5 Mistrusting the Alarm

Rage against the machine

It was April 2016; the rainy season was coming to an end in the Callejón de Huaylas, except for a period of occasional showers. Since the expected onset of precipitation in November, rain had been almost non-existent at a time of year when downpours could usually leave one entirely drenched in a matter of seconds. The situation was troubling highland farmers that make their living from seasonal crops, who were facing meagre harvests from the *campaña grande* (main sowing campaign)[1] as a consequence of dry soils. Authorities were equally worried at this point; the lack of rain increases people's vulnerability in the highlands exponentially, making them more dependent on state support and more prone to draw on last-ditch measures to sidestep the dramatic consequences of drought. *Campesinos* were starting to become desperate, and things were getting tense.

During one of those dry days at the end of the month, people in Carhuaz raised awareness about an attack against an early warning system's monitoring station. Voices were alerting others about a group of vandals that had stolen the video cameras from the devices installed next to Lake 513. Although some people first related the attack to an ordinary robbery (Fraser 2017), rumours later affirmed that people in the Cordillera Blanca were associating those video cameras with the drought; a sort of foreign machine that was blocking the expected rainfall. Whereas the attack did not cause major damage to the entire system, it showed for the first time that the early warning system was a real source of conflict in the area.

As no rain fell during the new harvest season, the troubles continued. In late November 2016, *comuneros* (members of *campesino* communities) gathered in Shonquil Pampa, a meadow located in the foothills of Hualcán Mountain, motivated by the government's intent to repair the mistrusted early warning system. Rumours indicated that the angry mass of people had been *chacchando* (chewing coca leaves)

1 In the Callejón de Huaylas, sowing season is divided in two main periods: a main campaign in October (in time for the wet season), from which products are harvested in the following months, and a *campaña chica* (small campaign) in April – at the beginning of the dry season – sustained fundamentally by irrigation infrastructure.

and drinking in the meadow since dawn, following intense hours of discussion and deliberation during the preceding days. Armed with sticks and tools, attendees dismantled and removed all the system's stations, including the monitoring station located in Shonquil Pampa and the repeater station downstream. It was a clear message to the local and regional authorities, who came to the place this time and witnessed the congregation – only to later be expelled from the site. But mostly, it was a very effective mitigation measure. Some days after the attack, it started to rain again, just in time for the crop season. Order was restored, and farmers were pleased.

Because of its consequences, this incident was used to revive old divisions that have long shaped the Andes. It was the struggle of an urban world in the lowlands seeking progress and modernisation that has been constantly threatened by a barbaric and uneducated population from the highlands. The destruction of the SAT in Lake 513 was considered a huge defeat for science and its efforts to overcome what are considered superstitious understandings of the environment. But at the same time, it was the resistance of highland communities seeking to preserve their traditional forms of living against what they perceive as foreign forces threatening their modes of existence. Lowlanders were angry and scared, arguing that the destruction of the SAT, driven by ignorance, was a direct threat to their lives, should an outburst flood reach Carhuaz. Highlanders, on the other side, were angry and felt their sovereignty was threatened by machines that, driven by greed and private interests, were putting their environment at risk. A new contentious encounter was taking place, an onto-epistemic fight between two different cosmovisions – or the figurations of them, at least.

This chapter explores the tensions and friction produced by the installation of the early warning system at Lake 513, and offers a general account of flood risk management in Ancash and the reasons for installing early warning systems in Huaraz and Carhuaz to monitor threatening mountain lakes. Rather than a deep exploration of the politics of scientific knowledge production in the Cordillera Blanca, a topic brilliantly explored by Mark Carey (2010), this chapter analyses the chronopolitics (Wallis 1970), the politics of time production, around efforts to create a safe future for the Andean cities of Ancash. Throughout this chapter, we will see how efforts to develop controlled temporalities in the mountain lakes of the Cordillera Blanca have emerged mainly from the catastrophic consequences of different events throughout the region's history. It is the story of how a national project, supported by an emergent field of glaciology and driven by a techno-scientific ethos of modernisation and development, 'expanded its control over one of the last Andean frontiers, the glaciated peaks' (Carey 2010, 156).

Yet, the chapter also offers an exploration of the contestations that those interventions have elicited. By further exploring conflicting accounts of the sabotage, this chapter reflects on the multiplicity of actors and elements involved in the explana-

tions of the attacks on the SAT. We will see how the highland's own otherness – the *gringos* and mining projects – was also fundamental to understanding the mistrust of those foreign machines. Just like *pishtacos* and *Chilenos*, other historical figures related to problematic otherness in the highlands that we will explore in this chapter, *gringos* would be a fundamental figure embodying centuries of colonial violence and extractivist relations with the lands.

Controlling time in the mountains

'Creation of an early warning service for flood risk in the population of the Quillcay sub-basin' reads a banner located at the beginning of the entrance towards Palcacocha, announcing what one can expect to find at the end of that dirt road. Next to it, a fence secured with a steel lock. The fence, Roberto explains to me, was installed by the *Comunidad Campesina* Tupac Amaru II as a way of protecting their common lands covering all the Cojup Valley from that point until reaching Palcacocha, which is around 11 kilometres away in the Cordillera Blanca. It is a measure that has not been without controversy. While the *comunidad* has owned those lands for over 100 years, as they personally explained to me during one interview, the foothills of the Cordillera Blanca above 4,000 metres elevation are now under the control of the Huascarán National Park, the state agency responsible for ensuring the protection of the area and free access for visitors to the park. The fence, Roberto affirms, is a strategy by the *comuneros* to claim sovereignty of those lands *vis-à-vis* the National Park's efforts to safeguard the mountain ecosystem. Moreover, it has been a significant impediment for those installing the early warning system close to the lake, who on several occasions have faced the *comuneros* restricting their free transit along the road.

Inge[2] Roberto and I spoke a few days previously to arrange a visit to Lake Palcacocha and see some of the engineering projects he has been conducting in the area over the past years. A member of the Natural Resources Management Office of Ancash's Regional Government (GORE), Roberto supervises the mitigation works to prepare the Quillcay Basin against an outburst flood that could impact Huaraz as it did in 1941. He knows better than anybody the process of flood risk management in Huaraz and the surroundings – all the technical details, but also all the struggles and conflicts.

The mitigation work in Palcacocha, Roberto explains to me, seeks to replace the drainage system existing at the time dating from the 1970s. Besides two walls to retain the lake water, authorities at the time dug an evacuation tunnel large enough to

2 *Inge* is a common term used to refer to engineers working in public agencies in Peru. It comes from *ingeniero* (engineer) and denotes clear recognition of status.

drain a reasonable amount of water from the lake. However, the rapid glacial retreat during recent decades increased the lake volume 44 times, from 500 cubic metres to 17 million, a water body now large enough to produce an event several times bigger than in 1941. Under this new scenario, the GORE aims to install temporary draining syphons to later expand the evacuation tunnel and ensure appropriate draining capacity of the lake.

