition to regulation of economic activities in the region, past several decades saw a dramatic change in land and sea protection as well. Before the Second World War there were very few protected areas in the terrestrial and marine Arctic (Lapland and Kandalaksha reserves in the USSR; subarctic park in Alaska Denali (1917)), whose borders or even existence were hardly set in stone. The 1980–1990s saw the largest increase of protected areas throughout the circumpolar North (for instance, e.g. Northeast Greenland National Park, Aulavik National Park and Pingo National Landmark in Canada, Putorana and Gydan nature reserves, Franz Joseph's Land in Russia and others). Thereafter many countries adopted a more systematic approach to conservation. For instance, the USSR almost doubled its nature reserve network, enacted a national wildlife law and produced its first red books of endangered species between 1970 and 1990.

Recently, new protected areas, including Láhko (2012) and Sjunkhatten (2012) national parks in Norway, national parks Russkaya Arktika (2009) and Beringia (2013) in Russia, and Tallurutiup Imanga—Lancaster Sound National Marine Conservation Area (2017) in Canada, have been established to protect the landscapes and the biodiversity of the Arctic fauna and flora. Canada's addition is the country's largest marine protected area, which at 109,000 square km, contributes to Canada's commitment under the Convention on Biological Diversity of reaching 10% of marine and coastal area by 2020 (Wong 2017) as well as domestic pledges to attain to 2020 Biodiversity Goals and Targets to conserve "at least 17% of terrestrial areas and inland water, and 10% of coastal and marine areas" (Government of Canada 2016). The Russian Ministry of Natural Resources and Ecology reported that it would too aim at meeting Aichi Targets of the Convention on Biological Diversity through its northern regions with the plan to increase the area of protected territories in the climate change sensitive north of the country by 11% by 2023 using the financial help from the German Federal Ministry for the Environment (Russian Federation 2017).

Cooperation in the field of conservation and environmental protection has also been expanding since about 1970s in the form of cross-border species conservation, heritage programmes and institutional, scientific and legal cooperation (from military cleanup agreements to international organisations and fora, such as the Arctic Council and the Polar Code).

It is a misconception that the cooperation in the Arctic between the West and the East began after Mikhail Gorbachev's seminal speech of 1987 in Murmansk. In fact, the first international conference on permafrost took place in 1963 in Indiana, USA (Permafrost International Conference 1963) and the second in 1973 in Yakutsk, USSR (Permafrost Second International Conference 1973a, b); the issues stemming from development of northern territories were a common ground between the countries even amidst the Cold War. The International Agreement for the Conservation of Polar Bears and their Habitat of 1973 is another such example where Canada, USA, USSR, Norway and Denmark came together to solve a common regional problem of declining species numbers. The Shared Beringian Heritage Programme

has been running for 27 years since its inception in 1991 by George Bush and Mikhail Gorbachev as an attempt to join efforts in the field of environmental protection, science and cultural exchange between Alaska and the Russian Far East.

In 2012, the US and Russian governments stated their intention to create a transboundary area spanning over Beringia National Park in Chukotka, Russia and the Bering Land Bridge National Preserve and Cape Krusenstern National Monument in Alaska, USA. However, geopolitical tensions brought the initiative to a halt. While neither of these environmental instruments are immune to changes of geopolitical climate, they have nonetheless been generated and propelled by the rising level of environmental consciousness across the Arctic rim. Such is a case of the 16 year moratorium on commercial fishing in the Central Arctic Ocean agreed between Arctic states and other interested parties following the open letter signed by more than 2000 scientists from all over the world. In 2015, the Oslo Declaration manifested a will of the Arctic Five to prevent unregulated fishing in the High Arctic (Regjeringen 2015) and in 2017, nine countries and the European Union concluded Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (U.S. Department of State 2017).

8.6 Conclusion

The European view of the Arctic's environmental history has been that of observation and discovery. While most of the prognoses about the Arctic of the present, whether regarding the growing militarisation and the advent of another Cold War or pressures of overpopulation and resource chase, are either yet to materialise or have been significantly smaller in scale or impact than predicted. And the temptation is high to look for causes of discrepancies between predictions and reality, and some do find them in economic, political or haphazard events, it may be that the Arctic development has altogether changed its trajectory and is no longer on the course favoured by writers of 'doom and gloom'. It may as well be that the future of the Arctic is no longer rooted in dichotomy of choice between exploitation and pristineness. And while social and economic development and natural environment are not in clear-cut opposition, willingness to recognise and mitigate anthropogenic impact together with the growing environmental awareness can help overcome the modernist binary supposition of the active and aggressive development versus passive natural environment.

Pro-environmental rhetoric of recent years and, more importantly, tighter regulations, restoration of the Arctic landscape and reclamation of land across Eurasian and American hemispheres, international efforts to mitigate the damage and prevent loss demonstrate that governments, companies and societies can learn from past activities whether they were economic advances or military experiments.

It is tempting to see the development and industry as intrinsically destructive, the standard against which we define and measure destruction (destructiveness) has a tendency, as was demonstrated, to shift across time and space, while the narrative

generally remains polarised. Acknowledging this discrepancy should not mislead us into believing that development and environmental governance are in equilibrium or to disregarding varying short-term, long-term and tipping event time scales that society and nature co-exist in. Instead, it should open up a new field of inquiry—the 'learning curve' of social and ecological balance in the Arctic as new relations and contexts are being redefined in formerly exploited and new areas.

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