

“Our Existence Is Literally Melting Away”

Narrating and Fighting Climate Change
in a Glacier Ski Resort in Austria

Herta Nöbauer

Introduction: The Anthropocene of the Glacier Ski Resort

This chapter engages with a particular “anthropocene”¹ in the cryosphere environment of the Austrian Alps that is characterized by environmental and climate change due to human activities (Sillitoe 2021). In the study I propose that glacier ski resorts illustrate an illuminating example of an anthropocene because of the deep environmental changes they are experiencing due to tourism and climate change. Taking Austria’s highest glacier ski resort, which rises to nearly thirty-five hundred meters, as an ethnographic case study, I will explore the relation between skilled workers and retreating glaciers and snow cover. The latter two have been described as some of the most significant signs of global climate change (IPCC 2013). The very long-term nature of the time frame within which they develop, along with their extraordinary capacity for balancing the atmosphere and providing vast water reserves for Europe, make alpine glaciers highly important signals and actors as well as outstanding, sensitive places. However, ongoing human activities and changes in climate conditions are transforming them into “endangered species” (Carey 2007) and troubled places, which, in turn, affect the life and work of humans in manifold ways.

Notes for this chapter begin on page 240.

Human-environmental dynamics in alpine cryosphere environments have only received scholarly attention in the last decade or so (Strauss 2009; Dunbar et al. 2012; Orlove et al. 2014; Elixhauser 2015; Huggel et al. 2015; Beniston et al. 2018). The interest has been prompted primarily by the profound changes and risks occurring in the alpine cryosphere due to the changing climate. However, until now there has been almost no anthropological enquiry focusing on glacier ski areas. This is perhaps surprising, because, as I argue, they provide a good entry point for learning more about the multifaceted processes, discrepancies, and paradoxes shaping human-cryosphere relations in the European Alps (Nöbauer 2021).

Glacier ski areas provide numerous sites that are specifically defined for use by a variety of people. The chapter highlights their significance as “occupationscapes” (Hudson et al. 2011) to local people. These scapes are “defined as landscapes formed and performed through histories of occupational behaviour” (Hudson et al. 2011: 21). While this concept articulates the structural and political dimensions of landscape formation through labor, it also shares certain similarities with the phenomenological approach to landscape as proposed by Ingold in his theory of “task-



Figure 9.1. The “occupationscape” of the Pitztal glacier ski resort, summer 2015. © Herta Nöbauer.

scape." According to Ingold, "tasks are the constitutive acts of dwelling," and "the entire ensemble of activities, in their mutual interlocking" (1993: 158), designate the "taskscape." Or, to put it in Hudson and colleagues' (2011: 29) words, in the taskscape "the habitual practices of humans form familiar patterns which can become landscapes or places."

Although all eight glacier ski resorts in Austria have been affected by retreating glaciers since the 1990s, albeit to different extents, they are considered and marketed as the sole remaining "future snow reservations" by scientists and even more so by tourist managers. Against this stance I argue that such future-oriented models hardly correspond to the experiences of skilled workers in Austria's highest glacier ski resort. Based on my anthropological fieldwork in this alpine cryosphere environment, I illustrate how vanishing glaciers and melting permafrost are profoundly affecting the landscape and the daily work and identities of these male workers and managers. By tracing the various narratives that emerge from their engagement with the troubled cryosphere and exploring the extensive range of practices applied to counter it, I examine the ways in which staff are experiencing and interpreting the profound changes in snow and icescapes. In doing so, I show that these dramatic environmental changes directly affect the workers' concerns about regional stability, their job security, and senses of identity. At the same time, I further argue, the practices applied to solving the problems caused by "unreliable" snow and ice constitute "technological fixes" (Rosner 2004). These in turn invite us to learn more about hegemonic cultural ideas about adaptation to climate change, and cultural change more generally.

However, before I elaborate on the alpine cryosphere "occupation-scape" in more detail I first describe the site of my ethnographic study and the emergence of modern snow tourism there. How snow has gained preeminent economic value in the Pitztal Valley and how it has become a cultural resource for identity construction in Austria more generally are explained in the same section. The subsequent section engages with the prevailing local narratives about human-environmental relations. Through these, the self-understandings and attitudes of local people, particularly glacier workers, in relation to their environment are revealed. Presenting these narratives is especially important because, as I show in the final section, they provide a polyphonic set of explanations of the daily practices of snow and ice management that the glacier workers employ in order to provide "reliable snow" in times of economic and climate pressures. Moreover, I demonstrate that the narratives and techniques reveal a political ecology of mountain landscapes and of skiing. In the conclusion, I briefly round off my ethnographic analysis.