Despite the urgency of the project, the work has been progressing slowly – much too slowly – something that Roberto attributes to the Regional Government's poor planning. As the supervising site engineer, Roberto had to start the work from scratch. He found hundreds of drainage tubes left by the Regional Government at the end of the public road – the same location as the *comunidad* fence – waiting to be transported over the valley to the lake and installed in order to reduce the water level. 'Before this road existed, there was only a bridle path, a very narrow road', he clarifies, so the transportation of the pipes to the lake had to be done by hand. The dirt road came afterwards, in 2017, to facilitate the monitoring work conducted in the lake. But even with that new road, only the syphons have been installed. The expansion of the draining tunnel is still pending, and with no signs of beginning in the short term.

Roberto affirms that the relationship with the *Comunidad* Tupac Amaru II has not been easy either. Since the beginning, they had full control over whom to hire for the work of carrying the pipes. That was the initial agreement in line with their position as historical owners of those lands. Yet, whereas initially only members of the community were involved in the work, over time they started hiring external workers from nearby villages like Uncush or Llupa, as they did not have enough people to carry out their duties. '[*Comuneros*] didn't want to work because most of them are in the city. They have their businesses there or they have other jobs. There are only a few *comuneros* that work on the land, not so many', Roberto affirms. However, with time, not even the replacement *comuneros* hired wanted to do the job. According to Roberto, they were asking for improved working conditions, like eight-hour shifts and free weekends – things that, according to him, could not be provided due to the reduced budget he had.

While *inge* Roberto and I walk through that long, thin mountain valley, we come across a group of three men doing some cleaning of the road. Roberto explains to me that they are from the *Comunidad* Tupac Amaru II in charge of controlling the access to the lake. They are also currently responsible for monitoring the drainage infrastructure and ensuring that the water canals around the road are clean and ready to receive the seasonal rain. The engineer introduces us while he highlights the importance of their work for the protection of the entire population of Huaraz. The *comuneros*, moreover, explain to me that they, the engineer included, have very little institutional support, and quite often they have to pay from their own pocket the fuel needed to constantly run the syphon motors responsible for draining the

lake. Roberto says that many people linked to the management of the early warning system and the mitigation infrastructure do not give the *comunidad's* work the recognition it deserves, that they are real heroes, and that authorities simply do not really know how things work in the Cordillera. *When the father abandons you, it's not easy to carry out something*, remarks the engineer, referring to the lack of state support they receive.

I can relate to the frustration Roberto feels when dealing with the institutionality of flood risk management in Huaraz and the Callejón de Huaylas in general. He affirms that he has to deal with many instances of corruption and bad labour practices. The institutions look nice on the outside, but inside it's all rotten, he tells me wearily. The blame, he says, lies in state corruption and the permanent rotation of authorities after each election. However, the ambivalent relationship he seems to have with the *comunidad campesina* is something that surprises me. He does not hide his strong criticisms of the organisation, even accusing it of being a fictitious, corrupt entity looking only for soft jobs and private profit. Yet, he also recognises the important work that *comuneros* conduct, and their heroic work as protectors of downstream cities like Huaraz. They are part of a fundamental network to safeguard the region against extreme outburst floods. It is a mixed image that, as we will see, is not unique to that case but something defined by the complex relationship between the lowlands and the highlands, concerning policies for managing flood risk.

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According to Mark Carey (2010), the origins of the flood risk management system in Ancash can be traced to the first disasters experienced in the region during the twentieth century. As we saw in previous chapters, the 1941 flood over Huaraz put into question the progress of previous decades and the feeling of human control over nature – a feeling that, as Amitav Ghosh (2017, 22) affirms, appeared to be behind a modern ethos assuming, 'in both fiction and geology, that Nature was moderate and orderly'. The 1941 flood was the first incident that directly struck the regional centre of power and administration of the Callejón since the republic was declared[3], raising the alarms about the latent risk of outburst floods threatening urban areas in the region. However, another two events would need to take place for the government to react to the urgency of further outburst floods: a flood in 1945 that buried part of

3 The 1941 event was not the first extreme flood that struck the region in the past. During those years, there was knowledge of the event in 1725 that buried the old city of Ancash and killed almost its entire population. Moreover, several minor related events had occurred in the region since the end of the 19th century as a direct consequence of climate change. However, all of them impacted towns and hamlets at a reduced scale and outside the main urban settlements.

Chavín and left thousands of victims, and another one in 1950 originating from Los Cedros Creek that destroyed the almost finished Cañón del Pato hydroelectric plant, a strategic power station intended to foster industrialisation in the coastal cities of Lima and Chimbote. These events revealed the vulnerability of water management infrastructure to the threatening forces of nature and, consequently, the fragility of the modernist project in those latitudes.

Challenges around outburst floods were first addressed with the creation of a new institutionality aiming to deal with the scientific knowledge so essential to understanding those events, while also creating the infrastructure required to mitigate such threats. In 1951, President Manuel Odría launched the Commission for Lakes Control of the Cordillera Blanca, or *Comisión de Lagunas* – Lakes Commission. The agency was integrated into the Santa Corporation, a state-funded agency created in 1943 aiming, as the law behind its creation affirms, to 'develop and exploit the mineral and industrial resources that come directly and indirectly from the Santa River region and its tributaries' (Carey 2010, 71). The Lakes Commission was conceived as the first national entity in charge of systematically studying the glacial lakes of the Cordillera Blanca, commanded to create an exhaustive inventory of the glacial lakes and an until-then non-existent classification system to define those water bodies that were dangerous and unstable. Based on aerial photography taken all over the Cordillera, the commission developed the first lists of water bodies based on scientific standards, including numerical designations for most of the elements found. Adopted names such as Lake 69, Glacier 513a and its ensuing Lake 513 remain the common means of referring to water bodies, thereby keeping their numerical record as a sort of proof of their recently discovered existence. With time, and as scientists gained access to the different areas of the Cordillera Blanca, records would also start including Spanish adaptations of traditional Quechua names: toponymies such as lakes Chinancocha and Orconcocha (from Quechua *china* and *urku*, female and male, and *qocha*, lake) or the same Palcacocha (from Quechua *pallqa*, bifurcated) that are preserved until now.

Over the decades, the emerging flood risk management system, headed by the Lakes Commission, would help usher in an increasingly efficient – but also more bureaucratic and sometimes highly centralised – apparatus for assessment of and intervention in the lakes. The work of glaciologists and geographers would be combined with the expertise of engineers and architects to develop evermore exhaustive lake registries and world-leading engineering works, such as that at Lake 513, to deal with the threats from reservoirs. This network of national and international scholars and engineers was not only a way of supporting and contrasting cutting-edge theories developed in other latitudes. It was also a strategy for consolidating a unique project, a nation-state agenda and all its implications for controlling the territory, its forces and its resources. A purposeful combination of science and technological intervention, the work of the commission would put in evidence the strong eco-

nomicist orientation behind flood risk management state efforts. Controlling and managing the lakes was, above all, a productive concern; a form of regulating the water outflows to produce hydroelectricity for the coastal cities while managing the risk of lake outbursts.

