

Introduction

While many may ponder the consequences of global warming, perhaps the biggest single environmental catastrophe in human history is unfolding in the garden. [...] Loss of genetic diversity in agriculture – silent, rapid, inexorable – is leading us to a rendezvous with extinction – to the doorstep of hunger on a scale we refuse to imagine. (Fowler/Mooney 1990: ix)

The Svalbard Global Seed Vault is a key component of global efforts to secure the diversity of our most important crop plants to ensure that they meet our needs for the long term [...]. It is a more complex and nuanced story than the “Doomsday Vault” romanticized by the popular press, but in the end the Svalbard Global Seed Vault is an elegantly simple and pragmatic response to a pressing global need. (Sir Peter Crane FRS in Fowler 2016: 14)

In September 2015, a delegation of Syrian scientists from the International Center for Agricultural Research in the Dry Areas (ICARDA) travelled to the Arctic island of Spitsbergen in the Svalbard archipelago to retrieve boxes of seeds they had deposited in the Svalbard Global Seed Vault over the course of the previous seven years. A series of droughts had challenged agricultural production in Syria between 2006 and 2009 and given rise to a food crisis exacer-

bating existing political, economic, and social unrest. All this triggered mass protests against the authoritarian national government in 2011 that developed into a civil war within little more than a year. To this day, this war has caused hundreds of thousands of deaths and millions of refugees, and devastated societal infrastructure, cultural heritage, and ecological habitats. With the loss of Syria's national seed genebank in Tel Hadia, a few kilometres south of Aleppo, it has also claimed a globally unique natural heritage: "the largest collection of crop diversity from the earliest centre of origin of agriculture, the Fertile Crescent [...] important not only for agriculture in the Middle East but for global food production and food security" (Westengen et al. 2020: 1311). Before the genebank staff were forced to abandon the facility in 2014, however, ICARDA had managed to send duplicates of 83 per cent of this collection to the Svalbard Global Seed Vault, a seed conservation facility in the Arctic that offers secure storage of safety duplicates of seed collections from all over the world. Beginning in 2015, when remotely monitoring the state of the occupied genebank in Tel Hadia was no longer possible and recovering the original seed collection stored there no longer seemed a realistic prospect, ICARDA began to retrieve the backup samples safely stored in Svalbard and to reestablish the Syrian seed collection in partner institutes in Morocco and Lebanon. This "rescue operation" (ibid.) averted an irreplaceable loss of agricultural biodiversity that would have been inescapable without the support of the Svalbard Global Seed Vault. It is a poignant example of how the availability of natural resources for food production, and hence the question of food security, is deeply entangled in a co-constitutive web of global and local ecological, political, social, and technological conditions and changes.

The Svalbard Global Seed Vault, one of the decisive factors in the success story of saving the Syrian agrobiodiversity collection from extinction, is a safety bunker for seeds built deep into a permafrost mountain on the Arctic island of Spitsbergen in the Norwegian Svalbard archipelago, which lies about 4,800 kilometres north of Aleppo, 2,000 kilometres north of Oslo, and a little more than 1,300 kilometres south of the North Pole. The Seed Vault was opened in 2008 and is run by a tripartite partnership between the Norwegian Government, the Crop Trust based in Germany, and the Nordic Genetic Resource Center (NordGen) based in Sweden. Stories about a "doomsday vault" in the Arctic saving the seeds to feed a post-apocalyptic world (e.g. Nature 2008; The Guardian 2015; Heatherington/Perley 2017), together with spectacular images of a concrete entrance into a snow-covered mountain radiating a turquoise light into the dark of the Arctic winter, have earned the Seed Vault global

attention. Behind the mysterious portal that separates the outside world from the interior of the vault through a security door, a tunnel leads 120 metres deep into the mountain and into what has been called “the most biodiverse room in the world” (Wickson 2016: 788). As of July 2025, more than 1.3 million seed samples of over six thousand species from all around the world (NordGen n.d. b) are conserved in airtight packages sealed in boxes stored on shelves in currently only one of three storage halls, each with a capacity to store a total of 1.5 million seed samples. The seeds are preserved in suspended animation, frozen at -18 degrees Celsius using a technological refrigeration system. They are further protected by the Arctic permafrost surrounding the vault, which guarantees a year-round temperature of no higher than -3 degrees Celsius. The Seed Vault’s purpose and promise is to conserve these seeds “in perpetuity” (Fowler 2016: 18) as a safety backup for the world’s endangered biodiversity for food and agriculture.

In the social sciences and humanities, the Svalbard Global Seed Vault has attracted attention as a technoscientific promise of security and futurity in the face of increasingly unpredictable and alarming social-ecological futures.¹ Scholars from a range of disciplines including sociology, cultural studies, and philosophy as well as interdisciplinary research fields such as science and technology studies (STS), heritage studies, and the environmental humanities, have analysed the social, cultural, and political implications of the Seed Vault’s efforts to conserve endangered biodiversity for food and agriculture. Their analyses can be divided into two groups with one focusing on *what* the Seed Vault conserves and the other asking *what for*. The first group foregrounds *the seeds* conserved in the Svalbard Global Seed Vault. Asking what they represent, these authors explore the premises and implications of the Seed Vault’s approach to agrobiodiversity conservation. They examine how the Seed Vault operates within a bio-reductionist (van Dooren 2009a, 2009b), molecular (Wickson 2016; Wolff 2020), and information paradigm (Alpsancar 2016), all of which allow the Seed Vault and genebanks more generally to turn agrobiodiversity into accumulable biocapital (Breithoff/Harrison 2020; Dalyan 2021; Paaanen 2024) while disregarding or even perpetuating

