3. Exploring the Naturalcultural History and Politics of Svalbard and the Global Seed Vault

In the 16 years since the Svalbard Global Seed Vault first opened its doors to the world's seeds and genebanks as well as to the public, it has attracted a lot of international attention. Journalists from all around the world have disseminated its story, as have a number of social scientists and humanities researchers. Many of these stories have been told from afar, based on sources of knowledge accessible from afar, because its remoteness and the high cost of a journey to Svalbard make it difficult to visit the Seed Vault. In recent years, access to the Seed Vault has become even more difficult since its doors were closed to the public in the wake of a water intrusion incident in 2016 and the subsequent reconstruction of the facility. On both occasions when I travelled to Svalbard for field research, in June 2019 and in February 2020, the security door separating the interior of the vault world from the outside world remained closed for me. It was not least this restriction of access to the interior world of the Seed Vault that prompted me to turn my attention outward – to the world(s) it is situated in. While this choice was imposed at first, it opened insightful, important, and hitherto underexplored paths towards the many worlds the Seed Vault is entangled in. It prompted me to consider and investigate the Seed Vault not only as a technoscientific conservation facility for seeds from all over the world, but also as a nodal point of the many worlds that come with the seeds and other actors the Seed Vault assembles and hence a window to the world(s) of agrobiodiversity conservation.

As elaborated in the introduction to this book, this approach to studying the Seed Vault and agrobiodiversity conservation follows the research tradition of feminist technoscience studies, which – together with postcolonial and other critical (techno)science studies – place the worldly situatedness and performativity of technoscientific projects, practices, and knowledges at the centre of attention. Investigating the worlds that come with technoscien-

tific objects, knowledges, and practices, as Donna Haraway has prominently proposed, is an effort to tear down "the wall between the political and the technical" (Haraway 1997: 37). It means challenging the isolation of the sciences from critical reflexivity and recognising the ways in which the technical is imbued with the political. Paying attention to the worlds that come with objects and subjects of research, Haraway argues, is a contextualising exercise that is indispensable for any critical inquiry insofar as it highlights how technoscientific knowledge- and world-making practices and processes are always located in specific worlds, embedded in power relations, and never impartial, disengaged, or innocent (see also Haraway 1988).

The present chapter introduces what it means to consider the Svalbard Global Seed Vault through the worlds it comes with and that come with the seeds it assembles. The first section focuses on the world the Seed Vault is situated in in its home, Svalbard. While Svalbard typically matters in stories about the Seed Vault in terms of the geographical, geological, and climatic environment it provides, my analysis focuses on the history of the archipelago, exploring how it comes to matter in the story of the Seed Vault. The second section traces the story of the Seed Vault through the eyes of the various actors in the world of agrobiodiversity conservation who are involved in it and to whose work it matters. It is through these accounts that I develop the analytical perspective I propose, namely to conceive the Seed Vault not merely as a technoscientific facility and actor in the world of agrobiodiversity conservation, but also as a political arena assembling a diversity of worlds and modes of world-making in the interplay of which the Seed Vault and its conservation efforts come to matter.

3.1 Svalbard: "The Last Frontier"? Dis/continuities of Frontierism in *ex situ* Conservation

> To understand the Seed Vault, you first need a feeling for its home, Svalbard. (Fowler 2016: 25)

At the beginning of the first chapter of *Seeds on Ice: Svalbard and the Global Seed Vault* (Fowler 2016), Cary Fowler takes his readers into the extraordinary environment that Svalbard provides to the Seed Vault. This environment is shaped by an icy mountainous landscape, endless darkness in the long Arctic winter

and all-day sunlight in summer, as well as a sparse flora and unique fauna adapted to the Arctic climate and milieu. Stories of humbling experiences the challenging environment of Svalbard has afforded Fowler himself and other men throughout history imbue the ensuing overview of the little more than four centuries of human history on the archipelago. A closer engagement with the history of human activity on and interest in the archipelago shows that Svalbard matters to the story of the Seed Vault in more ways than due to its remoteness, geological stability, and cold temperatures, which are the usual aspects mentioned when the archipelago is presented as a suitable home for the Seed Vault. This chapter shows that Svalbard also gives the Seed Vault a more-than-*non*human home.[1]

It is not immediately obvious what the history of Svalbard might have to do with the Seed Vault. The facility has only been part of Longyearbyen's townscape for less than two decades, none of the relevant actors behind the Seed Vault are based in Svalbard, and with no permanent staff the facility is an appendix to rather than a part of the town and the local community. If history is understood in institutional terms, the Seed Vault has no deep historical roots in Svalbard. However, history matters in other ways, too, which might be less evident but are no less meaningful and consequential. The history embedding the Seed Vault that I trace in this chapter is not the institutional history that has given rise to the Seed Vault as a backup seed conservation facility, which I have unfolded in chapter 1. Rather, what I am interested in here is the history of human relations to the natural world as it comes to matter in the history of Svalbard, including the Seed Vault as its most recent materialisation. This "naturalcultural history" (Haraway 2016: 118) at once exceeds and manifests in the history of Svalbard, making it possible to uncover the kindred relations between the Seed Vault and its home, Svalbard.

1 Around the turn of the millennium, the notion of the "more-than-human" became a popular indicator of the fact that human lives and life worlds are deeply entangled with more-than-human others and conditions (see Whatmore 2002: 146–167). Although the term aims to encapsulate the relational ontology of the human, it also maintains a distinction between the human and that which is *more* and *other* than human. In this respect, it foregrounds an anthropocentric perspective on relational ontology. The notion of the "more-than-*non*human" is a play on words that aims to subvert this anthropocentric language by highlighting that the way in which the natural world is just as more-than-nonhuman as the human world is more-than-human. I elaborate on the notion in more detail in chapter 4.1.

To trace Svalbard's history, I follow the path laid out by the Svalbard Museum in Longyearbyen. From the first historically verified landing on the archipelago in the course of mid-second-millennium European explorerism through a long history of extractivist resource exploitation over the following centuries, the Svalbard Museum presents the story of what I read as a world made through iterations of frontierism. Drawing on Anna L. Tsing's (2005) notion of the "salvage frontier" as a historically specific contemporary mode of frontierism, I argue that the frontierist world-making trajectory has not come to an end with the growing comprehension of the ecological repercussions of colonial-capitalist modernity in the twenty-first century and the surge in efforts to conserve what is left of the 'old world'. Rather, I show that it is reiterated – even conserved – by the most recent addition to Svalbard's more-than-nonhuman landscape, the Svalbard Global Seed Vault.

The History of Svalbard

The Svalbard Museum sits at the lower end of the centre of Longyearbyen, facing the town to one side and the Isfjorden to the other. It is an asymmetrically built, one-storied, sprawling, dark-coloured building that seems to mimic the mountainscape on the other side of the fjord, which rises above it in the background when viewed from the town centre. The Svalbard Museum was one of the first places in Longyearbyen I was drawn to during my first visit to Svalbard in June 2019. I had arrived two days prior to my arranged meetings with the Seed Vault people in order to have some time to familiarise myself with the place. Upon arrival at the museum, I realised that as part of the Forskningsparken, the Svalbard Research Park, it shares a building with the Arctic outpost of the Norwegian Polar Institute and the local University Centre. Glancing through the simple glass door that separates the latter from the reception hall of the museum, a remark in the work of decolonial philosopher Walter D. Mignolo that I had recently read popped into my head. In *On Decoloniality: Concepts, Analytics, Praxis* (Mignolo/Walsh 2018), Mignolo argues that museums are places of building historical memory as much as they are places of learning about history. Along with universities, he writes, they have historically been "instrumental in building Western civilization's profile and identity, as we know it today" (Mignolo 2018: 199). In doing so, they have exerted and secured what Mignolo calls the "epistemic totalitarianism" (2018: 195) of the European colonial project. I entered the museum sensitised by this

reminder that the historical knowledges presented in museums are situated (hi)stories of the events and contexts of which they tell.

As a researcher with only German and English language skills, I found the Svalbard Museum one of the main sources of accessible knowledge about the history of the archipelago, since most written historical sources are in Norwegian or Russian. English-language exceptions further undergirding the following account are Thor B. Arlov's *A Short History of Svalbard* ([1989] 1994) and two short entries in Marc Nuttall's *Encyclopedia of the Arctic* (2005). These accounts largely correspond to the museum's historical narrative, not least because Arlov, a historian at the Norwegian University of Science and Technology in Trondheim, has authored some of the texts on the Svalbard Museum's information boards and website.

Entering the exhibition, visitors embark on a circular path along which they learn about the history of human activity on Svalbard in chronological order. The parqueted path forms an open circuit around an area covered with grey stones on one side and blue ones on the other side, partitioned by and traversable on wooden gangplanks. This area displays the diversity of land- and sea-based nonhuman life on Svalbard, primarily in the form of stuffed Arctic animals accompanied by information signs. Svalbard's fauna comprises reindeer, arctic foxes, birds, and a declining number of polar bears, as well as walruses, seals, and whales in the waters around the archipelago (for more details see Humlum 2005: 1975–1977). With the highest average temperature of 5 degrees Celsius during a rather short summer season of usually no more than one hundred days, the flora is similarly limited and restricted to small wildflowers and short grasses which flourish for no more than a couple of months per year (Fowler 2016: 39–40). In retrospect, the arrangement of the exhibition in the Svalbard Museum seemed to me to re/construct a linear narrative of human-centred cultural history (r)evolving around the biological diversity Svalbard has to offer.

The Svalbard Museum's (hi)story of human presence on Svalbard begins with the first historically verified landing in 1596.[2] With the sea routes south of

2 There is no evidence in historical records that there was any Indigenous human life on Svalbard prior to its discovery by continental seafarers (see Kruse 2012: 61; Fowler 2016: 31). Arlov ([1989] 1994: 12–15; Arlov 2005) outlines a historiographical debate about the possibility of human visits to Svalbard before this historically recognised date of its discovery. This debate is based on persistent claims about the presence of Russian hunters on Svalbard in the fifteenth or sixteenth century, Nordic sailors in the twelfth century, and even Stone Age settlements. At the heart of this controversy, according to Arlov,

the European continent controlled by Spain and Portugal at that time, Dutch and other north European seafarers travelled to northern waters in search of a northerly and independent trade route to the East. The Dutch explorer Willem Barentsz and his crew happened upon the uninhabited archipelago on their third expedition in search of a northeast passage (Arlov [1989] 1994: 9). The search for a sea route through the Arctic continued, but before long this was not the only objective for seafarers from various nations as they sailed northwards. Beginning in the early seventeenth century, a long and multi-faceted history of resource extraction began to deplete the diversity of life on Svalbard and in the waters around the archipelago. This started with the systematic hunting of whales for their blubber, which was exploited as a source of oil to be sold on European markets. While the demand for oil in Europe was growing, formerly abundant whaling regions such as Labrador and Newfoundland were already on the brink of exhaustion (Arlov 2005: 4). In Svalbard, whaling was conducted in the fjords and inshore waters until the mid-seventeenth century. When the whales withdrew to open waters, away from the coastal region that had become a life-threatening environment for them, the hunt continued and was intensified at sea. By the end of the eighteenth century, the whale populations around Svalbard were on the brink of extinction and "[t]he western European whaling adventure in the northern seas had come to an end" (Svalbard Museum n.d. d; see also Arlov [1989] 1994: 16–33).

From the eighteenth until the mid-twentieth century, Svalbard became a popular destination for hunters and trappers going after walrus, seals, and birds as well as arctic foxes for their fur. Considering that hunting and trapping was economically insignificant compared to the former whaling, the narrative of the Svalbard Museum suggests that "the desire to be one's own master and experience adventure […] may have been [among] the main motivations" (Svalbard Museum n.d. a). At the turn of the nineteenth to the twentieth century, a number of airborne North Pole expeditions taking off from Svalbard, first by hot-air balloon and later by airship, drew further international atten-

lies "inconclusive evidence and lack of sources that open up for different interpretations, but also because of particular interests in this contested region" (Arlov 2005: 3; see also Humlum 2005: 1977).

tion to the archipelago.[3] At the same time, intensified efforts to scientifically explore the archipelago including its biological and geological resources generated interest in the mineral resources there (see Arlov [1989] 1994: 42–49). While today's Arctic climate does not allow for much vegetation, what is now Svalbard was once home to "forests, ferns, and dinosaurs, whose tracks and fossils can be found on Svalbard today" (Fowler 2016: 39). An immense stock of black coal lying dormant inside Svalbard's mountainscape is part of the archipelago's unusually well-preserved, sedimented history spanning over 400 million years (Humlum 2005: 1975).