In this effort, however, scientists and engineers were not operating alone. As Carey points out, highland peoples would also be fundamental actors in developing glaciological knowledge and constructing mitigation infrastructure. Colloquially known as *laguneros* (literally lagooners), locals living in villages and hamlets close to the lakes would share their knowledge of their surroundings with researchers, supporting them with facts about the occurrence of certain events and their understanding of local dynamics. Moreover, they would provide the necessary workforce for the construction of draining canals and dykes to reinforce the weak morainic walls containing glacier meltwater.

The introduction of labour-based work in those parts of the Andes would help to install a form of time and temporal rhythm so far only existing in the lowlands of the Callejón de Huaylas. *Laguneros* would become the main workforce for any task related to the management of the glacial lakes: from monitoring and informing about the occurrence of outburst floods to working on engineer interventions. The *Comisión de Lagunas*, in this sense, would be conceived as a civilisatory entity introducing and promoting a modern life-rhythm regulated by the standards of the salaried work, Carey affirms. It was a contractual relationship that, nevertheless, would also generate friction between the parts. While public officers would constantly complain about the unpunctuality and unseriousness of local workers in fulfilling their jobs, the latter would constantly demand basic improvements to their highly precarious working conditions, and accuse the commission of failing to make payments and violating initial working agreements. Moreover, balancing their tasks as *laguneros* and their duties at their *chacras* to take care of crops and animals would be a constant challenge for *laguneros*, even nowadays.

Despite the latent conflicts between *laguneros* and risk mitigation agencies, engineering works would bring several benefits to the higher areas of the Callejón de Huaylas. An important part of the engineering interventions would lead to the construction of roads and byways such as the one heading to Palcacocha, connecting urban areas with places of the Cordillera Blanca that, until then, had been untouched by the Peruvian state. According to Carey, the work in the highlands brought for the very first time direct connectivity to small hamlets and mountain communities that had been historically marginalised from the national project of economic progress and development. Furthermore, this new infrastructure would enhance tourism at a greater scale – a niche that, as mentioned in previous chapters, would also profit from the increasing expeditions of scientists and their outstanding visual registers of the mountain landscapes. As part of the Santa Corporation, the Lakes Commission was fulfilling its role in promoting economic development in the region

by "'open[ing] up" the Cordillera Blanca and broad[ening] interaction between local communities and outsiders' (Carey 2010, 111). It was a virtuous circle of economic growth that shaped and reinforced the relationship between the low- and highlands – at least to the eyes of authorities.

The flood risk management system would keep mutating according to the country's political scenario and based on the extreme events impacting the nation. As a response to the 1970 earthquake and avalanche, the government inaugurated the National System of Civil Defence (*Sistema Nacional de Defensa Civil*, SIDECI) within the Defence Ministry, nurturing narratives relating extreme climatic and seismic events with situations threatening the country's internal security. Efforts in this regard would combine military-based strategic thinking with techno-scientific approaches for civic preparedness amid extreme events, in tune with Velasco Alvarado's own military background and the Cold War scenario at an international level (Davis 2007; Masco 2014; Stehrenberger 2017). Moreover, the dramatic consequences of the *El Niño*-Southern Oscillation in the north of the country, first in 1999 and then in 2009–2010, would lead to a strong reformulation of Peru's risk management system. Inspired by the advice of the Hyogo Framework for Action 2005–2015 developed during the Second World Conference on Disaster Risk Reduction (UN/ISDR 2005), the Peruvian government enacted Law Nr. 29.664 in 2011 to create the National System for Disaster Risk Management (SINAGERD), an integral scheme defining three main lines of work: preparedness, response and recovery – officially defined as prospective, reactive and corrective management levels (PLANAGERD 2014). From that point on, the system to cope with extreme events such as floods and earthquakes would be split into two central institutions: a responsive dimension commanded by the Institute of Civil Defence (INDECI, former SIDECI) and a preventive one under the National Centre for Disaster Risk Assessment, Prevention and Reduction (CENEPRED) – also under the umbrella of the Defence Ministry. The work of both agencies would lead to the coordination of the country's Emergency Operation Centres at all levels: national (COEN), regional (COER) and local (COEL) – agencies created through Ministerial Resolution Nr. 059 in 2015. It would also include coordination with state agencies in charge of building mitigation infrastructures, such as local and regional governments, the National Water Authority (*Autoridad Nacional del* Agua, ANA) and agencies from the Ministry of Development and Public Works.

The various institutional transformations and interests in glacial lakes and water resources would lead to the creation of a risk culture in the mountain cities of the Callejón de Huaylas. The population would be increasingly aware of the dangers they were facing, requiring more interventions in lakes and creeks. The engineering works would be a pivotal means of controlling the water flows from mountain lakes and developing different forms of dams and walls to contain possible outbursts. These interventions would also introduce new rhythms and lifestyles to the higher

parts of the Cordillera Blanca, facilitating the connection of these zones with the urban areas in the lower lands through new roads. However, this would also lead to divergent positions, and therefore some disagreement and discord, concerning the management and control of glacial lakes. *Laguneros* would find it difficult to keep up with the schedules of their precarious work, as required by state agencies, while struggling to make their new tasks compatible with their traditional duties. Moreover, the increasing arrival of new actors in the Cordillera Blanca would slowly generate different types of conflicts, which, as we will see, have escalated in accordance with the further political changes in the region and at the national level.

Glaciers as a project

Hidden on the upper floor of Huaraz's Provincial Municipality building, in front of the city's *Plaza de Armas*, connected by some exterior hallways that give the feeling of being in front of a secret – or maybe forgotten? – area, lies the central monitoring station of Huaraz's early warning system; a video-surveillance centre – as presented to us – overseeing the state of the mountain lakes located above the city. The office, of around 20 square metres, appears brand-new, furnished with several wooden desks and office chairs, most of them empty and showing no sign of having being used. A recently installed kitchen area in one corner retains plastic wrap still covering its few tools. It is an office that, despite being operational for almost a year, still gives the impression of awaiting the arrival of a large contingent of workers.

Amador shows us the room; excited, eager – proud, like a father bragging about his child. Perhaps because he considers the SAT as his own child. *It's like my own child!* he exclaims, finally. As a member of one of the municipal associations involved in the project, Amador has been a leading proponent of installing the SAT in his hometown. However, it is a project that has meant sweat and tears for him. Many Huaraz officials were – and remain – sceptical about the necessity of the SAT, arguing that Palcacocha does not present a severe risk of outburst. Such comments have cause Amador several fights during municipal meetings; many moments when he thought the battle for the SAT was lost. But after years of knocking on doors, finding allies and placing the necessity of the early warning system on the public agenda, he succeeded. The system is there, right in front of us. Or part of it, at least.