1 The term “social-ecological” encapsulates an argument in environmental sociology that the social and the ecological are entangled in multiple ways rather than denoting separate spheres. While views differ as to how exactly the two are intertwined, in this book I argue for an understanding of social-ecological realities as co-constitutive, co-emergent, and interdependent.

the ongoing destruction of agrobiodiversity outside of seed banks (Nadim 2018). The second group of accounts focuses on *the promises* the Seed Vault embodies in light of the social-ecological threats and challenges that come with global agrobiodiversity loss and climate change. These authors analyse it as a social or political technology of salvation (Fava 2013), securitisation (Wolff 2020), or “becoming-safe” through both (Boschen 2022: 112–153), as well as a technoscientific means of generating specific forms of hope, security, and futurity (Harrison 2017; Harrison et al. 2020: 51–140).

The state of research on the Svalbard Global Seed Vault offers a multifaceted and differentiated understanding of its premises, promises, and (bio)politics. However, most of these accounts isolate the Seed Vault from many of the contexts and relations it is entangled in and which are crucial for a comprehensive assessment. For one thing, they pay little attention to the global system of agrobiodiversity conservation the Seed Vault is embedded in, which involves far more than the storage of seeds on ice, and to the ways in which the history of this global system matters to the story of the Seed Vault. This lack of engagement with the history of seed conservation beyond the Seed Vault is accompanied by a lack of attention to the historicity of not only seed conservation but also agrobiodiversity loss, which has only become a global ecological problem in the context of twentieth century agricultural modernisation. Secondly, by discussing the Seed Vault as a technology or set of technologies handling a *diversity of seeds*, most studies disregard the *diversity of actors* the Seed Vault assembles along with seeds and the ways in which they co-shape its conservation efforts and politics. Put differently, inasmuch as these analyses foreground the more-than-human (bio)politics of the Seed Vault, its more-than-*nonhuman* politics fade into the background. My study responds to these desiderata by focusing attention on the Seed Vault’s worldly entanglements. In doing so, I highlight ambiguities and spaces of indeterminacy in the story of the Seed Vault, as well as its potential to serve and conserve more-than-human relations other than the biocapitalist and biocolonial ones it has emerged from.

A first important contextualisation of the Seed Vault is that it is not a genebank in the proper sense, but a backup repository for the secure storage of safety duplicates of seed collections held in other genebanks all around the world. These support the work of farmers, breeders, and scientists by making seeds and the genetic traits they carry available for agricultural practice, research, and development. Whereas such genebanks have what STS scholars Pablo A. Pellegrini and Galo E. Balatti (2016: 2761–2763) call an “assistentialist”

or a “productivist profile”, meaning that they either assist farmers directly or focus on research and breeding, the Seed Vault is a strictly “preservationist” (Pellegrini/Balatti 2016: 2763–2764) facility focused on the long-term storage of a broad range of biodiversity. The conservation of the diversity of plants and varieties for food and agriculture in *ex situ* conservation environments – that is, outside of plants’ natural habitats – has gained increasing importance in global agricultural practice since the mid-twentieth century in the wake of an enormous loss of crop diversity *in situ* – meaning the diversity cultivated in farmers’ fields. According to broad estimates by the United Nations’ Food and Agriculture Organization (FAO), the diversity of crops cultivated worldwide declined by about 75 per cent over the course of the twentieth century (see Khoury et al. 2022). According to the FAO’s latest report on *The State of the World’s Biodiversity for Food and Agriculture*, less than two hundred out of around six thousand currently cultivated plant species substantially contribute to global food output, and as few as nine of these account for 66 per cent of total global crop production (FAO 2019: 114).²

Historical research has shown that this diminishment of agricultural biodiversity in farmers’ fields is deeply entangled with the modernisation and globalisation of agricultural production around the world in the second half

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- 2 There are an enormous number of studies that quantify the diversity of plants existing in the world and the decline of crop diversity in different ways, based on a variety of metrics, indicators, and geographical as well as temporal scales. For a literature review see Khoury et al. (2022). Of course, the loss of biological diversity exceeds the loss of crop diversity that is of interest in this book. The rate of biological diversity loss throughout the twentieth century is so great – and much higher than the expected background extinction rate – that scientists now largely agree that the earth is heading towards a Sixth Mass Extinction (see Dirzo/Raven 2003; Barnosky et al. 2011; Ceballos et al. 2015; Cowie/Bouchet/Fontaine 2022). The previous five mass extinction events in the Earth’s history, which date back approximately 65 to 443 million years, are attributed to rapid climate, atmospheric, and biochemical changes caused by asteroid impacts, tectonic, or volcanic activity. In contrast, the anticipated sixth mass extinction is mainly ascribed to anthropogenic causal forces. A significant driver is modern agriculture, which destroys ecological habitats and conditions for biological diversity to thrive through unrelenting land reclamation, non-replenishable resource overexploitation, excessive use of agrochemicals, as well as through the de-cultivation of biological diversity in farmers’ fields (see Böhning-Gaese/Bauer 2022; Khoury et al. 2022). This dual implication of agriculture in biodiversity loss, for which it is partly responsible and by which it is affected, is particularly evident in the loss of agricultural biodiversity, as I unfold throughout this book.

of the twentieth century, which largely relied on homogenised monocropping and the large-scale introduction of plant breeds producing high yields through the use of agrochemicals (see Flitner/Heins 2002; Kloppenburg [1988] 2004; Saraiva 2013; Fenzi/Bonneuil 2016; Peres 2016; Curry 2017a, 2022b). Although the social-ecological repercussions of this form of global agricultural production became widely evident as early as the 1960s, most of the international agro-political community was convinced that the high productivity and efficiency of globalised modern agriculture made this system indispensable if the entire world population was to be fed. Loss of crop diversity in farmers' fields was seen as an undesirable but unavoidable side effect. It was in this context that *ex situ* conservation of crop diversity in genebanks became the primary international strategy against agrobiodiversity loss.