Toward an Anthropology of Snow in the High Alpine Environment

Austria's highest glacier ski area is located in a high alpine valley named the Pitztal, in the province of Tyrol, in western Austria. The area, which is home to numerous small and large glaciers, is part of the huge and impressive Ötztaler Alps, which shape the border between Austria and Italy. I have conducted research on the anthropology of snow and issues of vertical globalization² in this forty-kilometer long valley since 2012. Although I have visited (and still visit) the Pitztal glacier resort during each of my fieldwork stays, making a broad range of contacts, formal fieldwork in the glacier resort itself was carried out during the 2014 winter season and in the summer and early autumn season in 2015. The warmer season in particular is the most intensive time for the workers who maintain the overall infrastructure of the resort and prepare tourist snowscapes by engineering the mostly gray and brown-red landscape. Although a seemingly paradoxical choice when researching snow and ice issues, the timing was actually perfect for learning more about the occupational engagement in the alpine cryosphere.

Work in the Pitztal: From Poor Agrarian Livelihood to Prosperous Global Tourism

As in many mountainous regions in Austria and elsewhere, in the Pitztal Valley snow provides the major rationale for the regional economy and identity. Snow constitutes the most important occupationscape both for the local permanent residents and the significant numbers of seasonal migrants who currently come mainly from Eastern European countries. Of the more than four hundred ski resorts in Austria, three are located in this valley, and one of these is the glacier ski area. The resorts were established between the late 1960s and the early 1980s, the glacier resort being the latest one. Although some mountaineering in the Pitztal had already started in the nineteenth century (Pechtl 2005), modern winter tourism was initiated by provincial politicians together with local inhabitants in the 1960s, a decade later than in neighboring regions. They shared the socioeconomic and political aim of reviving the Pitztal, which at the time was extremely poor, and of securing its economy. This ambitious goal was expressed in the following commitment by local people in 1966: "We will put our existence, our future, and all of our energy into tourism" (Hochzeiger Bergbahnen 2009: 6).³ The four political communes of the Pitztal, which currently have a total of around seventy-five hundred permanent residents, have undergone profound socioeconomic change since then.

They have been transformed from an extremely poor high alpine region that in the past was primarily based on agriculture into one whose wealth today derives from the service-based tourist economy. Tourism is supplemented by some small-scale trade and farming, mainly as a side-line, and alpine pasture farming, which, again, is mostly integrated into tourism. Tourism has brought stability to residence levels and even an increase in the population in the past few decades. However, while there is some in-migration in the mixed-economy northern region of the valley, more recently out-migration has increased again in the valley's most high-alpine southern part, which depends exclusively on tourism. This poses a certain threat to the Pitztal, as it does to other alpine regions in Austria and elsewhere. Therefore, the commitment to winter tourism continues to have great economic, social, cultural, and affective power in the Pitztal.

Memories of their poor livelihoods are still very vivid for many people in the Pitztal. They speak of a past full of deprivation and extreme physical hardship; brutally hard and cold winters; strong out-migration, including children's seasonal labor migration in order to prevent them from starving; lack of electricity, tarmac roads, and motor vehicles until the late 1950s; and many other material signs associated with modernity, progress, and comfort (Pechtl 2015). Those memories constitute a powerful narrative of anxiety about "falling back into the past." In particular, the fear is currently exploited by the tourist industry and ski resort companies to explain and legitimize ongoing plans to expand the glacier ski resort into hitherto "untouched" and protected glacier landscapes in order to establish Europe's largest glacier ski resort.

Counting more than one hundred employees, the glacier ski resort company is one of the biggest employers in the valley. The great majority of employees are local people, mainly men. Unlike the first ski resort that was established in the Hochzeiger area, which is entirely in the hands of local shareholders, the glacier ski resort is owned by a private, nonlocal Austrian company with a variety of investors. However, the land on which the ski resort operates is owned by the adjacent political commune of St. Leonhard, which, back in the 1980s, assigned the right to use the land for an unlimited period to the company, providing that it offered as many jobs as possible to local people. However, the divergence between land use and ownership causes various ambiguities and conflicts today. The glacier resort's ski season lasts eight months, usually from early September to early May—a period double that of ski resorts at lower elevations. The early season is dedicated to the training for competitive alpine and cross-country skiers from various countries, including Austrian champions. Due to its long season, the glacier ski resort is the most prosperous of all three resorts in the Pitztal, generating the greatest economic value. Its

economic strength and the social power that derives from it seem to be the main reasons of why locals who might otherwise be critical of interventions in the landscape maintain a public silence.

“The White Gold”: Skiing into Modernity and Globalization

Tourism has indeed brought modernity, prosperity, and globalization to the Pitztal.