The SAT is a combination of several technological instruments operating simultaneously to ensure what experts define as redundancy: an excess of information channels to ensure that, if one or two of them fail, there will always be another operational channel to provide warning of an extreme event. It is a form of redundancy that also includes people, despite efforts to minimise the system's dependency on human labour. Besides the four guards working individual shifts day and night at the monitoring station in Huaraz to inform authorities about any significant anomaly

at the lakes, those such as Palcacocha are still watched by *laguneros* day and night. Whereas the presence of *laguneros* has decreased considerably nowadays, the Regional Government still maintains its contractual relationship with some of them. Workers toil for long shifts of 15 days, often alone, in the solitude of Palcacocha, facing very precarious working conditions. *Laguneros* are required to fulfil strict monitoring tasks, radioing reports every two hours, even at night, to the COER and the Municipality's monitory station. Because machines can fail, and the flood risk management system requires *laguneros* in case that happens, life rhythms are still shaped by the necessity of controlling time at the highest peaks of the Cordillera Blanca.

Whereas various devices and objects – computer screens, laptops, printers, telephones, radio transmitters and documents – are present at some desks in the half-empty SAT office, one area appears to be the centre of the whole station, the focal point to which Manuel, the guard on duty that day, directs his attention: the four main computer screens (see Figure 12). The screens offer a window onto another reality, only upstaged by the two *real* windows and the natural light they provide.

Figure 12: SAT's main monitoring station in Huaraz's Municipality
(Usón 2022)

The two upper monitors show data from Palcacocha's most exceptional instruments: the accelerometer and the radar. On the upper-left screen, three graphs sum-

marise data from the accelerometer, located at a high point on the moraine containing the glacial lake and registering vibrations from the water and surroundings. Should a large piece of the glacier fall into Palcacocha, the accelerometer would relay the resulting vibrations, in real-time, as a spike on the graph. The upper-right screen graphs the current water level in Palcacocha, as provided by the radar sensor. Located at the edge of the lake, the radar bounces radio waves off the lake's surface, using the echo to estimate changes in the water volume or surface characteristics. Like the accelerometer, the radar also provides real-time data about the lake.

The lower-left screen shows real-time image of lakes Palcacocha, Cuchillacocha and Tullpacocha, each identified as presenting a risk of outburst events. However, the early warning system – including the accelerometer and radar components – is currently only fully operational for Palcacocha, Huaraz's most infamous source of flood risk. Further monitoring systems for Cuchillacocha and Tullpacocha are planned. In the meantime, the cameras offer a panoramic view of the three lakes, and can be easily controlled from the surveillance centre where we are located. It is a useful visual resource to create a sense of control through direct observation.

Finally, the lower-right screen shows general meteorological and barometric data from Palcacocha: the lake's water volume and level (both estimated by the radar at its edge), outflow (measured by a flow meter at the discharge point of the downstream drainage syphons), wind speed and direction, precipitation levels, ambient humidity and temperature – all of them captured from a weather station attached to the same antenna pylon as the video camera. All of the system's data-feeds appear to be functioning, except that for the lake's total volume. According to the SAT radar estimates, the current water volume is around 15.8 million cubic metres, whereas a barometric system installed in the lake by other agencies indicates more than 16 million – almost half a million cubic metres more. Manuel indicates that, due to this variance, the volume data provided by the SAT may be replaced by that from the barometric system.

Cross-checks between the monitoring system and other instruments do not end there. Located on the left of the main desk, below the main screens, is another computer, smaller in size and less obvious. It shows data and images similar to those on the main screens, but relayed from a station at Rajucolta lake, located south of the other three neighbouring water bodies. Rajucolta presents a risk of outburst that could impact Macashca, a small locality in the south of Huaraz. This small computer provides data types similar to those for Palcacocha (i.e., water level and volume, a live panoramic view of the lake, meteorological information) but also from additional instruments, such as an image indicating whether or not the flood alarm is on. This early warning system, donated to the Municipality by the company Orazul Energy tasked with managing the lake, promises to be an alternative to the complex network of devices installed in Palcacocha. It operates through a buoy located in the water, which turns out to be a simpler system than the SAT's combination of

accelerometer and radar. It also consumes considerably less energy, making it less susceptible to power interruptions.

The apparent technical disadvantages of the SAT compared with other devices have been a source of criticism not only among authorities in the region but also among the general public. After the SAT became fully operational, the Regional Government and the agencies behind the project prepared the first alarm test in Huaraz by December 2020. Yet this first simulation was highly controversial. Despite official efforts to inform the population about this initial test, an important part of the city was completely unaware of it, causing panic among residents who heard the deafening alarm sirens all over the city without knowing what was happening. Learning from the panic caused by the first test, the authorities lowered the volume of the sirens prior to a second simulation in May 2021. The result was an alarm that almost nobody could hear. Hence, from initially producing fear and panic, the early warning system went on to disappoint people. In the following months, the equipment suffered power interruptions due to snow accumulation on its solar panels, leading to a generalised verdict among *Huaracinos*: the SAT wasn't working. It was deemed a useless system, a waste of money or, worse, an excuse used by authorities to misappropriate funding. Consequently, alternative solutions were introduced, such as the early warning system installed in Lake Rajucolta, creating permanent tension and ongoing debates among agencies, concerning which system is the most efficient and responsive to outburst floods.

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The history of the SAT implementation in Palcacocha relates strongly to dramatic transformations of the Peruvian risk management system experienced in the 1990s. The successful consolidation of a robust risk management system in the Cordillera Blanca in previous decades would be deeply jeopardised by the radical neoliberal agenda of Alberto Fujimori, imposing strong budgetary and administrative cuts and privatisation processes. Once an iconic agency for the study and control of mountain lakes in the region, the Lake Commission suffered the dramatic consequences of the new political orientations, which aimed to minimise the presence of the state's administrative apparatus in the Cordillera Blanca. The Commission became the Unit of Glaciology and Hydrological Resources (*Unidad de Glaciología y Recursos Hídricos*, or UGRH), administered by the privatised energy company Electroperú, and suffered both substantial budget cuts during those years, and the relegation of flood risk management plans and programmes to a secondary issue for the public agenda. As UGRH, the agency would no longer oversee construction of mitigation infrastructure, instead focussing exclusively on monitoring, registering and assessing glaciers and mountain lakes nationwide.

The population's concern about lake outbursts in the region would arise again in the 2000s, following flood alarms in different parts of the region. One involved a major flood event in April 2010 that concerned Carhuaz and its surroundings, when a rock-ice avalanche from the top of the Hualcán Mountain fell into Lake 513 and triggered a tsunami-like wave large enough to overtop the 20-metre freeboards of the moraine dyke (Schneider et al. 2014). The outburst produced a debris flow that ran downstream along the Chucchún River, 513's central outflow, until reaching the city of Carhuaz, resulting in minor street-flooding. The event caused no fatalities and did not represent a serious threat to the town, but did significantly damage infrastructure along its path, including roads, bridges, properties and a water treatment facility, and flooded an area of more than 500 square kilometres (Carey et al. 2012; Vilímek et al. 2015). Defined as a cascade of mass movement processes, experts concluded that such an outburst flood could re-occur at greater magnitude, given the geomorphology of the zone and Hualcán's unstable slope immediately above Lake 513 (Schneider et al. 2014).