Today, the agricultural biodiversity conserved in *ex situ* conservation facilities is much greater than the diversity currently cultivated *in situ*, and many of these facilities steward a unique botanical and genetic diversity that would be irretrievable if lost. The problem with this, as history has shown, is that seed and genebanks are exposed to a variety of threats ranging from man-made disasters such as wars to hurricanes and floods, and also to more mundane threats such as financial and capacity limits or technological problems (Fowler 2008c: 12, 2016: 90–93). The case of the Syrian national genebank is only one in a long series of examples of seed collections that have been lost as a result of such events, in most cases irretrievably (see Fu 2017). The Svalbard Global Seed Vault is a direct response to this endangerment of biodiversity for food and agriculture both *in situ* and *ex situ*. It was created to provide a storage space that was as secure as possible, so that genebanks around the world could conserve safety duplicates of their seed collections for as long as possible. By preserving for the long term what the founder of the Seed Vault, Cary Fowler, refers to as “the biological foundation of agriculture and arguably humankind’s most important natural resource” (2016: 18), the Seed Vault promises to be able to undo local losses of diversity, enable breeders to continuously adapt agricultural production around the world to changing environmental and climate conditions, and thus ensure future food security.

The seeds currently conserved in Svalbard come from 129 seed and genebanks all over the world (NordGen n.d. b) and represent a wide range of farmers' varieties, crop breeds, and wild plants relevant for food and agriculture (Norwegian Ministry of Agriculture and Food n.d. b). The Seed Vault stores these seeds under a “black box’ agreement” (Fowler 2008b: 190; see also Asdal 2025: 50), meaning that every deposit remains the sole property of

the depositor at all times. Accordingly, the Seed Vault also differs from other genebanks in that it has no authority over the collection of seeds it stores. In this sense, it is not an international agrobiodiversity collection in the hands of the Norwegian government or the international actors responsible for its operation, but rather a manifestation and nodal point of previous and ongoing multilateral cooperation. This cooperation, in turn, exceeds activities related to the storage of seeds in Svalbard insofar as it also encompasses the continuous development and negotiation of the technoscientific, political, social-ecological, and other conditions under which it takes place. What is more, all cooperating partners bring a set of concerns, interests, needs, knowledges, histories, and more to the table, thus entangling their respective worlds in the cooperation and its outcomes.

Investigating the Seed Vault as a nodal point of a global network of genebanks and seed flows, but also of a diversity of actors, practices, imaginaries, knowledges, stories, histories, and more, in the interplay of which past, present, and future more-than-human and more-than-nonhuman relations and realities are being negotiated, is the second crucial contextualisation of the Seed Vault's premises, promises, and politics that my study performs. My inquiry into the world of agrobiodiversity conservation through the Svalbard Global Seed Vault complements and expands existing research in the social sciences and humanities by situating the Seed Vault within its global and historical, material-discursive and political entanglements while also cultivating attention to ambiguities, indeterminacies, and unexpected collaborations.

The research approach underlying this study is grounded in feminist technoscience studies. This transdisciplinary field, which emerged in the 1980s, constitutes a particular strand of both feminist theory and science (and technology) studies that investigates “the sociocultural embeddedness of all scientific and technological theories and practices” (Åsberg/Lykke 2010: 299).³ The notion of technoscience encapsulates a basic assumption and central critique of this research field: by conjoining “apprehension and intervention” (Murphy 2012: 71) in a single term, it challenges the idea of an independence of scientific knowledge production from its ‘good’ or ‘bad’ technological application. Instead, feminist technoscience studies scholars argue that scientific knowledge production is inseparable from technological intervention and instrumentality insofar as it is “not mere observation, it [is] *world making* as

3 For an overview of the field and the diverse range of scholars who have shaped and continue to shape it, see Åsberg and Lykke (2010); Catalyst Journal Editorial Board (2015).

the very scientific acts of study involve[] altering the world” (Murphy 2012: 71, *emph. added*). A key strand within feminist technoscience studies that is particularly relevant for this book is the work of Donna Haraway (1988, 1997, 2016). Arguing that “[it] matters what worlds world worlds” (2016: 35), Haraway emphasises that it is crucial for feminist technoscience studies to attend not only to technoscientific world making practices, but also to the worlds these practices are situated in.

Following an earlier version of this argument in Haraway’s work – her claim that “[n]othing comes without its world, so trying to know those worlds is crucial” (1997: 37) – I propose to consider the Seed Vault as a space that assembles not only a diversity of seeds, but also a diversity of worlds that come with seeds and other concerns related to the Seed Vault. This makes it possible to develop a differentiated understanding of the ways in which the Seed Vault is both the product of historical social-ecological processes and political struggles and an agentic force in ongoing material-discursive processes and struggles of social-ecological becoming. It is in this sense that the analysis I unfold throughout the book – as the book’s subtitle indicates – is not an account of the Seed Vault so much as an inquiry into the larger world of agrobiodiversity conservation *through* the Seed Vault. Conceiving and introducing the Seed Vault as a nodal point of agrobiodiversity conservation efforts, which primarily, but not exclusively, relates to international *ex situ* conservation efforts, I show that by collecting a diversity of seeds from all over the world it has created a technoscientific and political arena assembling a diversity of actors, practices, discourses, histories, imaginaries, and more. It is in the interplay of these that worlds come to matter through the Svalbard Global Seed Vault.