Figure 2: Norway and Svalbard on the Globe (Europe Centred)

Credit: TUBS, license: CC BY-SA 3.0, source: https://commons.wikimedia.org/wiki/File:Norway_on_the_globe_(Svalbard_special)_(Europe_centered).svg from July 18, 2025.

Figure 3: Topographic Map of Svalbard

Credit: Oona Räisänen (Mysid), license: CC BY-SA 4.0, source: https://commons.wikimedia.org/wiki/File:Topographic_map_of_Svalbard.svg from July 18, 2025.

With the discovery of these coal deposits, the second large extractive industry on Svalbard began to take shape. When the development of steam tech-

3 Longyearbyen has its own North Pole Expedition Museum, which exclusively covers air- and waterborne expeditions to the North Pole and displays an impressive number of historical documents, photos, and artifacts. See https://northpolemuseum.com/about (last accessed July 18, 2025).

nology at the end of the nineteenth century made the remote archipelago more easily accessible, "an Arctic coal rush developed" (Kruse 2012: 62). Between 1898 and 1920, before Svalbard became first regulated by international law, businessmen from ten different countries registered more than one hundred private land claims. However, by no means all these coal mining endeavours were successful, for a variety of reasons; geological mapping was insufficiently advanced and the necessary resources were often lacking (see Arlov [1989] 1994: 50–57). With the emerging coal mining business came the first year-round settlements on Svalbard. Some of the settlements located close to large coal deposits soon turned into permanent communities. Five coal mining villages established by companies from Norway, Russia, Sweden, the Netherlands, and the USA ultimately remained operative throughout the twentieth century. In 1906, the American Arctic Coal Company founded Longyear City, named after its major stockholder John Munro Longyear. When the Norwegian Store Norske Spitsbergen Kulkompani took over the coal mines in the area in 1916, the town was renamed Longyearbyen ('byen' is Norwegian for town) (Svalbard Museum n.d. b). Today, Longyearbyen is one of two former coal mining villages with coal mines still in operation and, as the largest of three remaining permanent settlements, the administrative, economic, and cultural centre of Svalbard. The other two settlements are Barentsburg, a Russian coal mining village operative to this day, and Ny-Ålesund, a small Norwegian research station. Although all three permanent settlements are located on Spitsbergen, the Svalbard archipelago's largest island, no road connects them, which means that Ny-Ålesund and Barentsburg are only accessible by boat, helicopter, or snow scooter from Longyearbyen (Fowler 2016: 31, 39).

The first laws and regulations to administer human life and economic activity on the archipelago were passed in the early twentieth century in the wake of the proliferation of the international mining industry on Svalbard. While "Svalbard was regarded a no man's land throughout the 19th century" (Arlov [1989] 1994: 60), the territorial struggles among Svalbard's many occupants who attempted to defend their land claims against trespassers created a need for authorities and regulations, especially with the Arctic environment impeding year-round presence prior to the establishment of permanent settlements (Kruse 2012: 62). A first international attempt to establish a legal regime on Svalbard, on the initiative of Norway, was first obstructed by the USA and Germany and then deferred by the outbreak of World War I. In its aftermath, a treaty to regulate access to the archipelago and its resources was developed as part of the Versailles negotiations. At the Peace Conference

in Paris on February 9, 1920, Norway, Sweden, Denmark, the Netherlands, the UK, France, Italy, Japan, and the USA signed the Treaty recognising the sovereignty of Norway over the Archipelago of Spitsbergen (see Royal Ministry of Justice 1988).[4] Norway officially changed the name of the archipelago from Spitsbergen to Svalbard in 1925, and this treaty is now commonly referred to as the Svalbard Treaty.

The Svalbard Treaty recognised "the full and absolute sovereignty of Norway over the Archipelago of Spitsbergen" (Royal Ministry of Justice 1988: Art. 1). In doing so, it abrogated the archipelago's prior status as "*terra nullius*" (Peters 2005: 1982, emph. in orig.). By providing a legal framework to regulate coal mining on Svalbard, a Mining Code Norway covenanted to devise (Royal Ministry of Justice 1988: Art. 8) and passed in 1925, the treaty also suspended conflicts between land claimants. Nevertheless, Svalbard's status under international legislation remains exceptional. Although the archipelago officially belongs to Norway and is regulated by Norwegian authorities as of its ratification by all initial signatories in 1925, the Svalbard Treaty grants equal rights to all citizens and companies from signatory countries regarding entering and residing in Svalbard, acquiring and utilising property, and engaging in land- and sea-based animal as well as mineral resource extraction and commercial activities (Svalbard Museum n.d. c; Peters 2005). Norway is only allowed to curtail these rights if and when they conflict with other provisions, such as the goals of environmental protection stipulated in Article 2 of the Svalbard Treaty and recently refined in the Svalbard Environmental Protection Act (Norwegian Ministry of Climate and Environment 2001).

Regulated by the Mining Code, the coal mining industry on Svalbard flourished for several decades. Beginning in the 1970s, however, it was plunged into a series of crises that eventually ushered in a new phase of human life and economic activity on the archipelago. Norway communised public services, established a university centre, built an airport in Longyearbyen, and relaxed restrictions on tourism; research and tourism became the main pillars of human activity on Svalbard. While the decline of the coal mining industry led to a significant reduction in the population of Barentsburg from about 2,500 in the early 1990s to only 340 inhabitants today, the combined population of

4 There are currently 50 signatories to the Svalbard Treaty. For a complete list see https://lovdata.no/dokument/NL/lov/1920-02-09 (last accessed July 18, 2025). Since it is an open treaty, other countries can join the Svalbard Treaty at any time (Peters 2005: 1982).

Longyearbyen and Ny-Ålesund approximately doubled in the same period to a current number of 2,556 inhabitants.[5] Svalbard's population is characterised by a high fluctuation. According to the last population statistics overview for Svalbard published by Statistics Norway (2017), as of 2016 it was composed of around 46 nationalities, with Norwegians constituting the largest part followed by more than 100 inhabitants from each of Thailand and Sweden and over 30 inhabitants from each of Russia and the Philippines. Svalbard's legislation does not stipulate that immigrants need a visa, residence or work permit, but they must have accommodation, employment and sufficient income to secure their own livelihood. While this incentivises international migration to Svalbard, the absence of political and labour rights as well as social security and inclusion mechanisms creates "a grey zone of informal power structures, unequal living, working and housing conditions, language barrier and perceived low level of social participation" as Zdenka Sokolickova (2022: 293) shows with regard to the Thai and Filipinx diasporas in Longyearbyen.[6] With life on Svalbard being strictly organised around work, there is no social security system and no medical care beyond primary care (Statistics Norway 2017: 10, 23). Severely ill, heavily pregnant, and dying people must relocate to the Norwegian mainland or other countries in order to receive proper care. Sophia Roosth (2016: n.p.) trenchantly summarises the situation: "Svalbard is not, as citizens call it, a 'life cycle community' – no concessions are made for birth and death, and only able-bodied working adults are welcome."

Among Longyearbyen's population, approximately a third works in the administrative, government, or research sector, while two thirds are employed in the declining coal mining business and the growing tourism industry (Fowler 2016: 31–32). This ratio and the development of the local industries also characterise the material townscape. Next to residential housing, there are government and administrative buildings, a higher education and research facility, a library and cultural centre, and a couple of museums, as well as many hotels, restaurants, bars, and souvenir shops complemented by endless tourism

5 For periodically updated population statistics see https://www.ssb.no/en/befsvalbard / (last accessed July 18, 2025, last updated March 31, 2025).

6 An-Magritt Jensen (2009) has identified three main reasons for the migration flow from Thailand to Svalbard: marriage and labour migration, and the search for better living conditions. According to Sokolickova (2022), these results are no longer accurate insofar as both the number of Thai inhabitants in Svalbard and the political situation have significantly changed in the past two decades.

services. As a result of the Svalbard Environmental Protection Act (Norwegian Ministry of Climate and Environment 2001), which protects all objects, structures, and sites from before 1946 as cultural heritage, Svalbard's history is also preserved as a visible material memory all over the archipelago. The mountain slopes around Longyearbyen are lined with the vestiges of former coal mines. In addition to the remains of coal mines, buildings, and other materials, the most striking example is the ghost town of Pyramiden in the Billefjord, accessible from Longyearbyen only by boat or snowmobile. This was one of the coal mining villages, founded by Swedish entrepreneurs in 1911 and sold to the Soviets in 1926 due to economic problems (Arlov [1989] 1994: 56). The Russians closed and abandoned Pyramiden in 1998. Preserved by the Arctic cold, the village sits on the waterfront just as it was when its human inhabitants abandoned it and is now populated only by birds, seals, and the occasional polar bear. Overlooking the Nordenskiöldbreen, one of Svalbard's largest but inexorably decreasing glaciers on the other side of the Billefjord, this dystopian scene now serves as one of Svalbard's most popular tourist attractions.

There is a certain irony to the fact that ghost towns bearing witness to bygone prosperous coal mining days, the few whales that have survived the extinctionist European whale hunt in Arctic waters, as well as melting glaciers and other slowly disappearing lifeforms, have now become tourist attractions – thus serving yet another extractive and environmentally harmful industry on Svalbard. This irony is less a paradox, though, than an illustration of a continuity between the various forms of human activity on Svalbard that have shaped and made the history of the archipelago. They all perform a resourcist, appropriative, and exploitative relation to the natural world that has made the 'natural environment' of Svalbard what it is today. The global depletion of natural resources and the steadily intensified burning of fossil fuels throughout the last couple of centuries, which also shape the making of more-than-human history on Svalbard through whaling and coal mining, are deeply implicated in the making of global existential threats to human and more-than-human life such as biodiversity loss and global warming (as well as other associated ecological problems).

The Arctic is one of the regions on earth where the already unfolding effects and challenges that come with these transformations and threats today are most visible. This has been proven throughout the last few decades by the growing research sector on Svalbard. Rising average temperatures cause glaciers to melt, permafrost to decrease, and rainfall to increase at the expense of snowfall, all of which affects the ecosystemic conditions of human and more-than-

human life on Svalbard and the survival rates of non-human species (see e.g. AMAP 2012; Norwegian Polar Institute n.d.; Øseth 2011).

At the same time, with the establishment of the Global Seed Vault in 2008, Svalbard has now also become an iconic scene of the global struggle to counteract the loss of biodiversity. However, as I show throughout the following, this does not represent a break within the history of human activity on Svalbard. There rather exists a continuity between the activities of the Seed Vault and the larger system of agrobiodiversity conservation it represents and reinsures, on the one hand, and the extractive history of the archipelago on the other. This continuity lies in the appropriative resourcist relation to the natural world that has driven the depletion of the world's natural resources throughout history. This relation to the natural world is a contributing factor to the production of contemporary social-ecological crises including the large-scale loss of global agrobiodiversity *and also* shapes the endeavour of *ex situ* agrobiodiversity conservation performed and safeguarded by the Svalbard Global Seed Vault, if in a different form. I unfold this argument by analysing the history of Svalbard as a history of different forms of frontier making.

A History of Frontierism

Alex[7] *is one of the first and few locals I meet in Svalbard. One day, they take me on a one- or two-hour tour around Longyearbyen and its surroundings in their truck, showing and telling me all kinds of things they know about Svalbard.*

The landscape we pass through is marked by remains: snow that the summer temperatures haven't melted yet; cadavers from reindeer that haven't made it through the winter, now gnawed by the occasional Arctic fox; coal dust that the wind has blown around the island from the big pile sitting at the port; no longer active coal mines whose vestiges disrupt the scenic view of the mountainscape around Longyearbyen.