Perhaps one of the most important political effects of the 2010 was to set the scene for the creation of the National Institute for Glaciology and Mountain Ecosystems (*Instituto Nacional de Investigación en Glaciares y Ecosistemas de Montaña*, INAIGEM) in 2014, a new agency in charge of studying glaciers and assessing the state of glacial lakes at a national level. According to glaciologist and mountaineer Benjamín Morales, who had a leading role in the creation of INAIGEM and was appointed as its first director, the creation of the institute was also strongly influenced by the political scenario at the time. In 2014, Peru hosted the twentieth Conference of the Parties (COP20) in Lima as part of the United Nations Framework Convention on Climate Change (UNFCCC). The then-government of Ollanta Humala used the context to promote a public image of a nation engaged with climate change. Figures like Morales would use that opportunity to champion the need for a research institution exclusively for assessing glaciers, leveraging the imminent threat revealed by the 2010 flood. 'They took away the issue of security or prevention and put in mountain ecosystems …, a contribution to the environment, climate change, etcetera. [Humala] announced the creation of this institute that had everything to do with the environment and climate change', Morales affirms. It was an apparent win–win scenario – a form of engaging with current debates worldwide about climate change and biodiversity without compromising the need to seriously address flood risk and threats associated with glacial retreat.

The creation of the INAIGEM, however, would not be without controversy. UGRH would continue operating as a unit in charge of assessing the condition of glacial lakes in the Cordillera Blanca[4]. This apparent overlap of responsibilities

4 Efforts to merge both agencies were proposed since the creation of INAIGEM. However, UGRH's unwillingness to consider this matter seemed to make any institutional fusion rather

would lead to friction and tense discussions between these agencies. It would even lead to the duplication of work and studies, such as a glacial register developed independently by both agencies (UGRH 2014; INAIGEM 2018) and flood hazard maps for cities like Huaraz. With both having a strong orientation towards research, the two agencies would prioritise their own outcomes and question the approaches and methodological decisions of the other. Furthermore, neither INAIGEM, UGRH, nor any other state agency would agree to take on the responsibility of overseeing the construction of new dams or embankments. 'Nobody wants to take risks because … if there is a flood, then they are afraid that they, the ministry in charge of it, would be held responsible', Benjamín Morales tells me. With no national agency officially in charge of reinforcing the dykes and walls retaining glacial lakes, Ancash's regional and local governments, supported by private companies appointed through tendering procedures, would be officially responsible for conducting engineer interventions for glacial lake security in a rather precarious manner, as our walk with Roberto showed.

Besides having a clear influence on state agencies, the 2010 flood would also promote the articulation of projects and working strategies from non-governmental and international agencies. In 2008, the Swiss Agency for Development and Cooperation (COSUDE in Spanish), which has worked on poverty reduction in Peru for more than 60 years, selected climate change adaptability as a priority issue for its work on a global scale. One of the leading programmes defined for Peru was oriented around climate change adaptation plans, specifically concerning glacial retreat. This strategy would converge in *Proyecto Glaciares*, an initiative launched in 2011 that aimed to identify concrete measures to deal with glacial-based risks while fostering the development of local and regional capacities to cope with them. Supported by members of Zurich University, COSUDE would lead a series of training curricula, including workshops, conferences and even a Master's-level degree programme in climate change at the University of Cusco. Moreover, the project would develop a full plan of flood risk preparedness for the city of Carhuaz, including talks and workshops, the creation of a flood hazard map and, particularly relevant for this chapter, the installation of an early warning system, the first of its kind in the country.

The early warning systems came to introduce a new form of temporality in the region. Lake monitoring was one of several operations that introduced clock-based time to the Cordillera Blanca; a system regulating the working rhythms in the mountains, and requiring participating *laguneros* to send regular reports on the state of

improbable. This appeared to start changing by the end of my last visit to Huaraz in February 2022, when negotiations finally started seeing positive results for making UGRH, together with all its team, part of INAIGEM. Progress on this matter, though, would be quite limited during the following months.

lakes like Palcacocha at specific moments of the day. Yet, previous human-based surveillance strategies, based on long-range radio communication systems connecting mountain lakes with cities like Huaraz, were considered a simple complement to the real mitigation works: the conduction of infrastructural interventions like dams and retaining walls. The reason for this, as we saw, was the authorities' strong mistrust of *laguneros* and their working times. The SAT inaugurated an augmented monitoring system to warn cities downstream of possible flash floods, aiming to reduce the limitations of previous human-based monitoring efforts. The unreliability of *laguneros* and their irregular shifts was now replaced by a semi-automatic warning system operating day and night with real-time data transmission. Early warning systems, in this sense, introduced a new form of preparedness, so far non-existent in the Callejón, rendering the monitoring efforts a central component in the control of mountain lakes – rather than a simple complement to mitigation infrastructure.

Poryecto Glaciares operated as a true hub where different agencies and organisations would come together to successfully implement the early warning system. The technical assessment and installation of the SAT for Carhuaz and the surroundings was delegated to a team from Zurich University in cooperation with other Swiss agencies, including private companies and research associations. Commanded by the glaciologist Christian Huggel, the research group would install five stations distributed along the Chucchún River, including the monitoring station near Lake 513 and a second station placed at Shonquil Pampa. Besides COSUDE and Zurich University, another key organisation for *Proyecto Glaciares* would be Peru's office of the Cooperative for Assistance and Relief Everywhere (CARE Peru), a non-profit international humanitarian agency based in Switzerland, working on the delivery of emergency aid and the execution of international development projects. Due to its strong experience in the field as a project executor, CARE Peru would lead the direct coordination and execution of the project's territorial incidence component, which, in addition to installing the SAT at Lake 513, would include an awareness programme to sensitise the population to issues of climate change and glacial-based disasters. Additionally, it would consider a training programme for institutions involved in disaster risk management at regional and local levels, working closely with municipalities, emergency offices, schools and health centres on the matter. Based on modelling results from the Zurich University team (Schneider et al. 2014) and the support of state agencies like INDECI, CARE Peru would also elaborate a flood hazard map for Carhuaz, which would be placed in several parts of the city, including the municipal centre, public spaces and shops.

CARE Peru's work in the zone also included a series of socioeconomic development measures, with a strong emphasis on the areas surrounding Hualcán and, notably, Shonquil Pampa due to its strategic position. Given its vast area (approximately five linear kilometres) of flat terrain with lack of slope, Shonquil is considered a buffer zone against possible floods, in which floodwater slows and deposits

part of its sediment load – the perfect place to situate one of the SAT's monitoring stations. A zone of vital importance for the economic activities of grazing associations, Shonquil Pampa represented the perfect case where *Proyecto Glaciares* would be able to put into practice the classic economic assumption that risk scenarios can also bring 'new opportunities'. Convinced of the relevance of including the local population in the development of the project, the agency analysed the type of productive activities present in these areas with the goal of accompanying risk management measures with economic development programmes, including livestock management training and funds for improving irrigation and grazing infrastructure. The approach aimed to create a sense of reimbursement in the zone, with the implementation of *Proyecto Glaciares* providing direct benefits for the local population.