The notion of the world is an unusual category to think with for a sociologist. According to Alexandra Schauer (2023), who examines the loss of meaning of the world in late modernity, the world has traditionally not been considered suitable as a basic sociological concept because it denotes “an ‘absolute metaphor’ referring to a totality that is not tangible as such” (Schauer 2023: 16, quoting Blumenberg [1960] 2009: 10, author’s translation; see also Blumenberg [1960] 2010: 3).⁴ While this observation is empirically apt, the explanation hinges on a canonical conception of the world as a “one-world

4 According to Schauer (*ibid.*), scholarly interest in the notion of the world is largely restricted to phenomenological discussions about worldliness as part of the human condition (the Heideggerian *In-der-Welt-sein*) and associated socio-philosophical debates

world” (Law 2015). For some decades now, anthropologists have been criticising such a monolithic understanding of the world for omitting alternative and more pluralistic theorisations in other bodies of knowledge that are excluded from the canon of the dominant modern social sciences and humanities (e.g. Viveiros de Castro 1998, 2014; Descola 2005, 2014). Drawing on the anthropological research of Eduardo Viveiros de Castro, therefore, Bruno Latour has reproached sociology with “anthropology blindness” (2004: 453) and “ethnocentrism” (2004: 455): “For the sociologist, nature, the world, the cosmos, is simply there; and since humans share basic characteristics, our view of the world is, at baseline, the same everywhere” (Latour 2004: 453).⁵ Where there are different worldviews, he argues, sociology usually considers them as different perspectives on one and the same world – manifestations of multiple cultures differently interpreting a singular nature, world, or universe. Taking anthropological accounts of fundamentally different ways of knowing and being in the world into account and drawing on William James’ conception of the world as a “pluriverse” (2004: 454), Latour argues that sociology’s adherence to the idea that there is only one nature, one cosmos, and one world is no longer tenable.⁶

Echoing this critique of the Eurocentric, modernist idea of “mononaturalism and multiculturalism” (Law 2015: 126), a growing body of anthropo-

about what it means, for instance, for humans as opposed to nonhumans to be in the world.

- 5 The postcolonial sociologist Gurminder K. Bhambra (2014) argues that the separation of sociology from anthropology is premised on a “profound division [...] between the social sciences whose remit is the modern world, and anthropology, whose remit is the traditional” (Bhambra 2014: 418). This separation has historically absolved sociology from the necessity of reflecting on the constitutive dependency of its categories on the construction of an Other and “from any consideration of colonial and imperial entanglements” (ibid.). Bhambra counters this de-responsibilisation by emphasising the importance of considering “the ‘connected histories’ that are the mutual conditions of emergence of both” (Bhambra 2014: 420).
- 6 In the context of this critique and following the work of Isabelle (Stengers [1997] 2010, [1997] 2011), Latour foregrounds the notion of the *cosmos* rather than the world. In doing so, he counters “the peace terms” (Latour 2004) of Ulrich Beck’s Kantian cosmopolitanism (Beck 2004) with a notion of *cosmopolitics* that recognises the deep entanglement of the human and the nonhuman world and integrates the latter into the sphere of politics. While this argument informs my thinking about the politics of world-making discussed in this book, Latour is less central to my embracing of the notion of the world than the accounts presented in the following.

logical scholarship developed in communication with Indigenous and other marginalised worlds refusing to be obliterated by the universalist ontology of modernity theorises the world as a fractiverse (Law 2015), a multiverse (Verran 2018), a pluriverse (Escobar 2018, 2020), or a world of many worlds, as Marisol de la Cadena and Mario Blaser (2018a) put it following the Zapatistas.⁷ These accounts and the worlds they are rooted in consider the idea of a one-world world not as a universal ontological truth but as one particular among many situated and partial ways of knowing and being in the world. They counter the canonical assumption of a singular world merely differently conceived by divergent cultural knowledges with an ontological pluralism that politicises the question of ontology. That is, worldly realities are neither ahistorically nor universally given but constantly emerge in “contingent and relational enactments” (Law 2015: 134). Put differently, the world is not a singular meta-physical being so much as a multiplicity of concrete and ongoing doings (see also Tsing 2015: 21–22).⁸ Crucially, drawing attention to heterogeneous practices of world-making giving rise to a multiplicity of co-existing worlds does not mean altogether dismissing the phenomenological and philosophical argument that the world is a hardly tangible totality. Rather, the aim is to contextualise this argument as one particular and situated way of knowing and being in the world (see Law 2015: 128). Ontological pluralism, in other words, “is not a matter of either/or but of *both/and*” (Blaser 2016: 565, *emph. added*).

7 The Zapatistas are a predominantly Indigenous peasant movement in the state of Chiapas in Southern Mexico. Since the adoption of the North American Free Trade Agreement (NAFTA) between the USA and Mexico in 1994, they have forcefully been defending their world against the Mexican government’s neoliberal policy of privatising communal land and deregulating markets. Guiding their struggle is the motto: “The world we want is a world in which many worlds fit” (Ejército Zapatista de Liberación Nacional (EZLN) 1996, as quoted and translated by de la Cadena/Blaser 2018b: 1). For a more in-depth scholarly discussion of the Zapatista movement see, e.g., Mignolo (2011: 213–251) and Klein (2015).