I ask Alex what the community is like, what kind of people live in Svalbard.

"People are selfish, but at the same time very friendly. They come here because they want to, not because they have to; if they don't want to be here anymore, they just leave. Everything is about making money. The biggest industry here, next to coal and research, is tourism; and frankly, people milk tourists like cows. But to be fair, tourists do come here

7 To protect the anonymity of the informant paraphrased in this vignette, I have replaced their proper name with a gender-neutral pseudonym and use the gender-neutral pronouns they/them throughout the text.

to have an exotic experience and are willing to pay a lot of money for it, so… The system is profitable, so people have no interest in changing it.

Almost no one is really from here and no one really stays very long. People come to live here for a few years, then they leave. Svalbard is like a no man's land; it is governed by Norwegian law, but at the same time, it's not Norway, everybody can come and live here; I mean, everyone from the countries that have signed the Svalbard Treaty but that's pretty much every country in the world. In a way, Svalbard is like a model for life on Mars; the Svalbard Treaty, it's like a model for treaties for new places.

I guess people come here because it's exotic. Many have been everywhere, and this is the last place for them to explore, like the last frontier. It's maybe similar to what the Wild West used to be in the US, you know, for the Gold Rush."

Alex's description of Svalbard and its population employs a remarkable array of metaphors and comparisons that mobilise capitalist and colonial narratives of world-making and resonate in many ways with the history of Svalbard as I have delineated it along the storyline of the Svalbard Museum. Reading the history of Svalbard through these metaphors enables me to develop an analytical perspective that foregrounds the relations to the natural world underlying the making of Svalbard throughout its history. This, in turn, makes it possible to situate the Svalbard Global Seed Vault within the more-than-nonhuman environment that Svalbard is by scrutinising continuities and discontinuities in the relations to the natural world it enacts. Two concepts that structure Alex's narrative are central to the following analysis: the imaginary of the Arctic archipelago as *terra nullius* that Alex invokes by describing Svalbard as a "no man's land", and their characterisation of Svalbard as "the last frontier".

First, the description of Svalbard as a "no man's land" is noteworthy considering that the archipelago's legal status changed a whole century ago. However, Alex's narrative is not primarily of interest in terms of its legal adequacy but in terms of the underlying ontological conception of land and nature and the associated relation to land and nature, which legal adjustments do not necessarily affect. There are countless philosophical and social-scientific accounts of the *terra nullius* imaginary that might ground such a discussion. The anticolonial and Indigenous studies scholars Tiffany L. King (2019: 68–69) and Max Liboiron (2021: 38–80) critically remark that much of this scholarship overemphasises land, or rather an understanding of land that fails to recognise a crucial prerequisite for casting land as *terra nullius*, namely its dehistoricisation. Dehistoricising land desired for appropriation means erasing its history, which usually means the displacement of Indigenous peoples and

often includes dehumanising or genocidal violence against Indigenous and other racialised groups, as history has proven not least in the 'Wild West' Alex alludes to.

This intervention, which highlights the intersection of more-than-human with intra-human forms of violent appropriation, exploitation, and extermination, is a contribution to the scholarly discourse on the idea of land as *terra nullius* and its social implications, the importance of which cannot be overstated. With regard to Svalbard, it raises an interesting question. Since there are no historical records of Indigenous human life on Svalbard prior to the arrival of the Europeans (see footnote 2 in this section), the colonisation and exploitation of the archipelago and its resources are not built on a history of violent dispossession, subjugation, displacement, or genocide of native human societies. For some, therefore, it may stand to reason to conceive Svalbard as an actual *terra nullius* and its appropriation as a much more innocent process. I certainly do not want to suggest that there are no essential differences between intra-human and more-than-human forms of violence, exploitation, and subjugation. Notwithstanding that, in what follows I take up the ideas of ecofeminist philosopher Val Plumwood (1993) in analysing the ontologisation of land as *terra nullius* as a specific type of relation to the natural/ised world that is structurally analogous to other forms of othering.

In her momentous contribution to feminist theory and the philosophy of nature, *Feminism and the Mastery of Nature*, Plumwood (1993) argues that the notion of *terra nullius* constructs land as "a resource empty of its own purposes or meanings, and hence available to be annexed for the purposes of those supposedly identified with reason or intellect, and to be conceived and moulded in relation to these purposes" (1993: 4). On the basis of a critical engagement with the European philosophical canon, she argues that the *terra nullius* imaginary has historically established an ontological principle justifying the colonisation, appropriation, and instrumentalisation of land and nonhuman as well as human life. The foundation of this principle is a logic of dualism that assimilates the other/ed into the self by transforming it or them into "a mere tool or means for ends that are not its own" (1993: 192). By proposing and developing the foundations for an integrated analysis of human and more-than-human domination, Plumwood was one of the pioneers of a radically relational thinking about human-nature relations that informs much current scholarship on the matter, including my own approach. In what follows, I argue that it is the appropriative and exploitative relation to what is othered and desired as natural resource that has historically made Svalbard a *terra nullius* and a frontier of colonial and cap-

italist world-making. Insofar as this mode of world-making has significantly contributed to the emergence of the ecological crises of the present, it is crucial to consider the continuities between such destructive modes of world-making and the technologies and practices that promise solutions for their effects – as *ex situ* conservation does with regard to agrobiodiversity loss.

Second, Alex's characterisation of Svalbard as "the last frontier" resonates in a number of ways with the Svalbard Museum's narration of the archipelago's history in terms of the various extractive industries that have depleted Svalbard's natural resources – from seventeenth- and eighteenth-century whaling, through the hunting and trapping of other animals, to the nineteenth- and twentieth-century coal rush. Comparing Svalbard to "what the Wild West used to be in the US", Alex invokes a classical notion of the frontier such as articulated in "the proud frontier story of the making of 'America'" (Tsing 2005: 58) through the conquest and civilisation of spaces constructed as priorly wild and empty. In this story, the frontier is a spatial category denoting the moving border between 'wild' and 'civilised' spaces and a social category marking the assumed qualitative difference between them. Insofar as it obfuscates the violent dispossession and displacement of Indigenous peoples and the despoilment of environments underlying the history of nation-making through conquest and colonisation, frontierism is a partial – and certainly not impartial – story told from the perspective of the conqueror. Consequently, the notion of the frontier can be (and has been) challenged by foregrounding the perspective of the dispossessed and displaced. This is not possible in the case of Svalbard. Scholars in critical political economy and political ecology have developed a different kind of critique that is more suitable for a critical discussion of Svalbard's history of frontierism, which scrutinises and differentiates the notion of the frontier as an analytical category. This body of scholarship makes it possible to expose the ties between the Svalbard Global Seed Vault, with its mission of *ex situ* conservationism, and this history.

The environmental historian Jason Moore "operationalize[s] the concept of the frontier for the study of world capitalist expansion and its structural tendency towards environmental degradation" (2000: 409). While Moore builds on world-system theory, he also criticises its narrow understanding of the frontier "as a zone of incorporation" (Moore 2000: 410; see also 2015). According to Moore, in a world-system analysis of capitalist expansion as a historically and spatially expanding process of capital accumulation driven by the exploitation of ever more labour power, land, and natural resources, the notion of the frontier denotes the moving border between already and not-yet capitalised

spaces, systems, and modes of production as well as the process of capitalist incorporation that moves this border (see e.g. Hopkins et al. 1987; Wallerstein 1989). Using the example of sugar cane, Moore argues that capitalist expansion is driven, at its heart, by "the production and distribution of *specific* commodities" (Moore 2000: 410, emph. in orig.) and the extraction of the raw materials they are made from. To encapsulate this specification, he introduces the notion of the *commodity frontier*. Insofar as commodity frontiers are always and inherently place-specific, the concept entails an understanding of frontierism as a "mode of capitalist expansion" (Moore 2000: 411, emph. in orig.) – here through the transformation of raw materials into commodities. According to Moore, then, the frontier is not "a certain kind of place" so much as "a certain kind of socio-spatial movement" (Moore 2000: 412). As such, commodity frontiers are not a result of the consolidation of global capitalism so much as its precondition and modus operandi (Moore 2000: 428).

Analogously, the environmental degradation that comes with the depletion of raw materials for ever-expanding commodification is not an unintended consequence so much as the source of new commodity frontiers, and hence a structural component of the frontier mode of capitalist expansion:

> "The extractive and agricultural character of frontier industrialization under conditions of ceaseless capital accumulation meant that not only was ecological exhaustion a fact of life in these areas, but that ecological exhaustion was a major impetus to further capitalist expansion and to the system's cyclical fluctuations." (Moore 2000: 412)

This is pertinently exemplified by the loss of plant genetic diversity in the wake of the Green Revolution and the concomitant expanding interest of industrial agriculture and the seed industry in regions with high biodiversity, often land cultivated by peasant farmers, as well as by the creation of a market for agrochemicals. In Svalbard, the history of whaling and later extractive industries illustrates Moore's argument. It was the exhaustion of the whale populations in Labrador and Newfoundland that first drove whalers to Svalbard's inshore waters and, after their exhaustion, to the open waters around the archipelago. With the near extinction of Svalbard's whale population other commodity frontiers emerged, which meant that capital accumulation in Svalbard was sustained by the exploitation and exhaustion of other resources. It is in this dynamic, Moore argues, that "[e]cological exhaustion at the point of produc-

tion [is] complemented by an environmentally destructive multiplier effect" (2000: 412).

Moore's discussion of commodity frontierism makes an important contribution to world-system theory's discussion of frontierism by offering a comprehensive and place-specific analytical tool for understanding historical and ongoing capitalist expansion through commodification and its correlation with environmental degradation. He seeks to foreground "the link between ecological transformation and the expansionary logic of world capitalism […] to suggest ways of rethinking early modern capitalist expansion as a socio-*ecological* process" (Moore 2000: 409, emph. in orig.). In *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (2015), Moore further elaborates his attempt to counter "Capitalism's governing conceit […] that it may do with Nature as it pleases, that Nature is external and may be coded, quantified, and rationalized to serve economic growth, social development, or some other higher good" (2015: 14) with a non-dualist analysis of the social-ecological historical reality of what he calls the "web of life". While this project conclusively historicises the capitalist valorisation of the dualist conception of society and nature, it remains overdetermined by an understanding of natural-cultural history as mainly driven by political economy. Thus, for one thing, Moore overlooks the importance of political relations and processes (see also Battistoni 2017: 29 fn 58). For another, although he highlights the links between and interdependence of society and nature, he defaults to an anthropocentric perspective on social-ecological processes that does not question a resourcist paradigm. This paradigm, however, lies at the heart of the *terra nullius* imaginary and the appropriative frontierism(s) it paves the way for.[8]

Anna L. Tsing (2005)[9] articulates a similar critique, based on which she develops a notion of the frontier rooted in the frameworks of multispecies

8 Supporting Moore's effort to articulate analytical categories that include both human and non-human productivity in economic processes, yet critical of his theorem of "cheap nature" (Moore 2015), Battistoni develops a compelling conception of "the 'work of nature' as a collective, distributed effort of humans and nonhumans acting to reproduce, regenerate, and renew a common world" (2017: 5). I thank Vicky Kluzik for pointing me to the work of Battistoni and Andreas Folkers for thought-provoking discussions of Moore's work.

9 The text cited here was first published as "Natural Resources and Capitalist Frontiers" in *Economic and Political Weekly* two years earlier (Tsing 2003). The 2005 version I refer to here is slightly updated but largely the same.

ethnography and political ecology. The aim of her rearticulation of the frontier is to abandon the premises and problematic implications of a resourcist paradigm: "Most descriptions of resource frontiers take the existence of resources for granted. […] The landscape itself appears inert: ready to be dismembered and packaged for export. In contrast, the challenge I have set myself is to make the landscape a lively actor." (Tsing 2005: 53) Instead of starting from the premise that nature is a given set of resources, Tsing asks how nature becomes a set of resources on or through the frontier. This question comes with an understanding of the frontier as "not […] a place or even a process but an imaginative project capable of molding both places and processes" (2005: 59). Frontiers, then, are "both material and imaginative" (Tsing 2005: 53).