During the first years, the project team made great efforts to create links with local actors and to inform them of the dangers of a flood from Lake 513. However, members of the project recognise that this had limitations and that the main emphasis was on mitigating the consequences of a possible flood, especially in the lower areas. The coordinating team also points out that there was a lack of greater involvement with the grazing communities in the Shonquil area about the purpose of the SAT, with whom there were only partial discussions of the equipment's goals and operation. According to Fiorella Miñan of CARE Peru, and part of *Proyecto Glaciares* at the time:

> when the SAT was implemented, there were also training and workshops with the population. We basically worked in the alluvial area [in the lowlands, where Carhuaz is located], in the most dangerous zone. But we didn't work too much with the areas close [to the lake] because we didn't have enough time or budget. … What we did initially was develop a communication strategy for the population in the communities. But perhaps within the same population there were different nuances. So, perhaps it would have been important to reach that level of specificity.

Despite those limitations, members of the *Proyecto Glaciares* were satisfied. Residents from Carhuaz acknowledged the efforts of CARE, COSUDE and Zurich University, welcoming them with gifts and organising open celebrations. Although some project members started hearing certain rumours about highland residents being unhappy with the equipment close to the lake and in Shonquil Pampa, they did not pay too much attention. Some sources even affirm that a local leader officially requested Carhuaz's mayor to remove the equipment in February 2016, but no action was taken (Fraser 2017). 'It seemed like everything was fine, and suddenly we got some comments that people weren't comfortable with the early warning system. It was 2016; they were saying that the early warning…we were in a drought, and it didn't help them. But during the inauguration there were a lot of people very grateful. It was a bit weird', affirms Jocelyn Ostolaza, a director of COSUDE in charge of *Proyecto*

Glaciares. Nevertheless, the various agencies were convinced that their work and interventions were successful and highly welcomed, at least in the lowlands. It had to be the right thing, they thought. After all, it was a system aiming to protect the population. Why would not they be happy?

Who destroyed the SAT? Fuenteovejuna did it

Some holes filled with concrete and wooden sticks are all that is left of the Lake 513 monitoring station. If Mauro were not there to show me the site, I would have never guessed it was previously the location of high-tech equipment capable of measuring changes in the lake. The station at Lake 513 was one of four units comprising Carhuaz's early warning system. The station's instruments (similarly to Palcacocha: an accelerometer to measure changes in speed and/or direction of the water surface, video and photographic cameras, an antenna and data logger) were all placed in a perimeter no larger than a couple of square metres and on a five-metre pole. At the time of my visit, just a few parts of the perimeter fence remained. Camouflaged between the green soil and the characteristic Andean *ichu* (feathergrass), those traces say little about those conflictive instruments installed more than five years previously. The rest of the equipment is all gone.

Mauro looks at the site in silence, resigned to the fact that a project like that will probably never take place again. As a former official of the Carhuaz Provincial Municipality, he took part in most of the conversations and negotiations with the different agencies and groups involved in the installation of the system – including Shonquil Pampa's Herd Association, which many in Carhuaz consider responsible for attacking the stations. Even though he affirms that people in the area have already started to change their opinion of the early warning system, and to reconsider the idea that the sensors formerly installed there influenced the region's lack of rain, he believes that the time for such equipment has already passed. Voices against the instruments are still very powerful. It is a lost battle, he thinks, an opportunity that the region wasted for what he considers a huge misunderstanding resulting from lack of education and poor communication.

Besides viewing the former site of the destroyed monitoring station, I found myself at Lake 513 together with Mauro to see the engineering works installed over past decades to reduce the risk of an outburst flood: a first installation of two syphons in the late 1980s that increased the freeboard of the bedrock dam from one to nine meters, and a second more permanent solution consisting of a 150-metre-long tunnel beneath the bedrock, which lowered the water level another 20 metres (Reynolds et al. 1998). Compared with Palcacocha, Lake 513 is notoriously inaccessible, being locating in a remote area of the Cordillera Blanca at more than 4,000 metres elevation. The route from Shonquil Pampa (see Figure 13), the last access point for vehicles, in-

volves a four-hour hike along a very steep path over slippery rock walls. Engineers and workers at the time had to carry all the working equipment with the help of pack animals. It was a massive logistical effort that, nevertheless, paid off well. If it were not for the drainage system, the flood events of the following decades, including the 2010 outburst flood, would have been considerably worse. It is an intervention that is still remembered as an engineering masterpiece, part of that nostalgic legacy of a strong institutional apparatus created to cope with the threat of uncontrolled flooding from the Cordillera Blanca.

It is intriguing how differently the local population reacted to the two risk reduction strategies implemented for the lake – the construction of drainage tunnels versus installation of the early warning system. According to Mauro, the engineering interventions were valued and appreciated by the population all over the Shuccshún River Basin, the same river that threatens to overflow with every outburst flood at Lake 513. It was a collective effort to drain the lake, an intervention that counted on the help of upland towns – including the Shonquil Pampa Herd Association. However, the early warning system was different. The transversal support that engineering interventions enjoyed in the past seemed to vanish when referring to the SAT equipment. Although apparently accepted at the beginning, the SAT came to divide the population over time. Its operation, as we have seen in this chapter, was a response to decades of flood risk management in the region, and was influenced by the country's changing political scenarios. From a mitigation-based approach founded on the notion of civil defence, the country would inaugurate a full agenda of risk preparedness and prevention, employing devices like the early warning system as central to the temporal control of emergencies. But they would also generate all sorts of reactions within their direct surroundings, leading to the ultimate destruction of all the stations.

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The destruction of the SAT was neither the first nor last act of sabotage targeting scientific equipment in the region. In the 1990s, a similar case to that at Lake 513 occurred nearby, at Lake Auquiscocha. According to Mark Carey (2010), the community from Shilla, a nearby village and part of the Carhuaz Province, destroyed a pluviometric station installed close to the lake and violently expelled the group of glaciologists in charge of the project. The community, Carey explains, gave similar reasons to those in the case of Lake 513: blaming the station for a drought. Long before the attack, the local population already suspected that Auquiscocha was a 'difficult' lake, that it was *encantada* (enchanted), and that any intervention there could trigger its anger and cause its collapse (Stein 1961; Carey 2010). Similar attacks took place in 2019 when an expedition to the Huascarán, commanded by the famous US

glaciologist Lonnie Thomson in cooperation with INAIGEM, was blocked by a local community at the foothills of the mountain who confiscated their equipment and forced the group to leave (Usón and Jasper 2025). In all of these cases, similar reasons were given: foreign devices used for wicked intentions were considered an imminent threat to the community's security.

Figure 13: Remains of the early warning system station in Shonquil Pampa. In the background, Hualcán Mountain, where Lake 513 is located
(Usón 2019)

The strong veil of secrecy around the destruction of the Lake 513 SAT makes it very difficult to find first-hand accounts about what happened that day. During my visits to the Carhuaz Province highlands, I did not find anyone who would openly admit to having taken part in the attacks – and with good reason, since responsibility for this criminal act carries legal consequences. The few people I spoke with who affirmed having witnessed the mass of people gathered at Shonquil Pampa were reluctant to provide many details, only specifying that it was a large crowd from diverse localities. According to Miguel Peñaranda, an officer from the Provincial Municipality of Carhuaz who closely followed the whole conflict, it is very difficult to open a legal investigation under those circumstances, because the same members of the *comunidades* protect each other. He associates the situation with Lopez de Vega's historical masterwork of the Spanish theatre, Fuenteovejuna, which portrays the murder of commander Fernán Gómez de Guzmán at the hands of inhabitants

of Fuenteovejuna following years of mistreatment and abuse. When a magistrate assigned to identify the culprits interrogates the villagers, they all simply respond: 'Fuenteovejuna did it'. 'It's just like in the play, right? We all did it', Miguel tells me. In this case, however, not everyone participated in the events at Lake 513. It was the *comuneros*. But from which *comunidad*?