8 It should be noted here that Schauer (2023) counters the sociological aversion to the world as an analytical category with a sociological theory of modern and late modern relationships to the world that builds on Hannah Arendt’s conceptualisation of the world as a political phenomenon characterised by historicity, plurality, and malleability. Despite the acknowledgment of plurality, this approach differs from the anthropological understanding of worlds as heterogeneous situated doings outlined here insofar as neither Arendt nor Schauer challenges the metaphysics of a singular world; they both understand plurality in a multicultural or epistemological rather than an ontological sense.

The anthropological body of scholarship developing this understanding of *the world as both a totality and a multiplicity* constitutes the first of three pillars buttressing my thinking about the Svalbard Global Seed Vault as an arena assembling a diversity of worlds.

The second pillar is an understanding of the world(s) as an emergent materialisation of ongoing and heterogeneous doings. Haraway (2008, 2016) has prominently encapsulated this idea in the notion of *worlding*, which articulates a situated, practice-based, processual, and relational understanding of how beings and worlds come to matter. She argues: “Ontologically heterogeneous partners become who and what they are in relational material-semiotic worlding. Natures, cultures, subjects, and objects do not preexist their intertwined worldings.” (Haraway 2016: 12–13) The notion of worlding is only the most recent articulation of Haraway’s decades-long critical engagement with technoscientific abstractions such as Nature and the World – capitalised to indicate the assumed universal ontology the terms represent. In a seminal article on her approach to the study of nature published over three decades ago, Haraway argued: “If the world exists for us as ‘nature,’ this designates a kind of relationship, an achievement among many actors, not all of them human, not all of them organic, not all of them technological” (1992: 297). The point she is making here is that the world not only comes to matter in concrete and continuously ongoing practices and is therefore multiple, but that such practices are enactments of specific more-than-human relations.

How we – whoever that we is – represent the world, then, is not the same as what it is; what dominant Western science calls Nature is not a given, objective reality but a particular, situated way of making sense of reality. According to Haraway, “the world is precisely what gets lost in doctrines of representation and scientific objectivity” (1992: 313). In contrast, while her thinking “does not end up with an ‘objective world’ or ‘nature,’ [...] it certainly does insist on the *world*” (Haraway 1992: 313, *emph. in orig.*) as a force that *matters* – meaning that it makes a difference in terms of both meaning and materiality. Haraway’s recent condensation of this argument in the succinct phrase that it matters what worlds world worlds (see above) highlights that, if worlds come to matter in ongoing, heterogeneous, material-discursive, more-than-non/human processes and practices of worlding, it matters where, when, how, with whom, to what end, on what grounds, and so forth these processes and practices take place. These are some of the questions that inform my investigation of the many worldings the Svalbard Global Seed Vault assembles and through which it comes to matter.

The third pillar of this focus on the Seed Vault as a nodal point of diverse worlds and worldings is the methodology of Situational Analysis, which has guided the empirical-analytical process underlying my study. Situational Analysis is an explorative, qualitative research approach in the interpretive paradigm developed by Adele E. Clarke and others (Clarke 2005; Clarke/Friese/Washburn 2018) as an extension of Grounded Theory in the tradition of Anselm Strauss (see e.g. Corbin/Strauss 2015). Unlike Grounded Theory, it focuses analytical attention not on individual subjects and bounded social groups as sources of knowledge and action but on relational and co-constitutive material-discursive and more-than-human social ecologies. These are explored by mapping the complex web of sites, individual and collective actors, and material and discursive elements that constitute a situation of inquiry as well as by tracing the relations between them. In doing so, Situational Analysis puts the emphasis on identifying material-discursive arenas of sustained interest and exploring the diversity of *social worlds* these arenas assemble and are shaped by. Social worlds, in Situational Analysis, denote mutable social wholes that consist of the individual and collective actors they comprise, and are held together by shared interests, concerns, practices, discourses, and technologies. Clarke and her colleagues use the terms social worlds and worlds synonymously. However, the notion of social worlds, which is rooted in Strauss' interactionist theory, comes with an anthropocentric bias that I seek to eschew by using only the term "worlds" in the sense of the theorisation of world(ing)s discussed above.

Although Haraway's thinking too is woven into the theoretical premises of Situational Analysis, as can be seen, for example, in the conception of arenas and social worlds as "lively, dynamic, deeply relational entities" (Clarke/Friese/Washburn 2018: 148), Clarke and colleagues consider it "too awkward to say that they are 'worlding' and 'arena-ing'" (Clarke/Friese/Washburn 2018: 148). In contrast to this assessment, I consider Situational Analysis an excellent means to explore how worlds world worlds. To do so, in contrast to previous scholarly accounts of the Svalbard Global Seed Vault that have primarily analysed it as a technology or set of technologies, practices, and rationalities, I propose to conceive the Seed Vault as an arena that assembles a diversity of worlds and worldings that come with a diversity of actors, practices, technologies, discourses, histories, stories, imaginaries, and more. The methodology of Situational Analysis enables this inquiry insofar as it is designed to map all these elements, dimensions, and the relations between them. Its aim is to stay with the complexity of a situation of inquiry rather than zooming in on one dimen-

sion (e.g. *either* practices or discourses or certain institutions) at the expense of both other dimensions and the multidimensionality of the phenomenon under investigation. It provides a conceptual and methodical framework that allows for exploring how phenomena – such as agrobiodiversity loss and conservation – and the arenas in which they are negotiated – such as the Seed Vault – come to matter in the interplay of a multiplicity of worlds and worldings. Thus, it becomes possible to show that the Seed Vault's politics of world-making is not merely a manifestation of the world it has arisen from but comes to matter in the interplay of the many worlds and worldings it assembles. This, in turn, allows me to develop a critical analysis of the Seed Vault that, following the tradition of feminist technoscience studies, enacts a mode of critique that is both deconstructive and productive – something that I consider both fruitful and essential for a sociology that seeks to grapple with the current social-ecological condition.