While Tsing does not elaborate on her conception of the imaginative, her arguments resonate with how the anthropologists Sophie Chao and Dion Enari (2021) discuss dominant and transformative climate change imaginaries. Following their line of argument, in what follows, I understand the imaginative as referring to "the varied and complex ways in which realities are conceptualised, fashioned, and contested […] [which are] shaped by divergent socio-cultural contexts, material-ecological terrains, and ideological and physical infrastructures that link the local to the global through partial and uneven connections" (Chao/Enari 2021: 35). Against this background, conceiving the frontier as an imaginative project indicates that it matters (to put it in a Harawayian manner), both in the sense that it makes a difference and that it has very real material consequences, what human and more-than-human worlds imaginations of current and future worlds are situated in (see also Tsing 2015). Put differently: the frontier as an imaginative project is a material-semiotic world-making device.

Rather than merely historicising imaginations of the social and the ecological, whether as separate (as in capitalism) or interdependent spheres (as in Moore's web of life), Tsing's ethnographical analysis traces the entangled material and imaginative practices that make social-ecological worlds. For her, it is in such entangled material-semiotic becoming that frontiers come to life in locally specific and therefore multiple forms (2005: 68). Tsing, thus, differs from Moore by seeing neither the time-spaces of transformation (e.g. zones of incorporation) nor the transformations themselves (e.g. practices or processes of incorporation) as what constitute a frontier. Rather, for her, the frontier emerges in the nexus of desire and promise evoked by and at the same time "encouraging ever-intensifying forms of resourcefulness" (Tsing 2005: 59). Two questions that Tsing raises in this context are central to my inquiry into the

imaginary of Svalbard as "the last frontier" and the question of what role the Seed Vault plays in this imaginary: first, *what forms* the frontier assumes in the constantly evolving terrain in which it emerges, and second, *how* (and to what extent) the desire-driven project of frontierism turns nature into a pool of resources (see Tsing 2005: 54–60). I proceed by unfolding the ways in which the history of Svalbard is a history of multiple frontiers making Svalbard what it is. Tracing these different frontiers, then, allows me to address the second question by asking what the different forms the frontier assumes in Svalbard have in common.

Probably the most commonly known form of the frontier, and the first form in which it came to Svalbard, is what Tsing refers to as the *nation-making frontier* (2005: 57). This goes back to the history of European colonialism and to colonial stories of the making of the Americas through a progressive process of 'civilization' of formerly 'wild' spaces (Tsing 2005: 57–58, quoting Sarmiento [1845] 1998 and Turner [1893] 1994). When the nation-making processes of spatial expansion and resource exploitation in the Americas and beyond were stretched to their limits (for the time being), Tsing argues, "frontier optimism" as the main sentiment associated with frontierism was replaced by "frontier nostalgia" (2005: 58). In the aftermath of World War II, however, frontier optimism experienced a renaissance in light of the promises of industrial technology. The start of a new era of seemingly unlimited resource extraction and capitalist expansion gave rise to a new type of frontier Tsing calls the *technofrontier* (ibid.). The new technofrontier mode of capitalist expansion, as it emerged in the mid-twentieth century, operates according to a new system of coordinates not only spanning the entire globe but also penetrating ever deeper into the earth and its resources. At the same time, the technofrontier preserves the imaginary of 'civilising' formerly 'wild' spaces in developmentalist narratives, thus maintaining relations with "its older frontier cousins" (Tsing 2005: 58).

The history of Svalbard as I have delineated it above is a condensed and illustrative example of frontier-making. Svalbard first became a frontier in the European colonial project when Dutch seafarers exploring Arctic waters in search of a Northeast passage to Asian markets first landed on the archipelago in the sixteenth century. In the subsequent struggles over its territory and natural resources, Svalbard became part of European and Russian (and then Soviet) histories of nation- and empire-making. The commodity frontier, if one were to think with Moore, shaped various extractive industries exploiting the archipelago's resources beginning with whaling. With the Arctic coal rush of the late nineteenth and early twentieth century, the technofrontier came

to Svalbard. Unlike in the story of a period of frontier nostalgia before the return of the frontier in the form of the technofrontier, however, in Svalbard nation-making and technofrontierism were entangled endeavours at least until the adoption of the Svalbard Treaty in 1925 resolved the legal status of the archipelago. Until the coal mining industry was plunged into crisis and nationalised in the 1970s, after which it went into continuous decline, the technofrontier mode of capitalist expansion through technologically driven exploitation of natural resources remained the primary force shaping human activity on Svalbard.[10] In the second half of the twentieth century, the promises of limitless capitalist expansion through the technological penetration of the earth began to unravel, and not only in Svalbard.

At that time, Tsing (2005: 58) argues, it became increasingly undeniable around the world that the global advancement of the technofrontier was contributing significantly to accelerating ecological devastation. The ecological ravages of technofrontierism marked the birth of an international environmentalism that soon took the shape of measures for global environmental protection and conservation. Again, the history of the Green Revolution, its social-ecological repercussions, and the conservationism emerging in response to them exemplifies this (see chapter 1). According to Tsing, however, the environmentalism of the late twentieth century did not so much challenge frontierism as translate the technofrontier into yet another new form: "This is the salvage frontier, where making, saving, and destroying resources are utterly mixed up, where zones of conservation, production, and resource sacrifice overlap almost fully, and canonical time frames of nature's study, use, and preservation are reversed, conflated, and confused." (Tsing 2005: 59)

Tsing develops the notion of the *salvage frontier* through an ethnographic study of logging practices in Kalimantan, Indonesia, which highlights some of the many ways in which processes of saving and destroying environments are inextricably entangled.[11] She argues that frontierist dreams of endless capital-

10 The contemporary resurgence of imperial conflicts raises the question of whether the nation- or empire-making frontier might experience a comeback on Svalbard (see e.g. Waehler 2022). While this is not the place for a discussion of this question, it is worth noting that this development indicates that the history of the frontier is less sequential than genealogical and that different forms of frontier are not mutually exclusive.

11 Tsing deals with the notion of the salvage frontier fairly briefly in this text and does not revisit it elsewhere either. To my knowledge, it has not been picked up or systematically developed further by anyone else. Accordingly, my summary of the concept is also fairly short. Annukka Paajanen's (2024) analysis of the Svalbard Global Seed Vault makes a

ist expansion come with a vested interest in measures of environmental protection and their promotion insofar as they harbour "fears of apocalypse" (Tsing 2005: 68). However, environmental protection and conservation measures usually only cover a small portion of the land or resources threatened with destruction or extinction, whereas the ecologically devastating appropriation of land and resources that has generated these threats in the first place continues elsewhere. In the case of logging and other large-scale land use practices that destroy whole environments, a common strategy of environmental protection is the establishment of reserves: "The reserve model [...] arises in places where environmentalists are panicked by the possibility of total destruction; it argues that *something* must be saved" (Tsing 2005: 69, emph. in orig.). As Tsing illustrates through the example of the Kalimantan frontier, in many cases this type of selective environmental protection ultimately works to save the frontier mode of capitalist expansion itself insofar as resource companies trade off (small) protected areas against rights to deplete other (large) areas. If there is a silver lining, she argues, it is "the mobilization that it [the reserve model; FV] has inspired, which brings the possibility of citizenship to those who never had them [sic] before: small collectors, tribes, trees" (Tsing 2005: 69). In other words, there is a possibility that established orders of othering and exploiting the natural/ised world may be destabilised in the wake of environmentalist mobilisation.

Although Tsing's conceptualisation of the salvage frontier is anchored in the examples of logging in Kalimantan and environmental protection through reserves, the concept is not determined by this context. As elaborated above, Tsing conceives the frontier as "a globally travelling" (2005: 68) imaginative project that comes to life by shaping places and processes in local and therefore multiple contexts and forms. Applying this idea to the Svalbard Global Seed Vault and the *ex situ* approach to conserving endangered agrobiodiversity illustrates that it is not only reserves and other *spaces* of *in situ* conservation that the salvage frontier moulds, but also *forms and processes* of conservation. As I have shown in the first chapter and continue to discuss throughout those that follow, the alarmed awakening to the disastrous consequences of irreversible loss of plant genetic diversity in the second half of the twentieth century prompted a rush to save "something" by conserving seeds in genebanks. In the

similar reference to Tsing (2015) to conceptualise the Seed Vault as "a site of salvage accumulation" (Paajanen 2024: 23–25). However, the notion of the salvage frontier, which is of particular interest to me here, is not addressed in her work.

course of this attempt, *ex situ* conservation – the key international strategy to preserve plant genetic diversity for food and agriculture – moulds what agrobiodiversity is currently and will be in the future. By organising conservation around "plant genetic resources" and by selecting which plant material is worth conserving, whatever the rationalities of selection, *ex situ* conservation consolidates a geneticised and technologised as well as a resource-oriented understanding of agrobiodiversity – the technofrontier version of agrobiodiversity.

Importantly, the preservation of this kind of agricultural biodiversity, especially in genebanks with a "productivist" or "preservationist profile" (Pellegrini/Balatti 2016: 2762–2764; see chapter 1.5) such as the Seed Vault and its depositors, is not an end in itself. It serves to make available the largest possible stock of plant genetic resources not only for future farming, but also for the breeding of new varieties supposed to help adapt the existing system of global industrial agriculture to future social-ecological challenges. In this sense, *ex situ* conservation of PGRFA and the Svalbard Global Seed Vault as the stronghold of this practice and understanding of agrobiodiversity operate in the salvage frontier mode of capitalist expansion – which ultimately also preserves the technofrontier mode. The crux of this is that rather than challenging an agricultural system that is built on technofrontierism and therefore complicit in the emergence of the social-ecological challenges it faces, *ex situ* conservation serves to sustain that same system of global industrial agriculture. By doing so, however, it also sustains the roots of the agrobiodiversity crisis it is supposed to be a response to.

As an iconic manifestation of the salvage frontier, then, the Seed Vault is the most recent iteration of Svalbard's history of frontierism. This history is not a series of consecutive phases throughout which the frontier assumes alternating, mutually exclusive forms; it is not, as one might conclude, "a series of ironic twists" (Tsing 2005: 59, quoting Schmink/Wood 1992). Instead, Tsing emphasises that "[s]uch twists are more than irony: they predict and perform their own reversals, forming productive confusions and becoming models for other frontiers" (Tsing 2005: 59). As I have shown through the history of Svalbard, different forms of the frontier can coexist and permeate one another. This genealogical understanding of the history of frontierism, illustratively condensed in the history of Svalbard, lies at the heart of my effort to situate the Global Seed Vault in Svalbard as its home or more-than-nonhuman environment. The history of Svalbard epitomises the emergence of the salvage frontier out of the dreams and desires associated with the technofrontier and in re-

sponse to the destructive forces it has unleashed. In like manner, the Svalbard Global Seed Vault was established to counteract the devastations and threats that have come to matter through the Green Revolution and industrial agricultural production more generally, while also preserving the technofrontierist dreams and promises associated with them.

Before going on to elaborate in more detail on the practices and politics of *ex situ* conservation and the Seed Vault's role in them, I want to conclude this chapter by reflecting on the second question raised earlier: How does nature become a set of resources in and through the frontier(s)? I address this question by tracing the making of resources through the different forms of frontierism and looking at what they have in common.

Thinking the frontier through Tsing as an imaginative-material project, or in Harawayian terms as a material-semiotic mode of world-making, means understanding frontierism not just as a mode of appropriating land and natural/ised resources but as a particular way of being in and knowing the world that *makes* land, nature, and biological diversity a set of resources. To develop this claim, I will briefly turn to a region that is geographically distant but closely connected to my argument through the history of frontierism. The frontier, in most of its various forms described above, creates what Macarena Gómez-Barris (2017) calls "extractive zones". Underlying her conceptualisation of this notion is a study of different regions in South and Central America that have a long and intertwined history of exploitative resource extraction and repression of local Indigenous communities. These areas, Gómez-Barris argues, become extractive zones in the encounter with "the colonial paradigm, worldview, and technologies that mark out regions of 'high biodiversity' in order to reduce life to capitalist resource conversion" (2017: xv).