Modern winter tourism has changed the value of snow, transforming it into a commodity now known as “white gold” throughout the European Alps (Denning 2015). Snow as a commodity and all associated infrastructure and imaginations now circulate within global economic and cultural flows—in addition to the global mobility of the many thousands of tourists from all over the world who consume snowscapes. All in all, turning natural snow into “white gold” was part of a broader process of configuring and pushing modernity and capitalist economy. It brought together specific ideas about nature (combining a romanticized aesthetic and the consumption of mountains), progress, labor, leisure, travel and mobility, infrastructures, subjectivity, body practices, and the (self-)governance of modern subjects (Tschofen 1999; Berthoud 2001; Bätzing 2003; Müllner 2017). More particularly, the assemblage implied novel technology for modifying snow (such as snow groomers and snowmaking machines), new infrastructure for accessing the mountains and accommodation, a new financial (credit) policy for acquiring that very same expensive infrastructure, and, last but not least, new styles of alpine skiing on prepared, flattened pistes, themselves previously unusual (Gross and Winiwarter 2015). The new ways of enjoying and consuming mountains and snow allowed an ever-growing number of people to literally “ski into modernity”⁴ (Denning 2015) and, I wish to add, increasingly into contemporary globalization.

Performing Identity through Snow

Concurrently, after World War II, skiing was elevated to an important skill of (self-)discipline through which Austria’s national identity could be represented and performed (Horak and Spitaler 2003; Tschofen 2004; Müllner 2013). International sporting events such as skiing championships (glorifying Austria’s ski heroes and presenting magnificent snow landscapes on postcards and TV), the tourist industry, and national education politics (which institutionalized obligatory ski weeks in Austrian schools) contributed extensively to this identity construction. While the significance of skiing as a national attribute is contested today, its relevance for performing regional identity is still accepted. As I witnessed during my fieldwork,

teaching proper skiing techniques even to small children is an integral part of education. Embodying the perfect skiing technique is perceived as a social prerequisite for becoming "a true Pitztaler and Tyrolean." Adults conceive of this embodied knowledge as a significant marker of regional difference in Austria. Accordingly, many of them distinguish between themselves as "the Westerners," who live in the mountains, and the others, the "Easterners," who live in the far-off city of Vienna. This stark oversimplification echoes the historical competition in constructing Austria as a nation after the decline of the Habsburg Empire in the early twentieth century. Notably, the attempts at nationalizing the alpine landscape⁵ and, vice versa, naturalizing the nation were at that time directed against the hegemony of understanding the nation as a modern project of "urbanization" (Johler 2002: 102).

However, modern snow tourism—whether it is called mass tourism or the democratization of tourism—has in the past few decades come to be troubled and contested for several reasons. The two main ones are, perhaps not surprisingly, related to environmental issues: on the one hand, the extensive ways of modifying and engineering the alpine cryosphere for the purposes of tourism have attracted growing criticism from regional, national, and trans- and supranational environmentalist associations and institutions. They have the shared aim of protecting this sensitive location by means of "soft" or environmentally friendly tourism. On the other hand, the changing climate is increasingly affecting the alpine cryosphere and with it the glacier ski resort in particular. How the local staff of the Pitztal glacier ski company are narrating, experiencing, and coping with the changing climate in their daily work will be the topic of the next section.⁶

"Going Along with Nature": Local Narratives about Human-Environmental Relations

Before presenting the most important techniques for coping with both the paramount economic importance of and climate change in snow- and icescapes, it is important to describe the three predominant local narratives about humans' relationship with their environment. Doing so, I outline a framework for understanding local and glacier workers' attitudes toward the challenges brought by the changing economy and climate. As I will show, those narratives contain a diachronic and synchronic structure directed at the past and present alpine "occupationscape." Moreover, I argue, they reveal a political ecology of mountain landscapes and of skiing (Stoddart 2012).

The first narrative I call the “traditional agricultural adaptation narrative.” By employing this diachronic narrative, local people connect with an alpine agricultural livelihood in which the relationship to the land as a natural resource appears quintessential. The narrative implies a comprehensive knowledge of the alpine environment and its landscapes and of how to cope with and care for the land. Adults in different social positions and situations repeatedly draw on this narrative when emphasizing, “We have always gone along with nature (and not against it).” They thus assert that they know how to deal with the hardship and dangers but also the benefits of and changes in the environment with regard to making a meaningful living out of it. However, tourism and EU agrarian politics have modified this sense of a deep relationship to the land and landscape. People hold both tourism and EU politics responsible for their shift from being agrarian land caretakers to nonagrarian landscape caretakers who are now occupied with protecting a landscape that is run in a nonecological way from “rewilding.”⁷ While the recent changes brought enormous relief from physical hardship, some older men and women expressed regret at having lost their former identity as autonomous mountain-farmers in their talks with me.

A few glacier workers also repeatedly voiced anger and cynicism about certain urban tourists exhibiting a lack of understanding of alpine livelihoods. “Quite a few urban visitors think the mountains are a romantic place, of course one with wireless internet access. They expect us to protect our environment according to the way they think it should be. But they have no idea what it really means to live here!” (field note, 15 September 2015). Such feelings reveal the ambivalence of being situated between the agricultural and touristic approaches to the environment and therefore lead us to the next narrative.