The empirical foundation of my inquiry into the world(s) and worldings of agrobiodiversity conservation through the Svalbard Global Seed Vault is a multi-modal study composed of ethnographic field research, qualitative expert interviews, and document analysis. By means of an abductive research process, in which empirical and theoretical engagement with the situation of inquiry inform one another in a circular manner, I conducted two ethnographic field research trips to Svalbard and the Global Seed Vault in June 2019 and February 2020 and a short field trip to a German plant research institute and depositor to the Seed Vault in December 2019. I further conducted fourteen semi-structured qualitative expert interviews that took place between May 2019 and March 2021, with one exception in March 2023. The experts I interviewed are members of the partner institutions behind the Seed Vault and other important institutions and organisations in the *ex situ* conservation environment, as well as activists from the non-governmental and civil society sector engaged in agrobiodiversity politics. The analyses I develop based on this body of empirical data are further undergirded by text and film documents that provide deeper insights than those that can be extrapolated from the other empirical material. Most previous social-scientific and humanities research on the Seed Vault has not been based on this kind of in-depth on-site empirical research.⁹ My study shows that a thorough empirical engagement

9 Notable exceptions are the works of Harrison et al. (2020) and Boschen (2022). However, other than in my study, in both these cases, the Seed Vault is not the heart of the

based on more than document analysis is essential insofar as many of the publicly available sources of knowledge about the Seed Vault paint an abbreviated and sometimes inaccurate picture. Against this background, the empirically grounded, comprehensive study of the Seed Vault presented here also offers a foundation for further social-scientific and humanities research in the future.

Before concluding this introduction with an outline of the structure of the book, I would like to clarify a few key terms. The conservation of seeds and other plant material in *ex situ* conservation environments targets a specific type of biological diversity referred to as *plant genetic diversity*. According to the United Nations' Convention on Biological Diversity from 1992, biological diversity or in short *biodiversity* comprises the diversity of ecosystems (land- and sea-based) and species (plant, animal, microbial, and other) as well as the diversity of variations within species. Plant genetic diversity refers to the genetic diversity of and within plant species. While *biodiversity loss* comprises the loss of plant genetic diversity, it refers more broadly to the loss of genetic, species, and ecosystemic diversity. To refer specifically to the loss of plant genetic diversity, scientists also use the term *genetic erosion* (see chapter 1.2). This notion was coined in the context of scientific and political debates about the devastating consequences of the loss of *plant genetic diversity for food and agriculture*, which is a specific element of plant genetic diversity. The broader biological diversity relevant to food and agriculture is also called agricultural biodiversity or *agrobiodiversity*. The latter is at the centre of interest in this book, against the backdrop that the *ex situ* conservation efforts of the Svalbard Global Seed Vault and the genebanks whose safety duplicates it stores focus on plant genetic diversity for food and agriculture. Although the more commonly used terms in the context of genebanking are plant genetic diversity or *plant genetic resources for food and agriculture*, throughout this book I frequently use the term agrobiodiversity despite the fact that it encompasses much more than plant genetic resources for food and agriculture. In doing so, I aim to retain awareness of the ontological embeddedness of (even extracted) plant genetic diversity in (social-)ecological contexts and to not uncritically reproduce the *ex situ* logic of the genetic paradigm.

Last but not least, readers will read about genebanks more than about seed banks. The term *seed banks* usually refers to conservation facilities exclusively conserving seeds, such as farmers' and community seed banks, as well as

analysis, but one of a number of case studies through which the authors develop an analysis of heritage or seed banking practices more generally.

seed repositories such as the Svalbard Global Seed Vault. The more common term *genebanks* denotes conservation facilities that conserve seeds along with other plant genetic material. The conservation strategies of such genebanks include seed freezing, but also field conservation, *in vitro* conservation, and cryopreservation of plant tissue in liquid nitrogen. Underlying this conservation approach is the conviction that “[s]pecific genes are what make a crop variety resistant to heat and drought, for example, or tolerant of pests and diseases, and are, therefore, the basis of agricultural adaptation” (Crop Trust 2022: par. 4). Insofar as genebanks often supply scientists and breeders rather than farmers, their objective is to conserve the genetic traits embodied in the germplasm of seeds and other plant material – hence the term “genebank” (see chapter 4.1). A sociological discussion of the premises and implications of these key terms is unfolded in the chapters that follow.