The process of converting areas rich in a diversity of natural resources into extractive zones for colonial capitalism commenced with the European colonial expansion that began in the 1500s. Londa Schiebinger's (2004, 2005) historical research on colonial botany shows that a key motive for many of the explorative voyages of the colonial era, beyond territorial expansion, was prospecting for and extracting natural resources considered valuable for European markets. While Svalbard became a temporary and globally rather insignificant extractive zone for oil extraction from whale and seal blubber and later for coal mining, South and Latin America are home to a number of extractive zones historically much more significant on a global scale. This is due to the fact that a number of the centres of plant and crop diversity (Vavilov [1926] 1992a; Khoury et al. 2016) are located in these parts of the world. They

became extractive zones through the colonial appropriation of the "green gold" (Schiebinger 2004: 7) that flourished there; more precisely, through the appropriation of botanical resources as well as Indigenous knowledge about their cultivation and the transplantation of these resources from the 'New World' to botanical gardens and plantations in the 'Old World' and its colonial satellites (Brockway 2002; Philip 2004; Schiebinger 2004; Schiebinger/Swan 2005). Alfred W. Crosby famously encapsulated the global movement of plants and other biological resources that began in the colonial era in the notion of "the Columbian exchange" (1972). Countering the euphemistic tone of this expression, others more critically refer to this process and the new forms it has been assuming throughout history as "biopiracy" (Shiva 1998; Kloppenburg 2000; Nehring 2022) or "biocolonialism" (Whitt 1998; Hawthorne 2007). The historical processes these authors and terms describe illustrate how nation- and empire-making, as well as resource and commodity frontiers, intertwine in the creation of extractive zones and the transformation of biological diversity into a resource for the thriving of empires.

A crucial argument in both Schiebinger and Gómez-Barris is that the practices of extractive colonialism co-emerged and are deeply entangled with the epistemological pillars of modernity. Schiebinger's historical analyses foreground the ways in which the emergence and propagation of modern science and its ideal of objective and observer-independent knowledge are interwoven with the European colonial powers' seizure of economic and geopolitical power between the fifteenth and the nineteenth century (see also Philip 2004; Schiebinger/Swan 2005).[12] In line with this, Gómez-Barris argues that the epistemological principles of the dominant modern sciences are both precondition and product of the extractive exploitation and commodification of land, nature, and peoples conceived as resources available to be harnessed for modernist 'civilisational' purposes:

> "Before the colonial project could prosper, it had to render territories and peoples extractible, and it did so through a matrix of symbolic, physical, and representational violence. Therefore, the extractive view sees territories as commodities, rendering land as for the taking […]. This viewpoint, similar to the colonial gaze, facilitates the reorganization of territories, populations, and plant and animal life into extractible data and natural resources for material and immaterial accumulation." (Gómez-Barris 2017: 5)

12 I unfold this argument in more detail in chapter 4.2.

The construction and utilisation of biological material as a set of natural resources thus becomes discernible as an *onto-epistemological* project: epistemology and ontology, knowing and being, are inseparably entangled (see also Barad 2007: 379, 409). Insofar as the extractive *view* – much like "the resourcist cosmovision" (Fenzi/Bonneuil 2016: 78; see chapter 1) – informs extractivist *practices* and *modes of being in the world*, it is ontologically implicated in the world that comes to matter in these onto-epistemological practices. To put it in Harawayian terms: It matters what stories, imaginaries, and knowledges make worlds and what worlds these, in turn, emerge from.

Thus understood, a problem with both the notion of the extractive view and the resourcist cosmovision crystallises. They each denote a particular *perspective on* the world that guides *interactions with* the world, thus implicitly positing the world as an entity at least to some degree ontologically preexisting its perception and moulding. As I have shown throughout this chapter, however, resourcism, extractivism, and frontierism have shaped the becoming of the world in a very real, material sense that is not reversible. They are modes of "material-semiotic worlding" (Haraway 2016: 13): Where frontiers come to life in the nexus of dreams and desires of endless capital accumulation, extractive zones emerge in and continuously reproduce the material-semiotic nexus of othering and appropriation that allows frontier dreams to become realities. Land *becomes terra nullius* and biological materials *become* natural resources through their construction and production as part of an inherently purposeless sphere that is ontologically different from the human, as resources available to be appropriated and exploited for the purposes of the appropriator.[13]

In Svalbard, the various resource frontiers that turned the archipelago into an extractive zone to benefit the making of European nations and empires have driven the whale and other animal populations to the brink of extinction. The technofrontier that came to Svalbard in the form of the coal mining industry

13 Scholars emphasising the structural analogies between human and more-than-human forms of othering and instrumentalisation argue that the same logic renders certain human lives exploitable, enslavable, and killable along racialised, gendered, classed, and other socially stratified lines of othering by way of excluding them from the sphere of the properly human. These analyses understand the human as a historical rather than an ontological category, invented by those "who defined themselves as humans in their praxis of living and applied their self-definition to distinguish and classify and rank lesser humans" (Mignolo 2018: 153; see also Plumwood 1993; Nath 2009; Jackson 2020).

has depleted the fossilised biodiversity inside Svalbard's mountainscape, fuelling not only the making of economic empires but also global warming, which has become one of the greatest contemporary challenges to ecological stability not only in Svalbard. In Svalbard as elsewhere, the frontier mode of worldmaking has created a world of disappearing more-than-nonhuman ecological and more-than-human social worlds. With growing public awareness of the social-ecological threats arising from global climate change and other (related) ecological hazards, such as the increasing vulnerability of plants and ecosystems and the advancing loss of biodiversity, conservationist efforts have created a new type of frontier. The salvage frontier comes to matter on Svalbard in the form of a "cold rush" (Pietikäinen 2024) in search of a new kind of resource: the conservational capacity of the Arctic cold and permafrost and the promise that they will be able to conserve the green gold of the past for the future. Salvaged in the Arctic permafrost inside the Svalbard Global Seed Vault, then, are the "plant genetic resources" the technofrontier mode of modern agro-industrial expansion has created along with the frontierist dreams of sustained capitalist expansion they carry.

3.2 The Svalbard Global Seed Vault (II): A Vault of Many Worlds

> Hundreds, maybe even thousands of journalists and other people have written articles about Svalbard [the Global Seed Vault; FV] and virtually none of them has gotten it right (laughs). And I realised […] that I thought the story as I knew it needed to be written down. (Cary Fowler, 19/20 March 2021: l. 88–96)

Probably the most popular, widespread, and at the same time fallacious stories told about the Svalbard Global Seed Vault are those that depict it as a "doomsday vault" or a "Noah's Ark" for the world's seeds. Coined by international media reporting on the Seed Vault after it first opened, these metaphors quickly gained momentum and subsequently informed other stories, including scholarly accounts of the Seed Vault (Qvenild 2008; Fava 2013; Gan 2015; Nadim 2018) as well as the public relations work of the partners behind the Seed Vault.[14]

14 In the early years after its opening, the partners behind the Seed Vault played their part in reproducing the doomsday narrative, possibly to attract international attention and thus further funding and seed deposits. The Crop Trust, for instance, tagged early

However, as Cary Fowler, the founder of the Seed Vault, frequently emphasises, these popular narratives "typically mask the complexity of the endeavor and, if anything, underestimate its practical utility" (Fowler 2008b: 190). While the Seed Vault is designed to be able to conserve seeds "for hundreds of years, or longer" (Fowler 2016: 18), contrary to the story of the doomsday vault, this long-term orientation does not derive from the anticipation of a global apocalyptic event in the wake of which agriculture and civilisation can be restored with the help of the Seed Vault. Instead, the aim of conserving the greatest possible crop diversity in Svalbard for as long as possible is to keep these resources available for global agriculture to adapt to changes and challenges in both the near and the more distant future (Fowler 2016: 17–18).

Interestingly, in his efforts to counter the doomsday story by underlining the very mundane and practical use of the Seed Vault, Fowler often resorts to a remarkably messianic rhetoric characterised by a strong salvationist pathos.[15] In a short piece about the Seed Vault published the same year it was opened, Fowler stated that "[c]onserving crop diversity is the prerequisite for the future evolution and success of agriculture. Few other human problems will be solved, if this one is not" (2008a: 501). In *Seeds on Ice: Svalbard and the Global Seed Vault* (Fowler 2016), the book Fowler wrote to counter the often inaccurate media coverage with a comprehensive account of the Seed Vault, he describes it as a "remarkable effort to save the past and the future of agriculture" (2016: 18; see also Fowler 2008c).[16] This effort is the result of Fowler's life-long dedication to the conservation of endangered agrobiodiversity, around which he built his career.

After a period of activism in the civil society sector, Fowler held various academic positions before he eventually worked in a number of the major international agro-political institutions and arenas, where he played a key role in the process of establishing the Svalbard Global Seed Vault. Over the course of his

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pictures of Seed Vault posted on *flickr* (an online community for sharing amateur and professional high-resolution photos and videos) with "doomsday vault" as a caption. I thank Marleen Boschen for sharing this observation with me.

15 In doing so, Fowler masks the ways in which the doomsday story does, in fact, matter to the Seed Vault. I discuss this, as well as the tension between the ways in which the doomsday narrative is both rejected and embraced by the people behind the Seed Vault, in chapter 5.1.

16 For a critical analysis of the media coverage of the Svalbard Global Seed Vault, see Chacko (2024).

career, Fowler has (co-)authored three books, each of which reflects the position from which it was written. The activist tone of *Shattering: Food, Politics, and the Loss of Genetic Diversity* (Fowler/Mooney 1990), co-authored with his former partner in civil society Pat Roy Mooney, later gave way to a more academic discussion of agrobiodiversity loss and conservation in *Unnatural Selection: Technology, Politics, and Plant Evolution* (Fowler 1994). *Seeds on Ice*, in contrast, which Fowler himself describes as "a love letter" (2016: 20) to Svalbard and the Global Seed Vault and which vividly interweaves the story of global crop diversity loss and the Seed Vault's conservation efforts with the story of Svalbard perishing in the light of global warming, reads like an ode to a world on the verge of extinction.

All three books open with a reference to the American geneticist and crop historian Jack Harlan, who first inspired Fowler to dedicate his career to saving crop diversity. The words he "will never forget" (Fowler 2009: 0:26), as Fowler put it in a TED talk a year after the opening of the Seed Vault, stem from an article with the expressive title "Genetics of Disaster" (Harlan 1972). In this paper, Harlan conceptualises the diversity within crops as a genetic resource that, as Fowler repeatedly quotes, "stand[s] between us and catastrophic starvation on a scale we cannot imagine. In a very real sense, the future of the human race rides on these materials" (Harlan 1972: 212, quoted in Fowler/Mooney 1990: 6, Fowler 1994: xiii, 2016: 5). For Fowler, against this background, the point of the Seed Vault is to collect and conserve "[v]irtually everything, every trait we might want our crops to have in the future – all the options – [that] can be found in this genetic diversity" (Fowler 2016: 17–18), so as to enable farmers and plant breeders to adapt their crops to increasingly uncertain future conditions (Fowler 2016: 14).

Continuing the exploration of the Svalbard Global Seed Vault as a central component of the international response to agrobiodiversity loss, this section discusses the Seed Vault's unique role in the global system of agrobiodiversity conservation as well as the rationality underlying it. To do so, I tell the story of the Seed Vault from the perspective of the partners behind it as well as other actors who have been involved in the past, such as the FAO and Bioversity International (formerly IPGRI, IBPGR). In addition, I discuss how critical commentators from the nongovernmental and civil society sector perceive the Seed Vault. Through passages from the expert interviews conducted for this study, I develop an account of what the Seed Vault was designed and envisioned to be, what it is and is not today, and what the interested public perceives it to be, to do, and to be able to be and do.