I call the second, synchronic narrative the “touristic adaptation narrative,” in which local people perceive their relationship to the environment through the lens of the tourist economy. Such an understanding of the environment equates to what Escobar (1999), in his anti-essentialist political ecology of “regimes of nature,” has termed “capitalist nature.” It targets the modification, commodification, and, even more, the domination of nature and its resources for touristic and capitalist ends. Noteworthy here is the distinct time structure that organizes the tourist landscape and the perception of it. In contrast to agriculture, tourism is determined by modern ideas of leisure and holidays and thus implies different understandings of seasons. It further involves distinct expectations of having snow at specific times and in specific places. Many local glacier company staff stressed the imperative of controlling and managing the environment and the uncertainty regarding the weather by employing a large package of

snow and ice management techniques (see below) in order to provide the prime prerequisite of "snow reliability" to the tourists. Heinrich, who is in charge of piste preparation and security, illustrated this approach: "Regardless of whether this is climate change or not, if glaciers and snow are retreating like this, we have to go along with that fact and make all possible efforts to provide snow using various methods in order to guarantee tourism" (interview, 6 August 2015). However, they admitted that one can never control nature entirely.

The third narrative has evolved with respect to the ever-increasing importance of technology and infrastructure in high alpine environments, which has, in Escobar's (1999) terms, generated a "technonature." I call this the "technological adaptation narrative." As a "regime of nature," it combines with "capitalist nature" and thereby aims at using, accessing, controlling, modifying, and, where required, dominating nature. The narrative, in turn, encompasses contexts in which tourist and community domains and interests coincide (such as with hydropower). I propose that this narrative is of special anthropological interest because not only is it about the relevance of modern technology but it has also flourished as a medium through which access to the alpine environment is facilitated. It also reveals cultural ideas about the nature and social life of technology. With it, the local narrative describes the idea of the "adjustment" of technology to nature; this "adjustment" could be to nature's physical qualities and resources (such as cold and water), or it could be institutionalized in ideas about nature (such as environmental sustainability). When talking with others about various infrastructure-building projects in the glacier ski resort or somewhere down in the valley, I usually heard that particular infrastructure plans would either "go along with nature, or not." For example, a technician explained to me that the photovoltaic power plant installed in the glacier resort during my fieldwork in 2015 would "go along perfectly with nature." In a similar vein, the two hydropower plants built a few years ago along the valley's Pitze River were described as "going along with nature."⁸ In contrast, the glacier company's plan to build a further large pool in the cryosphere environment for collecting more water for snowmaking was "not going along with nature." This plan was rejected by the relevant environmental assessment authorities. Likewise, while snowmaking by means of snow cannons requires cold temperatures, a special snowmaking machine called the All Weather Snowmaker (see below), installed to counter the effects of climate change, is able to produce snow even at very warm temperatures, and hence some workers considered it as "going against nature." Heinrich in particular explained that this machine "goes against nature because it is unnatural to have snow at warm temperatures." According to him, "Technology should al-

ways go along with nature and not against it" (interview, 14 November 2014). For him, both natural snowfall and making it snow require cold and not heat, and this dictates which technology is "good." Quite in contrast to him, his colleague Markus, a technician, reaffirmed his conviction that "any technology available in the market should be used for guaranteeing snow" (interview, 2 November 2016). According to him, anything possible should be done to ensure winter tourism and with it the future of the Pitztal. But what are the current techniques for providing "snow reliability"? The next section engages with them in detail.

Challenges in the Alpine Cryosphere: Facing Vanishing Glaciers and Melting Permafrost

Although glaciers in general have been shrinking since the end of the Little Ice Age in the nineteenth century, from the mid-1980s glaciers worldwide have undergone a more or less dramatic retreat (Bender et al. 2011: 407). As shown in a number of anthropological studies, glacial loss and lack of snow cover not only affect the ecological balance in locations around the world but also directly impact people living in the vicinity, affecting their local economies, regional and global tourism, modes of perception, and senses of place (Cruikshank 2005; Orlove, Wiegandt, and Luckman 2008; Wiegandt and Lugon 2008; Dunbar et al. 2012). The retreat of the glaciers in the Ötztaler Alps, which are (still) home to the largest end-to-end glaciated area in the Eastern Alps in Europe, is particularly drastic (Fischer 2017).⁹