At this point, accounts start to diverge. Whereas some people associate the first attack with an attempt to steal the equipment and make some profit from it, others say that it was a politically driven action. The latter versions affirm that events began with an earlier conflict, between people from Hualcán and its surroundings versus those of Carhuaz, concerning a drinking water project inaugurated during Ollanta Humala's presidential administration around 2014. Carhuaz was facing a severe water shortage at the time that demanded new water catchment infrastructure in the higher lands. The new catchment points, however, meant a reduction in the amount of water available for irrigation in the upland areas, a cost that the people from Hualcán and the surroundings had to bear without any compensation. In addition, the project required the installation of several kilometres of pipelines on communal and private lands, which was also carried out also without any indemnification. Some people believe that Hualcán's former mayor used this situation for political purposes to demand more resources for his community from the provincial Municipality in Carhuaz. Rumours accuse him of inciting the population to cut off water supplies to Carhuaz if they were not compensated for the interventions made. Furthermore, it is rumoured that he encouraged others to destroy the recently installed early warning system as a way of generating pressure – an accusation that has never been confirmed. This version of the story suggests that although the former mayor's administration ended some weeks before the first attack on the monitoring station, his influence would have still been sufficient to incite the destruction. For unknown reasons, the early warning system came to be associated by some with the drought affecting the region, which would have elicited the second attack in November.

Other versions, however, affirm that rumours about the SAT's link to the drought originated from other *comunidades*, not from Shonquil Pampa vicinities, let alone Hualcán – but from farther away. Miguel Peñaranda from the Provincial Municipality of Carhuaz suggests this, affirming that people from Hualcán had nothing to do with the destruction. 'The whole area of Huaypán, I don't remember the names of the communities right now, but it is the area that belongs to Yungay Province, all of them crossed over and arrived here', he affirms, referring mostly to villages located to the north and outside Carhuaz's jurisdiction.

Nicolás Peje, Hualcán's current mayor and one of the few people I spoke with who admits witnessing the attack, argues the same. As somebody who went to Shonquil Pampa with other authorities during the second attack, attempting to dissuade people from destroying the equipment, he says that most of the participants were from

other places. Nicolás suggests that members of *comunidades* from several surrounding towns, including Runtu, Pariacaca and Musho, gathered at Carhuaz's stadium the previous day to discuss the actions to be taken against the equipment at Lake 513. He recalls widespread rumours throughout the Callejón de Huaylas, claiming that the monitoring equipment was preventing rainfall, a situation that the *comunidades* from both the Cordillera Blanca and Negra determined to resolve. 'From Hualcán we went up to about seven people to see what was going on. But more came from other *comunidades*, because *comuneros* are obliged to if the *comunidad* says so. They draw up an act, and whoever doesn't obey pays a fine'. Just as people from Carhuaz blame Hualcán – the faraway village in the highlands of Carhuaz, for the destruction of the stations – Nicolás seems to do the same with other areas, other *comunidades*. The problem, he affirms, comes from somewhere else, not from his people.

No matter which version of the story we consider, *comuneros* are always held responsible – an anonymous mass from distant villages attacking the instruments while under the effects of alcohol and coca. Whether guided by superstition or political motives, arguments around the destruction always involve themes of ignorance, desperation and manipulation. The amorphous mass that *comuneros* comprise represents a form of alterity that is even invoked by local residents from Hualcán. Just like the so-called *indio* or the indigenous in the past, the figure of the *comunero* embodies that responsibility, independent of context or motivation. Once again, the highlands entail, as in other moments of history, a barbaric space that supposedly only education and the civilising ethos of urban life can remedy.

The gringo menace

We are almost ready to leave! screams Nicolás Peje, Hualcán Town's mayor, to the group of people waiting in the municipal SUV – me included. He and other officers are putting the last touches to some wooden signs that his administration wants to install in Shonquil Pampa together with the Provincial Municipality of Carhuaz, the administrative unit to which Hualcán – and the city of Carhuaz itself – belong. The signs were a donation from the Peace Corps, a US agency with presence in the region, as part of an integrated project for tourism and reforestation that they wanted to conduct in the zone. Framed within its agenda for rural and sustainable development, the agency committed to donate 3,000 pines to Shonquil Pampa Herd Association for reforestation purposes. In return, it was agreed with the association's directory, with Carhuaz Municipality working as mediator, that the community would allow and support the installation of the signs Nicolás is completing preparations for a tourist trail along the Cordillera Blanca.

Despite its threatening condition, Lake 513 and its surroundings offer an astonishing mountain landscape of idyllic beauty, which, in the eyes of the Municipality,

has a strong tourist potential. Mauro from the Carhuaz Province Municipality, one of its main promoters also present that day, sees in the tourist trail an opportunity to expand Carhuaz Province's tourist sector, which is modest compared with other locations in the Cordillera Blanca. His idea is to connect the trail – involving Lake 513 and its neighbouring Lakes Cochca and Auquiscocha – to a major circuit of local amenities. The project, however, does not seem to have the same positive perception among local residents.

As we arrive in Shonquil Pampa with the signs in the SUV, we find the entire Herd Association gathered in the sector: about forty people, mostly men aged between 25 and 60. Members of the association seem upset. They have been waiting for hours to talk to the municipal authorities. As soon as we approach the group, some of them start asking Mauro, Carhuaz's officer and the project's visible head, about the alleged agreement between the Municipality and the association regarding the tourist signs. Association members intervene very angrily, arguing that this agreement was never discussed with the entire association and that they were unaware of the signs. They also seem to doubt the intentions of both the Municipality and the Peace Corps. Mauro and other municipal members are repeatedly asked *Why do you really want to install these signs?*

After minutes of intense discussion between both sides, in which Mauro and Nicolás try to insist calmly that the signs have a touristic purpose, the main suspicion is revealed: they believe that the Peace Corps is receiving money from CARE Peru in what they interpret as an effort to re-install *esas cosas* (those things). *If the people don't want the equipment, it won't be installed!* exclaimed one Association member. *The meeting was in the Municipality and without the association!* exclaims another. Mauro insists on defending the tourist route to the lake, explaining that it has nothing to do with the early warning system. His explanations, however, do not convince the Association members, who continue to question the presence of foreigners, including myself, in the area. *The gringos are coming in from all sides, now we are already fighting!* says one.