I begin by situating the creation of the Seed Vault in a larger historical and agro-political context, in order to explain its unique role within the world of agrobiodiversity conservation as backup for other genebanks. I then discuss the challenges the Seed Vault has faced when its own backup, the Arctic permafrost, which was supposed to provide the securest possible environment in the world for the long-term cold storage of seeds, turned into a threat to the seeds by melting and leaking into the facility. Sensationalist media reports presented this incident as proof that climate change had undermined the stronghold against disasters such as climate change. The expert interviews I conducted show that the story is more nuanced than that. The section concludes by discussing divergent interpretations of the political implications and impact of the Seed Vault. It is through these that I develop the analytical understanding of the Seed Vault I propose, namely as not only a *technology* promising to save the world by saving the seeds of more-than-human futures, but as a political *arena* assembling a diversity of worlds collectively negotiating the reality of agrobiodiversity loss and conservation.

Securing the Past and Future of Agriculture

As I showed in chapter 1, *ex situ* conservation became the globally predominant response to the increasing de-cultivation and concomitant large-scale loss of agrobiodiversity when the global agro-political community became aware of the pitfalls of this development conjured by the modernisation of agriculture. According to the Acting Secretary of the Seed Treaty, Kent Nnadozie, the primary focus on *ex situ* conservation as an international approach to counteracting the growing loss of plant genetic diversity gained acceptance in the second half of the twentieth century because it was considered to be the appropriate response to the perceived urgency of the unfolding agrobiodiversity crisis:

> "Because of the rapidly increasing rate of loss of diversity – in terms of habitat and land use changes and focus on monocropping – there was a lot more move and drive, a push to have lot more *ex situ* conservation, to collect and preserve what is there so that that's not lost in the process." (Kent Nnadozie, Secretary, Seed Treaty, 26 March 2020: l. 789–795)

As described here by Nnadozie, the historical emphasis on *ex situ* conservation was first and foremost an emergency measure taken due to the urgent need to find a response to the plant genetic erosion caused by the modernisation

of global agriculture. While this logic is reasonable in terms of taking short-term security measures, it focuses on the symptoms rather than the roots of the problem, which the conservation of plant genetic diversity in genebanks leaves untouched. With the proliferation of *ex situ* conservation came the realisation within the international agro-political community that the conservation of plant genetic resources in genebanks, too, is not a failsafe measure against agrobiodiversity loss. Genebanks are constantly exposed to a variety of threats ranging from wars to storms and floods, as well as technical problems such as power cuts or malfunctions of refrigeration equipment (Fowler 2008c: 12–13).

This shows that agrobiodiversity loss is not an issue restricted to *in situ* environments but a problem that can equally occur *ex situ*. To give a few examples: In 1971, Nicaragua's national seed bank fell prey to an earthquake; in 1998, the national seed bank of Honduras was destroyed by a hurricane; the national genebank of the Philippines was flooded in the wake of a typhoon in 2006 and then again destroyed by a fire in 2012. Wars and uprisings have caused the devastation of seed banks in Liberia and Sierra Leone in the 1990s, and in Afghanistan and Iraq in 2001 and 2003. In most of these cases, the diversity conserved within these seed banks was irretrievably lost (Fu 2017).

Ex situ collections often include a range of varieties nowhere cultivated *in situ*; as a result, the loss of such collections can mean that these varieties go extinct altogether. Once this danger began to be appreciated in the 1970s, the FAO developed yet another security measure. Genebanks in the member states were urged to create safety duplicates of their seed collections, from which these could be rebuilt in case of loss (Curry 2022b: 665). At that time, it was already common for genebanks to have dormant backups of their active collections, usually stored either in the respective genebank itself or by a partner institution. To prevent irretrievable losses of agrobiodiversity due to catastrophic events such as mentioned above, the new safety duplication standard required genebanks to create a second copy of the collection that would serve as a safety duplicate and should therefore be stored in a different, preferably geographically distant location. While the more well-equipped seed banks soon amended their standard procedures, part of the work done by the Crop Trust and its partners to this day involves supporting smaller and less well-equipped genebanks in applying this standard.

The latest version of the FAO's *Genebank Standards* (FAO 2014) recommends that safety duplicates should be stored under the best possible long-term storage conditions and, if possible, in a different country. The primary factors of

what makes a location optimal for storing safety duplicates are defined as follows:

> "Facilities must ensure low radiation (radioactivity) and stability (low probability of earthquakes). The facility must be situated at an elevation that guarantees proper drainage during seasonal rains and eliminates the risk of flooding in the event of rising sea levels due to global warming. Equally important is economic stability and socio-political certainty. Koo et al. (2004) suggest that safety duplicate samples should be located away from the risk of political embargo, military action or terrorism that could disrupt international access." (FAO 2014: 58)

The Svalbard Global Seed Vault was designed to facilitate safety duplication under exactly these conditions – to provide, as Fowler puts it, "the ultimate safety net for existing genebank collections" (2008a: 501). Accordingly, the latest edition of the *Genebank Standards* explicitly recommends the Seed Vault (and no other facility) as an internationally accessible facility offering the kind of storage space required for safety duplicates.

Herein lies a crucial characteristic of the Seed Vault that essentially distinguishes it from other genebanks. A scientist from the Crop Trust, Hannes Dempewolf, explains the unique role of the Seed Vault compared to other genebanks as follows:

> "It's a global backup for seed banks all around the world. There are a lot of misunderstandings around it. People think that is what a genebank is, which is totally wrong and something that we are constantly trying to fix when we talk to media about it; making people understand that there are seeds that are alive, that you have to regenerate them. This is not a solution where you just shove something and then dig it up 200 years later. This is something that is a living, breathing system." (Hannes Dempewolf, Scientist, Crop Trust, 28 May 2019: l. 1031–1041)

This interview passage shows that the conservation of crop plants in genebanks cannot be reduced to the cold storage of boxes filled with seeds. This type of conservation is restricted to facilities with a "preservationist profile" (Pellegrini/Balatti 2016: 2763–2764; see chapter 1.5), such as the Svalbard Global Seed Vault. The seeds it stewards, in contrast, come from "working collections" (Curry 2017b: 3, 2022b: 665) actively conserved in genebanks with a "productivist profile" (Pellegrini/Balatti 2016: 2762–2763). As chapter 4.1 elaborates in

more detail, the work of conservation performed in genebanks of the latter kind involves a whole series of practices and technologies that make it possible for seeds to remain viable in long-term storage. The active and ongoing work of conservation includes drying and packaging seeds in air-tight bags for long-term storage as well as periodic revitalisation, regeneration, and renewed conservation. The exclusive and exceptional purpose of the Seed Vault, in contrast, is to securely store the packaged and boxed safety duplicates of genebank collections for the long term. Crucially though, although the Seed Vault has a different conservation profile and purpose than the genebanks whose safety duplicates it holds, the interview passage also highlights that they are interdependent parts of a larger system of crop conservation. While it is the genebanks around the world that do the breathing, the Seed Vault fulfils a crucial role in keeping the "living breathing system" of crop conservation alive.

The first, and so far the only, case in which the Seed Vault came into effect in the sense that a depositor had to withdraw their deposit in order to reestablish a lost seed collection is the case of ICARDA in Syria outlined in the introductory chapter. Through the example of this case, a scientist working with the FAO elaborates the role of the Seed Vault within the world of conservation as follows:

> "It is a safeguard and it has its importance in that it is there in the event of a disaster – which happened at ICARDA. And it's a success story; maybe not as big as the news makes it out, but it's a success story. Was everything saved? No, because not everything was able to be regenerated, not everything was able to grow, but a lot of it was." (Scientist, FAO, 6 March 2020: l. 861–868)

The example of the loss and restoration of ICARDA's Syrian seed collection shows that the process of re-establishing the collection in partner institutes in Morocco and Lebanon that followed was more than a process of re-stocking the shelves in those genebanks. Ever since the duplicates stored in the Seed Vault were retrieved from Svalbard, ICARDA's genebank staff has been regenerating and multiplying as many of these samples as possible. This process, which aims to establish a new working collection as well as new safety duplicates going back to the Seed Vault, is expected to continue at least until 2030 (see Westengen et al. 2020: 1312–1313, 1315–1316). As the above-quoted interview passage shows, not every sample from the safety duplicate was entirely retrievable because the regeneration process was not successful in all cases. Notwithstanding that, the fact that safety duplicates had been stored in

Svalbard made it possible to save a large part of the plant genetic diversity in the Syrian collection that would otherwise have been irretrievably lost.

Apart from exemplarily elucidating the value of the Seed Vault, the example of the loss and partial restoration of ICARDA's Syrian seed collection also illustrates what a number of social-scientific accounts of *ex situ* conservation practices have highlighted in recent years, namely that seed conservation, in order to be able to successfully revive frozen seeds and make them available for use, is a process that requires a lot of care work (see Chacko 2019a; Laboissière 2019; Boschen 2022). Such care work, in turn, requires a lot of time and funding, well-equipped and well-staffed genebanks, as well as appropriate environmental conditions. This underscores the importance of international cooperation and a legal framework to underpin it, such as provided by the FAO bodies and the Seed Treaty.

Against this background, the case of ICARDA in Syria both corroborates the logic of double safety duplication and highlights the significance of strengthening "robust infrastructures *and* the capacities of professional staff" (Curry 2022b: 666, emph. added). According to the historian of conservation science Helen A. Curry, these aspects have been neglected since the conception of security underpinning seed conservation practices shifted from a notion of security through capacity-building to a conception of security through backup between the 1960s and 1990s. However, as Curry notes, the privileging of making copies as a cost-effective measure of securitisation "has produced only an elusive security" (2022b: 682) insofar as the roots of the threats that backups are supposed to secure against remain unaddressed. The loss of the Syrian seed collection and the experience of being able to re-establish most but not all of the diversity it previously comprised increased awareness within the *ex situ* conservation community of the perils of securing seed collections primarily through backups (Westengen et al. 2020: 1315–1316). While this does not mean that *ex situ* conservationists question the system of *ex situ* conservation as such, in their reflexion on the case of ICARDA in Syria Westengen and colleagues underline the benefits and indispensability of safety duplication and its limits as well as the necessity of infrastructures and capacities to recreate working collections from backups.

A Leaky Promise of Security?

An important point in critical accounts of the Seed Vault and its rationality of security through backup is the fact that the Seed Vault itself is no more immune

to the kind of disasters jeopardising collections held in genebanks around the world than those genebanks themselves (see GRAIN 2008; Nadim 2018: 245). This does not necessarily undermine the Seed Vault's promise of security insofar as it rests on a logic of double safety duplication, which implies that the diversity securely stored in Svalbard is supposed to always also exist in at least two other genebank collections: in the original collection and in the first of two backups. What is more, as Fowler has always pointed out, the idea behind the Seed Vault is not to make "absolute guarantees" (2008b: 15) but to provide the *safest possible* backup infrastructure currently conceivable to secure the world's agrobiodiversity against irretrievable losses in the event of a failure of other conservation infrastructures. One of the factors underlying this promise, that the Seed Vault is the safest possible storage space there is, is the Arctic permafrost and the guarantee it is seen to embody: to provide stable sub-zero temperatures securing the seeds inside the vault against a possible failure of the technical refrigeration system (for the other factors see chapter 1.5). In other words, the Arctic cold is the safety backup for the technical refrigeration system cooling the Seed Vault further down to -18 degrees Celsius.

In recent years, though, it has become increasingly evident that it is not only the technical refrigeration system that is vulnerable. The Arctic is one of the regions on earth where the effects of global warming first became palpable and, to this day, give rise to the most drastic measuring data. According to NASA (n.d.), in 2024 the decrease of Arctic sea ice per decade reached a rate of 12.2 per cent compared to its average extent between 1981 and 2010. Warming temperatures are both cause and effect of this, which is why the Arctic is more strongly affected than other parts of the world. Between 1912 and 2011, the yearly average temperature measured in Longyearbyen increased by around 0.25 per cent per decade (Norwegian Polar Institute n.d.). A report on *Climate Change in the Norwegian Arctic* by the Norwegian Polar Institute predicts that towards the end of the twenty-first century, among a number of other issues, global warming will lead to a severe increase in temperature, precipitation, frequency of extreme weather events, and permafrost thaw (Øseth 2011: 26–41).