"Our existence is literally melting away," stated Reinhold (field note, 8 August 2015), the chief technical manager of the Pitztal glacier ski resort, thus voicing his concerns about the retreating glaciers and snow cover in the ski resort in one of our conversations. Standing with me at around twenty-nine hundred meters in summer 2015, this local man in his mid-fifties described to me how much farther the glaciers had reached when he had begun working in the resort in the 1980s. Like him, several other staff members described the drastic retreat of the glaciers that they had witnessed during the last few decades. Nevertheless, glacier ski areas are marketed to tourists as providing "true snow reliability" when compared with resorts at lower elevations, particularly as climate research models are projecting that ski areas in Europe located below twelve hundred meters, in contrast to those in higher areas, will disappear toward the end of the century due to the ongoing temperature rises in the European and Austrian Alps (APCC 2014: 16, 25; Marty et al. 2017). However, a recent study has revealed that by then there may be a decrease in snow depth of about 50 percent even for elevations above three thousand meters

(Marty et al. 2017). This forecast echoes Reinhold, who finds it difficult to imagine their glacier ski area as having reliable snow in the long-term future: "We'll have to make even greater efforts and fight even harder on the glacier in ten or twenty years. We'll need more equipment and more staff" (interview, 8 August 2015).¹⁰ His colleague Heinrich was convinced that there will still be skiing on "their" glacier for the next few decades at least. The high altitude combined with snow depots (huge hills of harvested snow—see below) and snowmaking would continue to make it possible (interview, 6 August 2015).

Coping with "Atypical Dangers" and Climate Change

Similar to ski resorts at lower elevations, glacier resorts assemble a whole range of legal provisions and adopt a multitude of standard operating procedures as a prerequisite for their establishment and maintenance as well as for safety reasons. In high-altitude resorts, many of these regulations relate to their particular weather, ice, and snow conditions. Familiarity with these regulations is very important when carrying out field research in order to fully comprehend the diverse tasks and narratives of the workers. In particular, so-called "atypical dangers" such as avalanches, a piste entirely freezing, crevasses that cannot be filled in, and ablation (i.e., the melting of snow and ice cover over large areas) must be constantly safeguarded against and/or eliminated.¹¹ If this is impossible, then pistes must be closed (Amt der Tiroler Landesregierung n.d.: 23). According to these regulations, the workers fill in crevasses with snow and ice for safety reasons. Another task relates to the natural movement of glaciers: as they move, they destabilize the towers of the T-bar lift. As a result, each year workers must adjust and relocate the lift towers. Ablation poses another challenge, as I saw during my fieldwork. Bare rocks and debris or permafrost soil appear in ablated areas, which must then be adapted into a "piste-friendly" base by flattening the ground. To do so, workers use drilling and blasting technologies to break up the rocks, and vast amounts of stones must be removed in trucks. "Pay attention and keep away for the next few minutes!" workers repeatedly warned me for security reasons.

While such tasks are mainly defined by provincial piste security regulations, other practices, widely described as snow management, have emerged more from the economic and competitive imperative of "snow reliability" and its current interlinkage with the changing global climate. These are regulated by environmental assessment legislation. However, both categories of practices intersect with one another to a certain extent insofar as they share the safety of tourists and piste security as their prime concerns.

The issue of “snow reliability” in particular has received greater attention in studies of climate change in ski resorts since the turn of the millennium (Mayer, Steiger, and Trawöger 2007) because of the impact the changing climate has on the cryosphere environment. Among other effects, glacial retreat and the permafrost degradation of alpine rocks, debris, and soil are considered to be major hazards in alpine regions. They cause the break-up of rocky slopes and rock falls that endanger the built environment and infrastructure and cause casualties (Krautblatter and Leith 2015: 147). To Heinrich, melting permafrost poses the most serious problem, as the following quote illustrates:

Really my biggest concern up here is the permafrost. . . . This is very dangerous because you never know when it will start falling apart. But once it is melting, the rocks break apart, and rockslides then become a big danger to our guests and all of us. I know when and how to trigger avalanches for security reasons. But we don't know how to deal with the melting of permafrost except by covering some areas with textiles. (Interview, 14 November 2014)

Making Snow and Glaciers “Reliable” in Times of Climate Change

Against the backdrop of challenges, problems, and dangers facing the company's workers, it is pertinent to describe the three most important techniques for making snow “reliable” and the pistes secure within the rapidly changing cryosphere. These involve making snow depots and covering them with geotextiles,¹² covering sensitive and dangerous zones of glacier and permafrost with the textiles, and making snow by means of technology. While these practices are mainly linked to the economic value of snow and the touristic adaptation narrative, they also have social significance and value to the workers.

The most crucial practice in providing “snow reliability” is making pistes out of the snow stored in huge outdoor snow depots. At the beginning of the season in September. The workers make the depots either during or at the end of the season in May. They drive snow groomers to collect the snow and later distribute it into thick (fifty-centimeter) white stripes running across the rocky brown-gray landscape. This method has been in use for more than a decade. The harvested snow is composed of two-thirds natural and one-third technologically produced snow, which in 2015 together amounted to approximately three to four thousand cubic meters. While these hills of collected snow have an essential economic value, workers also attribute a social significance to them, as illustrated by Heinrich, who emphatically stated, “These depots stand for my future job security!” (field note, 29 July 2015). For him, the snow depots are both

powerful performers in the landscape and represent his future occupational security.