Outline of the Book

The first chapter traces the historical emergence of the Svalbard Global Seed Vault by unfolding a short history of agrobiodiversity loss and international conservation efforts from the mid-twentieth century to the present. It begins with the so-called ‘Green Revolution’ of the post-World War II era, a US-led agricultural development programme with the professed goal of preventing hunger and societal upheaval in the Global South by increasing agricultural production. The chapter shows how the modernisation approach of this programme and the agricultural realities it implemented in many countries around the world spawned the loss of agricultural biodiversity the world now faces as a global social-ecological problem (1.1). Beginning in the 1960s, alarmed voices in the scientific community warned about the devastating consequences of “genetic erosion” (Frankel et al. [1969] 1970; Harlan 1975), which triggered a coordinated international effort in the UN environment to systematically conserve the plant genetic “heritage of mankind” (FAO 1983). I delineate how *ex situ* conservation became the predominant international response to agrobiodiversity loss in this historical-institutional context (1.2). I then trace the ensuing international negotiations over sovereignty claims and property rights, access and benefit-sharing regulations, breeders’ and farmers’ rights, and other issues (1.3) and discuss how they eventually resulted in a co-operative international agro-political climate favourable to the establishment of the Svalbard Global Seed Vault as the first international agrobiodiversity

conservation facility (1.4). I conclude the first chapter by delineating the conditions of possibility for the establishment of the Seed Vault as well as its technical and operational functioning (1.5).

Chapter two begins by developing the approach of my inquiry into the Seed Vault and the world(ing)s of agrobiodiversity conservation through an engagement with the state of social-scientific and other relevant research. I discuss in more detail how scholars in the social sciences and humanities have analysed and theorised the work of the Seed Vault so far, and elaborate on other research that informs my thinking. My approach comprises engagements with the science, technologies, and politics of agriculture and (agro)biodiversity conservation beyond the Seed Vault in historical scholarship as well as in STS and the environmental humanities (2.1). The second section elucidates the methodological and empirical foundations of my study. I introduce the methodology of Situational Analysis, outlining the theoretical and methodological premises, concepts, and ideas that are relevant to my research. I then go on to unfold the empirical-analytical process, presenting sites, phases, and methods of my study and explaining some of the empirical choices made and limits faced (2.2).

Chapters three to five take the reader on my empirical journey to and beyond Svalbard and the Global Seed Vault, unfolding the different ways in which it matters what histories, imaginaries, and more-than-human relations, what worlds and worldings make the Seed Vault and the phenomena of agrobiodiversity loss and conservation. Divided into two sections each, all three chapters develop a critical analysis that deconstructs and constructively juxtaposes the Seed Vault and the *ex situ* world of conservation with other worlds and worldings the vault assembles around the issue of agrobiodiversity loss. This type of critical analysis that is both deconstructive and productive reflects the concern of feminist technoscience studies not only with the implications and problems of hegemonic technoscientific projects, but also with “forms of technoscientific counter-conduct” (Murphy 2012: 72). Crucially, the aim of placing emphasis on the latter is not to renounce technoscience or compare ‘bad’ (e.g. because it reproduces established power relations) with ‘good’ technoscience (e.g. one that is more democratic). Rather, the aim is to highlight the diversity of forms of world-making, their entanglements and interdependencies, as well as the transformative potential of interventions into dominant technoscience.

Chapter three follows the paths of my first journey to Svalbard. Reiterating Fowler’s assertion that “[t]o understand the Seed Vault, you first need a feeling for its home, Svalbard” (2016: 25), I begin by situating the Seed Vault in Svalbard. Svalbard typically matters in stories of the Seed Vault with regard to its

cold temperatures, remoteness, and the assumed geological and political stability of the archipelago, which are seen to make it the safest possible location for the Seed Vault. In contradistinction to this, I focus on how Svalbard gives the Seed Vault a more-than-*non*human home. To do so, I situate the Seed Vault in the history of human activity on the archipelago as told by the Svalbard Museum in Longyearbyen – from its colonisation in the age of empires through different phases of extractivist resource depletion to the present day. Reading this history as a history of divergent iterations of an extractivist and frontierist relation to the natural/ised world, I trace its continuities as they come to matter in the Seed Vault and *ex situ* agrobiodiversity conservation (3.1).

The second section shifts the focus from the histories embodied in the Seed Vault to the worldly relations and politics it enacts in the present. Recounting what it was envisioned and designed to be by the people and organisations behind it, I elaborate the logic of backup security that characterises the work of the Seed Vault. Only seven years after it was established, this logic was undermined by a water intrusion into the Seed Vault due to melting permafrost. While the media narrative foregrounds the irony of a climate change-related threat to the stronghold against climate change, my interview material shows that this story misses some important aspects. It also shows that the response of the partners behind the Seed Vault to this incident – a time- and resource-consuming reconstruction of the facility – is characterised by the same logic of security-through-backup as the Seed Vault's work of safety duplication. The chapter closes by discussing how the Seed Vault and its specific rationality of conservation is received by conservationists and activists in the world of agrobiodiversity conservation. It is through these accounts that I finally unfold the analytical approach to the Seed Vault I propose and have introduced above, namely to conceive it as a political arena assembling a diversity of worlds and forms of world-making (3.2).

Chapter four extends the focus from Svalbard and the Global Seed Vault to the worlds and worldings that come with the seeds conserved inside the vault. It brings into view how different more-than-human relations come with divergent forms of agrobiodiversity conservation. I first introduce what I call, following one of my interview partners, the *ex situ* world of conservation, which refers to more than the global network of genebanks whose collections the Seed Vault reinsures. By elaborating on the work of *ex situ* conservation in genebanks and its relation to *in situ* and on-farm conservation approaches, I develop an analysis of “the *ex situ* world” as a set of practices, rationalities, technologies, and more-than-human relations. It is shaped, among other things, by an *ex*

situ worldview that is prone to neglect the perils of biological and agricultural de-diversification outside the genebank insofar as at its heart, it is characterised by an understanding of vegetal life as a composition of extractible resources (4.1).