The Seed Vault became associated with these developments in October 2016 when a critical mass of water flooded the tunnel leading from the concrete entrance of the facility to the seed chambers inside the mountain. This seemed to prove the point critics had been making about the Seed Vault being exposed to local disasters in the same way that other seed banks are. Many of the news headlines addressing this incident showed no doubt about the reason for this water intrusion: "Norway's Underground Doomsday Seed Vault Is Under

Threat From Climate Change" (Time 2018); "'Doomsday' seed vault meant to survive global disasters breached by climate change" (The Verge 2017); or "The Arctic Doomsday Seed Vault Flooded. Thanks, Global Warming" (Wired 2017).[17] This sort of media coverage points out the irony of a climate change-caused disaster jeopardising the Arctic stronghold for the world's agrobiodiversity, which many consider to be a safeguard against disasters caused by climate change itself.

The story as told to me by the people more directly involved with the Seed Vault does not posit global warming as the main culprit in this incident. According to Åsmund Asdal, the coordinator of the Seed Vault, melt water intrusion has been a continuous issue during the snow melting season ever since the vault was built, albeit previously in negligible amounts:

> "It was written in our annual reports every year that there was water intrusion during snow melting times in summer, but the volumes of water were very low. But in October 2016, there were extremely heavy rainfalls here and so the amount of water was much higher than before; and that convinced all partners that something had to be done." (Åsmund Asdal, Seed Vault Coordinator, NordGen, 7 June 2019: l. 805–812)

As Asdal explained it to me, the significant increase in the amount of water intrusion in 2016 compared to previous years can be attributed to two factors. First, in the Arctic, global warming has lately led to more permafrost melting in the summer than in the past as well as to a higher probability of rainfall instead of snowfall. Hence, the volume of water accumulating around the Seed Vault was simply higher than before. The second factor, which according to Asdal is much more relevant, is the original design of the facility. For one thing, the tunnel leading from the entrance element to the seed chambers was water-permeable to begin with. The primary cause for the large amount of intruding water, however, was that when the Seed Vault was built, insufficient attention was paid to how this would alter the environment. The construction of the Seed Vault severely destabilised the permafrost, which did not reestablish around the tunnel as expected. Although the seeds inside the vault were ultimately not jeopardised because the intruding water never reached the storage rooms, the

17 A google search for "Svalbard Global Seed Vault" with a filter for news published between October 2016 and December 2017 shows many similar headlines on the first few pages.

incident prompted the partners behind the Seed Vault to reconstruct the facility.

The reconstruction of the Seed Vault was carried out between 2017 and 2019 under the aegis of Statsbygg, the company responsible for Norwegian government estates. After Statsbygg had turned down my initial interview request, an unanticipated opportunity arose later in the research process to conduct an interview with one of the engineers who had worked on the reconstruction site. Their account of the water intrusion and the measures taken to secure the facility enriches and differentiates the story as told by Asdal. According to the engineer, the problems with the original design and construction of the Seed Vault that allowed for a critical mass of water to intrude in 2016 in the first place go back to a lack of knowledge about permafrost and to unforeseen changes in the Arctic climate and weather in the years after the facility was built. As they explained the situation to me, the mountains in Svalbard are lithic at their core and covered by a thick layer of permafrost on the surface. While permafrost is generally assumed "to be a mountain, […] it's really just a lot of water and sand" (Engineer, Statsbygg, 26 March 2023: l. 80–81). When the Seed Vault was first constructed, parts of the surface layer were removed from the mountain it was built into and then raised again on top of the tunnel. The engineers who built the Seed Vault expected that the permafrost would reestablish itself in the Arctic cold, and thus form a natural watertight layer around the steel tunnel leading down into the seed chambers built into the lithic part of the mountain. However, the permafrost did not reestablish itself as expected; as the interviewee trenchantly put it: "Permafrost is an angry lover. You touch her the wrong way, she won't come back." (Engineer, Statsbygg, personal communication) Instead of returning to a permafrost state, the mass that remained on top of the tunnel into the Seed Vault after its construction and before its reconstruction was a porous layer of sand that the heavy rainfalls in 2016 simply "washed away" (Engineer, Statsbygg, 26 March 2023: l. 82). Crucially, these rainfalls were equally unexpected because up to that point, according to current knowledge, "Svalbard has been what they call an Arctic desert" (Engineer, Statsbygg, 26 March 2023: l. 87–88), that is, an environment where there is little to no precipitation. Hence, "in part, it is fair to say that it [the water intrusion; FV] has something to do with climate change. But at the same time, if the permafrost had reestablished itself, it probably would not have been a problem. But of course, we [will] never know." (Engineer, Statsbygg, 26 March 2023: l. 115–119)

The engineer's account indicates that the original design and construction of the Seed Vault as the secure facility it was envisioned to be was influenced by two types of limits to knowledge arising from different kinds of material bounds to knowledge. First, ecological changes on intersecting global and local scales, which have accelerated in recent decades due to global climate change, continuously create new, unknown and often unpredictable environmental conditions that challenge established knowledges, as the example of climate and weather changes and their consequences in Svalbard illustrates. Second, the misjudgement regarding the reestablishment of the permafrost after the construction of the Seed Vault is, at its core, a consequence of the fact that knowledge, to put it with Haraway (1988), is inevitably situated and partial:

> "[Permafrost] doesn't really [come back; FV] if you mess with it. But I guess, that was a knowledge that was not quite known when they constructed the first time. Or maybe it's a very particular knowledge. I mean, you can be a very good engineer, but if you come from mainland Norway, this is not something you know. And in Svalbard, people change all the time. It's just a working environment, so most people go home after a few years. Some stay, but not many engineers have stayed. So, there are very few experts on this." (Engineer, Statsbygg, 26 March 2023: l. 91–101)

Statsbygg's engineers developed the measures taken for the Seed Vault's reconstruction after the water intrusion based on the recognition of this previous lack of knowledge and by bringing in the required expertise. Three main measures were taken. First, the tunnel was reinforced and made watertight through several layers of different materials. Second, a technical room previously located inside the Seed Vault was moved to a new outside building to protect the technical equipment from jeopardy in case of another (if now unexpected) water intrusion. The third and most important measure, according to the interviewee, was the reconstruction of the permafrost. As they told me, by drilling holes deep into the surface layer of the mountain and filling them with cold water, "we reestablished the permafrost with years of freezing down the earth" (Engineer, Statsbygg, 26 March 2023: l. 123–124). The result of these reconstruction measures, as the engineer puts it, is "double and triple and quadruple security for the future" (Engineer, Statsbygg, 26 March 2023: l. 120–121). What remains are the limits to knowledge, not all of which are known and which usually only become discernible when infrastructures fail, as the water intrusion incident proves.

The Politics of the Seed Vault

The engineer's story of the Seed Vault's reconstruction after the water intrusion incident seems to lend plausibility to a risk-oriented framework of analysis, such as developed by Ulrich Beck (1992, 1999) in his theory of the (world) risk society. In view of various large-scale techno-ecological catastrophes that occurred in the second half of the twentieth century and made the hazards of technological progress tangible, like the chemical and nuclear disasters of Bhopal (1984) and Chernobyl (1986), Beck argued that modernity's dichotomic understanding of society and nature had become destabilised.[18] According to Beck, the awareness they triggered of society's intrinsic dependency on an industrially integrated nature heralded the start of a second, reflexive modernity. In this new reflexive stage of modernity, it is no longer the idea of a bright future of technological progress that determines present action, but a threatening if yet unreal future of (self-made) technical risks with destructive ecological ramifications. While sociological analyses of risks and risk discourses made important contributions to the sociological analysis of the interplay of society, nature, and technology, critics, especially in environmental sociology, have pointed out the limits and selectivity of the risk terminology and its insufficiency for a comprehensive analysis of many of the most perilous environmental problems of the present. One important aspect of this critique, raised by Peter Wehling (2011: 533–536; see also Beck/Wehling 2012), is that by focusing on future challenges and how to avert or handle them, risk-oriented perspectives fail to take into account the historical social-ecological contexts from which these risks emerge in the first place.

While the stories of the Seed Vault assembled so far all seem to be set in a world full of risks, variously evaluating the attempts to guarantee security (of seeds, infrastructures, or social-ecological futures) in the face of these risks, the reception of the Seed Vault in parts of the non-governmental sector – similar to Curry's critical analysis of conceptions of security unfolded above – resonates with the sociological critique of the risk-oriented approach. Henk Hobbelink, the co-founder and until recently the coordinator of GRAIN, an NGO engaged in seed politics since the early 1980s, elaborates his perspective on the Seed Vault as follows:

18 Another pertinent example is the southern corn leaf blight of the 1960s and 70s, which globally destroyed large amounts of the yields in monoculturally farmed fields cultivated with new hybrid corn varieties (see chapter 1.2).

> "When Svalbard [the Seed Vault; FV] was created […] our worry was – and still is – its timing, its whole work in the media, the way it is being pictured, being projected as the solution. It gives a false sense of security, as if we have the problem solved. We are not against Svalbard in principle, but against the way it is being used […] to suggest that by creating genebanks you can solve the problem of the destruction of biological diversity. That is obviously not the case. That is our main issue with it." (Henk Hobbelink, agronomist, GRAIN, 1 May 2020: l. 636–648; see also GRAIN 2008)

What Hobbelink calls into question here is the idea of a simple, technological solution for a problem or set of problems that is much bigger than any technology could "fix" (see also Ribeiro/Shand 2008). He criticises the Seed Vault not for what it is or does in itself, but rather for the techno-solutionist (mis)understanding of agrobiodiversity conservation that it embodies and perpetuates. By iconically materialising the heroic promise of sustaining the world's agrobiodiversity through seed banking, Hobbelink argues, the Seed Vault makes it more difficult for other measures against ongoing agrobiodiversity loss to gain more approval or even attention.

Hobbelink also argues that the idea of seed banking as a technological fix for the loss of plant genetic diversity diverts attention from the forces at the root of "the destruction of biological diversity", which collecting and conserving seed diversity, no matter how securely, will not solve.[19] His choice of words here is noteworthy: Defining the *destruction* of (agro)biodiversity, rather than its *loss*, as the problem (re)politicises the issue. From this point of view, the status quo that the Seed Vault preserves is not only that of an endangered agricultural biodiversity, but also that of an agriculture that puts biodiversity in danger in the first place. Accordingly, rather than criticising *ex situ* conservation as a measure against agrobiodiversity loss in general and assessing the adequacy of the Seed Vault's contribution to it, Hobbelink problematises the effect that

19 The anthropologist Tahani Nadim similarly argues that "a project such as the Doomsday Vault […] not only fails practically but more worryingly perpetuates a logic of ruination" (2018: 245), insofar as the seeds it preserves far into the future will not fulfil their purpose if that future no longer has fields, soils, or people and practices to tend them (see also Folkers 2017: 369–370). While she certainly makes an important point about what might be more broadly referred to as putting life on ice (Kowal/Radin 2017; Radin 2017) or the suspension of life (Lemke 2021), with regard to the Seed Vault this criticism hinges on a narrow understanding of a "doomsday vault" assumed to fulfil its purpose in a faraway future.

the hegemonic power of *ex situ* conservation has within international seed and agricultural politics and the ways in which the Seed Vault, or rather the mis/understanding of agrobiodiversity loss and conservation it communicates to the public, stabilises these power relations.