Once collection is complete, after several weeks the workers cover the hills with large white geotextiles in order to prevent the snow from melting too soon. During my fieldwork stay in 2015, there were seven such huge hills of snow awaiting distribution and 7.5 hectares of textiles protecting them. Usually, the textiles can be reused for three seasons. As Heinrich explained to me, depending on the natural snow cover on the glacier, some covered snow depots could stand there for as long as three seasons without melting. However, the snow conditions were different in 2015, when Heinrich lamented, "There was nearly no snowfall this summer. It might be that there won't be enough snow in the depots to open in September. However, if so, then we'll have to go along with nature and not against it." "And what does that mean?" I asked him. "It means that we have to open the season later," he responded (field note, 29 July 2015). Opening later, however, would cause the company to make a financial loss, he added. Later he admitted: "Even though humans can control most of nature by technology, there will of course always be some part that humans can't control" (field note, 29 July 2015).

In addition to the snow depots, certain glacier and permafrost areas are covered with textiles during the summer. The aim is to prevent the ice and permafrost from rapidly melting and to keep the pistes safe. The specific "sensitive" and dangerous zones protected in this way are around the ski lift towers, the rocky outcrops on the glaciers, and retreating and collapsing glacier terminuses (Mayer et al. 2007: 165; Olefs 2009: 35). The covering method has been exploited at various lower glaciers in Europe since the mid- to late 1990s (Mayer et al. 2007: 165n12), but the fleece textiles were used for the first time in Austria, including at the Pitztal glacier resort, in the early 2000s as a consequence of the extremely hot summer in 2003 (field note, 29 July 2015; "Ein Pflästerli für die Gletscher" 2006: 8). This sort of covering took place even before glaciologists from the University of Innsbruck had experimented with different textiles in glacier ski areas in Austria, including the Pitztal, between 2004 and 2008. Their research results have since shown that the covering method results in a 60 percent decrease in ice and snow ablation (Fischer, Olefs, and Abermann 2011: 95). The scientific findings were echoed in the narratives of several glacier workers when they attributed a social and ecological value to the snow management practices: "We are sometimes blamed by environmentalists for destroying the glacier," Heinrich emphasized, with strong feeling; he continued, "But the opposite is the case: we're protecting the glacier and caring for it!" (field note, 29 July 2015). However, as he and others stated



Figure 9.2. A worker uses a digger for removing some textiles in late summer 2015. © Herta Nöbauer.

in various conversations, it is impossible to cover the whole glacier and completely stop it from melting.

In contrast to the research cited above, ecologists and environmentalists have criticized the use of textiles. According to their critique, textiles mar the appearance of the landscape and have a negative impact on the microorganisms of the snow and ice (BMFWF 2017). These distinct competing scientific standpoints are also reproduced in the differing national-regional environmental regimes regarding the use of textiles. In contrast to Switzerland, for instance, where covering with textiles requires approval by the respective canton's spatial planning administration (*"Die Gletscher sind wieder abgedeckt"* 2013), in Austria it is defined by environmental regulations as part of the maintenance of glacier ski areas (BMFWF 2017).

The history of snowmaking by means of "modern" technology reaches as far back as the 1930s (Nöbauer 2017, 2018). To produce snow, water is pumped through pipes and snow cannons under high pressure, and the droplets sprayed out need to freeze. Thus, the temperature of the air must be between minus four and zero degrees Celsius, and the water around zero degrees Celsius. Low relative humidity is also essential, as the drier

the air, the more snow can be produced. Large amounts of water and energy are also required for this process. The water is taken from communal water sources, collected in large, specially constructed pools, and then pumped through an extensive network of pipes to the snow cannons. Snowmaking can be activated by a fully automated computer system or manually by workers. The quantity and quality of water used are strictly regulated by provincial and national legislation in Austria. In contrast to countries such as Switzerland, Canada, and the United States, which permit the use of chemical or bacterial additives in snowmaking, the "water purity rule" in Austria prohibits this. In the Pitztal glacier resort, glacier water and some spring water are used for snowmaking. Two-thirds of the electrical energy required to drive the process is taken from the Tyrolean power grid (widely based on hydropower) and one-third from the glacier company's own photovoltaic solar power plant.

In Austria, around 70 percent of all ski slopes are currently supplied with technically produced snow (WKO 2018a). This high percentage puts Austria among the leading countries in Europe in terms of human-made snow in alpine ski tourism. Ski lift companies consider snowmaking indispensable for securing winter tourism. They invest approximately €120 million annually into snowmaking infrastructure (WKO 2018b). The snowmaking technology industry meanwhile is participating in the global economy, with an annual turnover in the billions of euros. In the province of Tyrol, which has by far the most ski areas in Austria, nearly all slopes are supplied with technically made snow (Steiger and Abegg 2015: 323).