The second section traces the interdependencies of the *ex situ* world of conservation with other worlds and modes of worlding. It begins by reviewing how this matter is discussed in the *ex situ* world of conservation, where international interdependency in access to plant genetic diversity is becoming a matter of growing concern in light of the social-ecological challenges of the present. I then discuss the question of global interdependence through the Parque de la Papa (English: Potato Park) in the Peruvian Andes, which lies in one of the world's primary centres of biodiversity and is the first Indigenous organisation ever to have put heritage seeds into storage in the Svalbard Global Seed Vault.¹⁰ The Potato Park is an interesting case in several respects. Since it first deposited seeds in Svalbard in 2015, members of the park have cultivated a collaboration with the *ex situ* world that is oriented towards securely preserving the unique biocultural heritage cultivated and conserved in their territory as well as towards a mutually beneficial transformation of global food systems (see Khoury et al. 2019; Argumedo et al. 2021). This collaboration is noteworthy insofar as the Potato Park comes with a world that fundamentally differs from the *ex situ* world. The conservation practices and rationalities of this world are situated within a deeply relational cosmology in which more-than-human relations are relations of kinship and mutual care.¹¹ Taking this cosmological otherness seriously in the discussion of global interdependence through the

10 In referring to the Potato Park and its inhabitants as "Indigenous", I follow their self-description on the internet, in publications about the park, as well as in the interview I had the chance to conduct with one of the park's founders. Throughout this book, I capitalise the term Indigenous to indicate that it is not a substantial category but a historically specific and political term. On the notion of "Indigeneity", see chapter 4.2, footnote 20.

11 I use the term "cosmology" as it is understood in anthropology (e.g. Viveiros de Castro 2015; de la Cadena/Blaser 2018b; Verran 2018) rather than in physics or philosophy. In these disciplines *cosmology* usually refers to a universal cosmos whereas anthropologists such as those quoted here deploy a pluralist understanding of *cosmologies* as situated and partial knowledges of the world understood as a multiverse (Verran 2018) or of one particular world among many worlds in a pluriverse (de la Cadena/Blaser 2018b). Differing and incommensurable cosmologies, from this perspective, cannot be traced back "to imaginary ways of 'seeing the world' but rather to the real worlds that are being seen" (Viveiros de Castro 2015: 64; see also Blaser 2016).

Potato Park, I develop a more-than-human understanding of *earthly interdependence* as something that exceeds resource and food security. This dimension of interdependency affects not only Indigenous and other societies with a relational cosmology but all life on earth, and it is therefore crucial to take this into account when engaging with the social-ecological threats and challenges of the present (4.2).

Chapter five returns to Svalbard and turns to the stories and imaginaries of agrobiodiversity loss and conservation circulating around the Seed Vault, discussing how “[it] matters what stories make worlds [and] what worlds make stories” (Haraway 2016: 12). The first section addresses the popular and persistent, if not unchallenged, biblical narrative portraying the Seed Vault as a “doomsday vault” or a “Noah’s Ark” for the world’s seeds. Although the partners behind the Seed Vault constantly strive to dispel this narrative because it misconstrues the vault’s this-worldly mission, it captures a salvationism that I argue runs through their promissory re/presentation of the Seed Vault. To unfold this argument, I take the reader into a seed storing ritual performed on the occasion of an anniversary event in Svalbard I attended as a participant observer. I discuss the ways in which the religio-symbolically saturated mise-en-scène of the Seed Vault in the ceremony performatively entangles the promissory techno-optimism of the *ex situ* world in biblical narratives of salvation, thus co-producing the story of the Seed Vault’s mission as a messianic one (5.1).

The second section explores the Seed Vault’s entanglement in other forms of dealing with the loss of agricultural and biological diversity beyond the techno-optimist conservation of seeds in genebanks. I draw attention to one of the actors less evidently assembled by the Seed Vault, an art project I came across during my first field trip to Svalbard. This project consisted of an exhibition of artworks engaging with agrobiocultural diversity, on the one hand, and a performative ritual of burying these artworks for long-term conservation in the permafrost alongside the Seed Vault, on the other hand. The art project provides an intriguing contrast to the engagement with agrobiodiversity loss in the *ex situ* world of conservation and the Seed Vault insofar as it challenges both the *what* and the *how* of *ex situ* conservation. Unlike the techno-optimistic and salvationist seed storing ritual, the ritual of burying artworks in the permafrost was characterised by an affective atmosphere of grief and practices of mourning over social-ecological losses that invite us to rethink what it means to deal and learn to live with past, present, and future loss of agrobiodiversity (5.2).

The book closes with a sixth and final chapter that summarises and reflects on the results of my inquiry into the world of agrobiodiversity conservation through the Svalbard Global Seed Vault. I conclude that a sociology that aims to grapple with the social-ecological catastrophes and transformations of the present and future in a productively critical way needs to cultivate attention to the more-than-human relations underlying both the crises facing the world and the solutions or responses developed to deal with them. The case of the Svalbard Global Seed Vault and *ex situ* agrobiodiversity conservation shows that understanding contemporary technoscientific politics of world- and future-making requires attending not only to what technologies and technoscientific practices do, but also to the worlds and modes of world-making they are embedded in and committed to as well as to the rationalities, imaginaries, and more-than-human relations they come with.