A slightly different position that challenges this criticism to a certain degree has been articulated by Pat Roy Mooney. Mooney is a civil society activist and influential critic in the field of biotechnology and biodiversity politics, as well as a former associate of Cary Fowler.[20] In the interview I had the chance to conduct with Mooney, he advanced the following position on the Seed Vault:

> "I think it is fine – which is a shock to everybody, of course, because I know that civil society is not supposed to like it. I have always felt that that was based upon a lot of sloppy thinking and sloppy research and misinformation. I don't think Svalbard is the solution to the world's problems – nor does anybody else, I think. But for its cost and for the fact that it is a backup to backup systems – so, it is the court of last resort for seeds – given the price of it, it is a very practical, reasonable thing to do." (Pat R. Mooney, Civil Society Activist, ETC Group, 6 May 2020: l. 141–152)

For Mooney the Seed Vault is, first and foremost, a cost-effective answer to the need for safety duplication and therefore a "practical, reasonable" solution – not "to the world's problems" at large, but to a very specific need in global conservation efforts. He goes on to elaborate:

> "*Ex situ* [conservation; FV] has some value, that is why Svalbard has some value. I do think the future is going to depend upon what farmers save for themselves and around the world and that that is most important. The second-level importance is what is stored at national levels by governments, and then moving up. So, in a way, the least important is what is in Svalbard and second least important is what is in the regional genebanks of the world or the CGIAR centres and so on. But still: I am not against them or anything, I

20 Mooney was one of the earliest activists who intervened in international seed politics beginning in the 1970s (see e.g. Mooney 1979, 1983). In the early days of their activism he worked closely with Fowler, among other things as co-authors of *Shattering* (Fowler/Mooney 1990) and as co-founders of the Rural Advancement Fund International (RAFI) together with Hope Shand. The latter, which has operated under the name ETC Group since 2001, was one of the first CSOs in the field of agricultural and seed politics and remains one of the most influential ones to this day. For more information, see https://www.etcgroup.org/ (last accessed July 18, 2025).

> know they are not made so that the world thinks that the problem has been solved because we've got Svalbard. I don't find that to be the case. I know we say that to each other in civil society – I don't think it is true, I don't think people believe it is true, I don't see governments acting like it is true. What I do see happening is that we've got big seed companies going around the world duplicating everything that is in genebanks and not really concerned about what is left in genebanks after they have made their duplications." (Pat R. Mooney, Civil Society Activist, ETC Group, 6 May 2020: l. 179–199)

Mooney makes an important distinction in this passage between different levels and actors in global seed conservation efforts and seed politics that is crucial for a critical analysis of the latter. Following his line of argument, the Seed Vault might be used and thus appear as an end in itself on the supranational and global level, more specifically if one looks at the interests of the international seed industry. On the national and subnational level, however, according to Mooney, governmental efforts to address the agrobiodiversity crisis do not suggest that the problem is considered solved thanks to the fact that national and sub-national seed collections are safely duplicated in the Seed Vault (if they are). National and intergovernmental agricultural politics and the activities of the international seed industry aside, what becomes discernible in Mooney's critical stance towards arguments articulated by civil society actors such as GRAIN or Hobbelink is that, in his view, they are mistakenly directed at the Seed Vault. The Seed Vault has generated an unprecedented amount of public attention to seed banking that, according to Mooney, serves the cause of crop conservation beyond its own efforts: "It has drawn, I think, a lot of international attention to the importance of genetic diversity, of crops. Probably nothing has caught more attention than Svalbard in terms of this issue. […] This being discussed is a good thing." (Pat R. Mooney, Civil Society Activist, ETC Group, 6 May 2020: l. 243–251)

This perspective came up more than once in the interviews I conducted for this study. The following passages are from an interview with a plant scientist who has been working for Bioversity International (formerly IPGRI, IBPGR) for a long time, that is to say for an organisation with one of the longest histories in agrobiodiversity conservation and co-initiator of the first Svalbard Initiative together with the FAO. According to this interviewee, generating international attention to the importance of plant genetic diversity, the dangers of its loss, and the resulting need for conservation was not only a welcome side effect of

establishing the Svalbard Global Seed Vault but one of the driving forces behind it:

> "I think most of its value is raising awareness. It's a real public awareness story and that has a lot of value. You cannot do that with a genebank, a boring genebank in a country where it is just an old crumbling building or a couple of deep freezers; that doesn't excite the public. But the story behind Svalbard has great value and that is what was also invested in by the people who were the visionaries: the public awareness impact that this would have on conservation. I think that is a very important component of the of the global conservation system." (Scientist, Bioversity International, 20 January 2021: l. 563–574)

This perspective adds another layer to the Seed Vault's cost-benefit-efficiency Mooney invokes in the passage quoted above, by defining public awareness of the reasoning behind conservation measures as a value in itself. Importantly, this is a value that the Seed Vault is able to generate in a way other genebanks are not, as the interviewee sets out in more detail:

> "Nobody wants to fund a genebank, that's a reality. It's like nobody wants to fund a library, it's not exciting. And a genebank is a live library. And so, the funding strategy had to shift because these collections were just being very neglected, they were being funded by small project money here and there, and their long-term funding was not secured. […] So that is how this initiative [the Seed Vault; FV] came to be realised. That – *ex situ* conservation – is probably one of the hardest things to get donor funding for." (Scientist, Bioversity International, 20 January 2021: l. 594–611)

The arguments that both the scientist from Bioversity International and Mooney put forward offer some more nuance regarding the ways in which the Seed Vault is an important part of the global system of agrobiodiversity conservation beyond providing a secure backup space for seed collections. While this might create the impression of a generally more differentiated understanding of the Seed Vault than articulated by Hobbelink or GRAIN, the two perspectives differ not so much in accuracy as in how they hold the Seed Vault accountable politically. While GRAIN problematises the Seed Vault as a strong symbol of the wrong *answer* to the agrobiodiversity crisis, Mooney highlights the way in which it advances the right *questions*. Put differently, in Mooney's view and that articulated by the scientist from Bioversity Interna-

tional, the Seed Vault draws attention to the *problem* of agrobiodiversity loss or destruction, whereas for GRAIN it draws attention to a questionable *solution* to it. In the following, I unfold how these different ways of looking at the Seed Vault illustrate two divergent notions of the political function or impetus attributed to the Seed Vault and the different actors behind and around it.

Although Hobbelink does not explicitly declare the Seed Vault a techno-fix, he criticises it for diverting attention from the destructive forces underlying the agrobiodiversity crisis. This argument ultimately amounts to the same thing insofar as it suggests that as a technological approach to a problem that actually requires political attention, the Seed Vault is an inadequate solution. Inherent in this criticism is a certain paradox regarding the understanding of the political it articulates. On the one hand, it separates the technological from the political in a way that does not account for the ways in which techno-solutionism *is* a political response to a given problem. Instead, it assumes that the political happens somewhere else than science and technology, thus reproducing the split between politics and science that has given rise to the idea of such a thing as a techno-fix in the first place.[21]

On the other hand, the argument that the Seed Vault creates "a false sense of security" (see above) through its presence in the world and due to the promises associated with it does credit it with a certain political power after all. This power lies in the Seed Vault's assumed capacity to paralyse political action, in seed politics as well as in agricultural politics more generally. This story imagines the Seed Vault as a technocratic intruder in the world of agricultural politics, obstructing 'genuine' politics with its technological promise of security. It allows for differentiating the Seed Vault into what it is designed to be (originally by its creators and now by its managers) and what it is perceived to be (by a vague public or by the undifferentiated media through which this assumed public comes to know the Seed Vault). However, the political agency ascribed to the Seed Vault seems to be anchored in its ascribed status as a techno-fix more than in its effects in the political arenas in which it assumes relevance. Such an interpretation of the Seed Vault as a self-contained and stable entity and agency in the world of agricultural politics

21 As I have indicated in the introduction to this chapter, with Haraway (1997), Latour (1993, 2004a, 2013, 2017), and other STS scholars, my aim in this inquiry into the Seed Vault and the world of agrobiodiversity conservation is to develop a critique that goes beyond such dualisms.

leaves little room for the Seed Vault to be or become something other than what it was designed to be – for example through the relations it enters into.

The understanding of the Seed Vault's political effects articulated by Mooney and the scientist from Bioversity International, in contrast, counters this interpretation with one that leaves much more open what the Seed Vault's political effects are and might become. Here, the Seed Vault does not so much close the case of agrobiodiversity loss and conservation as it discloses it to the world. This makes it possible to focus attention on how the Seed Vault, by drawing unprecedented attention to the issue of agrobiodiversity loss, creates an arena, in which the what and the how of addressing this issue become a subject of collective negotiation. Rather than as a fixed and stable technology intervening in or even obstructing seed and agricultural politics, then, the Seed Vault appears as an agency or a thing that assembles political actors and processes.

This way of thinking about the Seed Vault finds a possible expression in Bruno Latour's notion of "*res publica*, the public *thing*" (2013: 337, emph. in orig.). In *An Inquiry into Modes of Existence: An Anthropology of the Moderns* (2013) Latour unfolds an object-oriented conception of politics that conceives politics as a process and praxis in which a thing of public concern assembles a more-than-human collective. What is important to Latour is the active agency of the thing that assembles "a public to gather around it" (2013: 337). The political collective, which equally encompasses both humans and more-than-humans, emerges in the processual, circular movement of assembling around a public thing and mutates co-constitutively with the thing assembling it.[22] In consequence of this understanding, Latour conceives "the political(ly)" (2013: 339) as an adverb rather than an adjective. This means that things are not political per se, but that the political is a constant doing and becoming in collectivity. With regard to the Seed Vault, this means that it is neither political nor apolitical in itself. Rather, the politics of the Seed Vault come to matter in what it does and what is done with it.

22 This understanding of politics as a process of assembling an indeterminate and constantly evolving collective echoes the notion of "the assemblage", as used by Tsing (2015), for example. According to Tsing, the concept serves to evade essentialist or fixed notions of collectives, insofar as "[a]ssemblages are open-ended gatherings. They allow us to ask about communal effects without assuming them. They show us potential histories in the making." (Tsing 2015: 22–23)

An important implication of this conception of the political(ly) is that it makes discernible how political processes, practices, and their material effects are mutable and constantly in the making, and so to a certain degree indeterminate:

> "The same movement of enveloping, encircling, embracing, gathering in can thus serve […] either to fabricate inclusion […] or else fabricate exclusion. And nothing in this movement ensures its duration […]. Everything depends on its renewal, on the courage of those who, all along the chain, agree to behave in such a way that their behaviour *leads* to the next part of the curve." (Latour 2013: 342, emph. in orig.)

Conceiving the Seed Vault in this Latourian sense as a *res publica*, a public thing that assembles an indeterminate political collective,[23] makes it possible to take seriously the "false sense of security" it evokes for some while at the same time understanding it as not merely an inhibition to politics, but also a call to political action. While the Seed Vault certainly is a technology or set of technologies and practices for *ex situ* conservation that has emerged as part of the global system of *ex situ* agrobiodiversity conservation, at the same time it is more than that. The Seed Vault does not determine the collective it calls to action – *ex situ* conservationists only, for instance – and thus prefigure the kind of action that will be taken. Rather, the collective that assembles in the arena the Seed Vault creates and that collectively shapes the next curves of the political turns the Seed Vault takes and may take is an effect of the diversity of responses to this call to action. Understanding the Seed Vault in this way as a thing, or in the terminology of Situational Analysis as an arena assembling a diverse collective of actors and the worlds they come with, rather than as the technology of a specific world, makes it possible to draw attention to the less evident and less expected actors and worlds that form part of the political collective assembling around the Seed Vault. This is not meant to contest the idea that there are material and epistemic power relations within which some actors assume more

23 In a Latourian frame of thought, it stands to reason that the Seed Vault assembles a more-than-human political collective both outside and inside the seed chambers. Such a perspective exceeds the scope of this study, not least for empirical reasons. As explained in chapter 2.3, different practical research restrictions made it impossible for me to develop a more thoroughly more-than-human research approach, such as through a multispecies ethnography attending more closely to the seeds conserved inside the Seed Vault or in other genebanks.

relevance and influence than others, and that these must be part of any comprehensive analysis. Rather, the point is that an analytical focus on the Seed Vault as a political arena makes it possible to recognise spaces of indeterminacy, unexpected agency, and transformative potential in the worlding practices the Seed Vault enacts, facilitates, and may yet enact.