Snowmaking had already started to be used on a few glacier terminuses in the 1980s. Its further employment since the mid-1990s was intended to enable the ski resort companies open early in the season when there is insufficient snow to cover the rocky base (Mayer et al. 2007: 161–63). The subsequent development in the early 2000s to making snow in even huge glaciated areas has been identified by scientists as a clear and exclusive effect of global warming (Mayer et al. 2007: 161–62).

In the Pitztal glacier ski resort, around 15 percent of its eighty-five hectares of slopes are supplied with technically produced snow. Although this proportion of human-made snow is still rather small compared with the Austrian average and with other (glacier) ski areas,¹³ it is surprising for such a high elevation. The first snow cannons were introduced on the Pitztal glacier in 1991. However, in their accounts to me, a couple of workers already retrospectively associated this early installation with "climate change." The retreat of glaciers back then had indeed begun to disrupt the course of slopes. Facing these changes and the decrease in numbers of skiers during the summer, the company decided to reduce the skiing season from twelve to eight months.

Beside the snow cannons, the All Weather Snowmaker, a unique machine otherwise used only in Switzerland, was adopted at the glacier resort in autumn 2009. It is a huge, multiton machine affixed into a building specially constructed for it at an elevation of around twenty-nine hundred meters. As its name indicates, the machine, which made a long and challenging journey from Israel to the Pitztal glacier, works independently of the weather and is capable of producing snow even at ambient temperatures as high as thirty degrees Celsius. The desire for such weather-independent technology on a glacier attracted my interest from the very beginning of my research on snow and, in fact, prompted my decision to conduct fieldwork in the Pitztal in particular. Its operation requires a very high amount of energy, which provoked some glacier workers to criticize the snowmaker. Moreover, as already mentioned, Heinrich asserted that making snow at warm temperatures “goes against nature.” In contrast to the snow cannons, the snowmaker is based on the vacuum ice principle. The same cryogenic method has been applied in various extreme environments and at varying heights and depths, such as for desalinating sea water and cooling gold mines in different regions of the world (for details see Nöbauer 2017, 2018). After countless problems (some of which still have to be resolved) due to its emplacement at high altitudes, in 2009 its operation began for the first time in the alpine cryosphere environment (Nöbauer 2017, 2018).

Snowmaking has attracted a significantly broader and stronger critique of its ecological impact than has the use of textiles. Against the backdrop of a whole range of scientific and technological projects established in Austria and elsewhere to reduce the amount of energy and water used, the criticism has primarily been due to the machines’ high consumption of energy and water (de Jong 2013; Gross and Winiwarter 2015). Conflicting environmentalist standpoints are echoed by equally conflicting scientific discourses on snowmaking. All in all, however, the different environmental legislative frameworks related to the use of water and the diverse energy sources (fossil fuels, hydro and solar power) are often not taken into account in the controversy about the ecological impacts of snowmaking.

Conclusion

This chapter has engaged with the “anthropocene” in the “occupation-scape” of the Pitztal glacier ski resort in Austria. By focusing on the engagement of the local men working in this particular alpine cryosphere with the dramatic environmental changes occurring there, I explored the multilayered impacts that the globalized tourist economy and climate

change have on the environment and workers. My exploration of their and wider local narratives about human-environmental relations along with their practices of snow and ice management shows that, against the backdrop of the highly competitive tourist economy, the workers and the glacier company are under increasing pressure. Primarily, glaciers receding at unprecedented speed, retreating snow cover, and degrading permafrost dominate their daily work, feelings, and thoughts regarding future prospects. These drastic environmental effects and the techniques to counter them obviously impact the workers' sense of individual and regional identity and, in particular, of job security and regional economic stability. However, as demonstrated by their polyphonic explanations of their actions and thinking, workers do make social and cultural sense of such changes. In fact, the predominant local narratives about human-environmental relations, which I have traced, reveal a rich, complex, and sometimes conflicting arrangement of explanations. Placing these distinct narratives about adaptation to their environment within the political economy of past and current alpine livelihoods, I argue that they provide important "cultural sets of practices and ideas" (Wolf 1982: 391) that local people are using and manipulating in order to make sense of ongoing changes. Beside the significance of local narratives of adaptation, workers also incorporate particular scientific discourses and knowledge about "countering climate change" in the alpine cryosphere into their cultural set so they can empower themselves and legitimize their practices. Sciences such as glaciology thus are given a special place in local explanations and, so I propose, have a particular responsibility as a result.

While the modern business of snow and glaciers is clearly created by a local and global political economy (cf. Wolf 1996), it is also very much shaped by a political ecology. In particular, the three adaptation narratives point to the different and often conflicting approaches to land and landscape and the ownership, use, and consumption of it. As I have shown, the widespread and highly complex local narrative of "going along with nature, or against it" implies distinct manifestations of "adaptation." They range from using and cultivating agricultural land and caring for the landscape, as represented in the first "traditional agricultural adaptation narrative"; and extend to modifying, controlling, and, indeed, dominating nature for touristic ends, as illustrated in the "touristic" and "technological adaptation narratives." However, the limits of domination over nature notwithstanding, "capitalist nature" and "technonature" have also become evident.

A closer analysis of the narratives and techniques reveals a major and perhaps surprising idea: the deep belief that the effects of climate change can be countered by means of modern technology. This belief invites us

to learn more about hegemonic cultural ideas of adaptation to climate change. While technology is clearly matter of culture, such an exclusive focus on “technological fixes” (Rosner 2004) should make anthropologists (and others such as environmentalists) skeptical. Rather, it also seems increasingly important to critically consider other dimensions of cultural practices, such as consumption and production styles or eventually other cultural ideas of a noncommodified “nature.”

To conclude, this ethnographic study has demonstrated how people in a particular alpine cryosphere location are attempting to make sense of and *in* an “overheated” world (Eriksen 2016) that is exerting increasing pressure on them.

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Dr. Herta Nöbauer is senior lecturer at the Department of Social and Cultural Anthropology at the University of Vienna. Her research and teaching interests include various topics associated with the anthropology of the environment, technology, and emotions. In her current research, she focuses on the anthropology of snow and vertical globalization in the European Alps. Among others, she has published on human-snow-technology relations, weather issues and climate change in the alpine cryosphere, and identity and work issues related to the alpine environment.

Notes

1. Paul Sillitoe uses the term “anthropocene” as a contraction of “anthropological scene,” particularly the anthropological scene with respect to environmental change due to human activities, to which the now familiar term “Anthropocene” refers. It signifies a play on words to indicate that anthropology has something important to contribute to the study of the Anthropocene (email communication with Paul Sillitoe on 8 June 2019).
2. I use “vertical globalization” to describe the increasing flows of people, ideas, infrastructure, communication technology, trade, and finance oriented toward high mountain areas and the sky. While this orientation is geographically directed upward, vertical globalization may also be directed downward beneath the surface of the earth (e.g., toward the maritime areas or the extraction of diverse resources).

3. German original: "Wir legen unsere Existenz, unsere Zukunft und all unsere Kraft in den Tourismus" (Hochzeiger Bergbahnen 2009: 6).
4. I adopt my subchapter's expression "skiing into modernity" from Andrew Denning's (2015) book title.
5. The first line of Austria's anthem starts with "Country of mountains. . ." (in German "Land der Berge").
6. The significant rise in the costs associated with ski holidays is another reason why skiing is increasingly contested. This popular leisure activity is indeed on track to become an elitist activity.
7. The local meaning of "rewilding" is nature or land getting wild. In contrast to approaches to conservation (Carey 2016) which mainly focus on attempts of reconstructing damaged ecosystems and landscapes, the vernacular use in the Pitztal has negative connotations. Letting land go wild means having no access to the land for agricultural and touristic use.
8. For illuminating details about the tensions between economic and ecological conditions of hydropower in the Pitztal, see Tina Wimmer's master's thesis (2019).
9. On average the glaciers in the Pitztal region retreated more than 24 m in 2016; the year before, they shrank even more, with the average at nearly 66 m (Fischer 2017: 23).
10. During one of my later visits, in December 2018, Reinhold explained that the retreat of glaciers and the degrading of permafrost were accelerating faster than they had expected. "Climate change is quicker than politics and bureaucracy," he affirmed. He anticipated that the areas of bare rock would rapidly enlarge, necessitating new "rock management" practices to flatten them. Such practices, however, have been strictly prohibited by environmental politics until now. Therefore, according to Reinhold, the company and politics would need to react appropriately within the next five years in order to maintain the operation of the ski resort (Reinhold, pers. comm., 4 December 2018).
11. For very recent details, see endnote 10.
12. Some Austrian glaciologists (Olefs 2009; Fischer, Olefs, and Abermann 2011) have experimented with various materials (including different colors and thicknesses) for covering, such as membranes, biodegradable textiles, and nonwoven fabric. Their results have shown that white-colored geotextiles made from nonwoven fabric that is breathable and permeable are the most effective. The Pitztal glacier resort had applied exactly these latter textiles even prior to the glaciologists' experiments. After three seasons of use on the glacier, the textiles are being returned to the construction industry, where they are reused.
13. In the neighboring Ötztaler glacier ski areas, 77 percent of the 111 kilometers of slopes are covered with technically made snow (<https://www.soelden.com/schneeanlagen>).

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