The mood of the gathering, which slowly turned into a local assembly, remains volatile. One of the attendees affirms that things are happening and that the landscape is changing. He mentions the changes in places like Pastoruri, one of the most famous glaciers in the Cordillera Blanca, visited by thousands of tourists every year. He claims that the landscape there used to be beautiful, but is now all ruined because *gringos* have moved in. He also says that machines of all kinds were being introduced. *Culture brings these problems. Gringos destroy everything!* he finally adds.

The air of mistrust is widespread. Some continue to link all this to the early warning system, destroyed and dismantled some years ago. Another person refers to *pluviómetros*, rain gauges that have been installed there and in other parts of the valley, whose purpose he claims – attributed to information he had seen on the Internet – is to *reduce* rainfall. That is their main function, he affirms, as the *pluvio* in their name suggests. It could be for preventing floods, or for mining purposes, who knows?

Rainfall was apparently a problem for the *gringos*, and so their machines were there to stop it.

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The scene I witnessed in Shonquil Pampa reveals a fundamental issue around the SAT case: the definition of an external figure – in this case the *gringo* – as primarily responsible not only for the drought affecting the grazing lands and its surroundings, but for almost every environmental problem faced by the region now and in the past.

Historically, the figure of the *gringo*, like other figures, has come to define a controversial otherness in the Andes. Related in some cases to a benevolent figure, especially when connected with aid agencies, NGOs and other philanthropic organisations, the *gringo* has also personified the upheaval initiated by the colonial world more than 500 years ago. The figure of the *gringo* can been related to the *pishtaco*, another historical figure that, as Mirosław Mąka and Elżbieta Jodłowska (2019) suggest, is a direct conceptualisation and visualisation of the trauma experienced under the *conquista*, itself a disaster for the native population. This syncretic figure emerges as a thematisation of the massive extraction of resources from the colonised lands, a process that the local population embodied in this mythical figure. According to local stories, the *pishtaco* is a foreign-looking person that steals the fat (*grasa*, *wira* in Quechua) of the indigenous inhabitants, an element that is considered a sacred substance in the Andean world as it carries the essence of life[5]. The *pishtaco* extracts the fat of living people not for his own consumption but for the reinforcement of technological equipment. 'The fat', Mąka and Jodłowska (2019, 134) affirms, 'goes to the cities of the Pacific Coast, to their churches and convents, to the mines, factories and enterprises. From there it is shipped further – to Spain and the United States, or it is used by the Peruvian government in its international transactions'. The authors even suggest that there is the belief that the fat was commonly used to reinforce and refine the oldest church bells in the country, which is why they have the best sound. Just like minerals from the mountains, the extraction of the fat fulfils a commercial and productive purpose. It is the same substance of the native body that is used for colonial endeavours.

Throughout history, the appearance of the *pishtaco* has undergone several changes. He has been associated with the figure of monks and priests, the *hacendado*

5 It is no coincidence that one of the main figures of the Andean world is Wiracocha, the creator of the *runakuna*, which literally means 'fat of the lake'. The name refers to one of main foundational myths of the Quechua and Aymara worlds, in which Wiracocha emerges from the foam of the water of Lake Titikaka. Wira, Quechua for both fat and foam, comes to personify that moment when life is created.

(landowner), soldiers, doctors or any other foreign figure in the eyes of the Quechua population. According to Anthony Oliver-Smith (1986, 19), at the time he was conducting fieldwork in the Callejón de Huaylas, the *pishtaco* was portrayed as 'a large man, white or mestizo, who wears a leather jacket, boots, and a broad-brimmed hat'[6]. He has even been related to the figure of the *Chileno* (Chilean) due to the Confederation War of 1836–1839 involving Peru. During that conflict, the Chilean army, supporting the counter-revolutionary army of General Agustín Gamarra against the forces of the Peru–Bolivian Confederation, advanced throughout the country until reaching the Department of Huaylas, now Ancash. There, they fought the Battle of Yungay, close to the town of the same name, defeating Peru–Bolivian Confederation forces and ending the war. The Chilean forces are remembered as a bloodthirsty army, supporters of a traitor like Gamarra and perpetrators of the most terrible war crimes in the region (Villanueva Torrealba 2019). Later, during the Pacific War of 1886–1889, again involving Peru and Bolivia against Chile, the figure of the external Chilean enemy was strengthened, further feeding the notion of an evil force threatening Peru's national sovereignty. Nowadays, Chileans are often portrayed as rich, arrogant foreigners who come to the region to open all sorts of businesses – from blueberries harvested for exportation to pharmacy chains and retail shops. Being originally from Chile, I was confronted with these stories several times in the region, as a sort of recrimination about the past actions of my fellow *Chilenos*, to which I responded apologetically and with quite some embarrassment.

Representing a continuity with the figures of the *pishtaco* and *Chileno*, Marcos Yauri Montero (2014) suggests that the *gringo* has become the most prominent stranger denoting a threatening otherness, following the expansion of mining in the region during the past decades, especially during the 1990s. The *gringo*, Yauri affirms, would have assumed this predominance due to the 'presence of multinational capital investment in mining and the consequent ecological disruption, and the environmental, cultural and other social pollution' (Yauri Montero 2014, 30). The neoliberal agenda pushed by Alberto Fujimori in the 1990s promoted an investor-friendly characterised by weak environmental regulation, reduced tax burden and disarticulation of indigenous land tenures. Fujimori aimed to reverse the paucity of international investment in recent decades, attributed both to expropriation policies fostered by Velasco Alvarado's political agenda and the climate of violence

6 Oliver-Smith also tells as an anecdote about how he was commonly related to the *pishtaco* during his first visit to the Callejón de Huaylas. Before his fieldwork in the aftermath of the earthquake in 1970, he spent the summer of 1966 in the Cornell-Peru field school studying the oral stories of this mythical figure. 'My research topic nearly got me stoned out of one peasant community so distant that few outsiders had ever ventured there, and my questions evoked unbridled hilarity among sophisticated townfolk. They would literally double up with laughter at the thought of this green gringo, who certainly looked like a *pishtaco*, sauntering into Indian peasant villages to ask them questions about *pishtacos*' (Oliver-Smith 1986, 19).

triggered by the internal war against the Shining Path revolutionary group (Salas Carreño 2008). The Fujimora administration would oversee massive expansion of mining projects nationwide, which exponentially increased territorial conflicts due to environmental degradation and the expansion of mining activities into areas formerly used for agriculture and farming (Li 2015).

Ancash was no exception to this trend. Since the end of the 1990s, the expansion of Antamina and Barrick Gold, the two main mining conglomerates with a presence in the region, extracting copper, zinc and gold, produced a considerable injection of capital but also intensified territorial conflicts. According to Peru's Ombudsman Office (Defensoría del Pueblo 2013), 15 of the 30 social conflicts registered in the Ancash Department in 2013 were related to mining. By 2021, such cases decreased to 16, but half of all the regional conflicts were still related to mining operations (Defensoría del Pueblo 2021). Whereas some people refer to these conflicts as, firstly, a sort of scapegoat for all the region's problems, and, secondly, a means by which local communities are able to profit from their mining neighbours, it nevertheless shows that mining is an active figure in the region, a source of tension that mobilises and concerns people. Claims that linked the early warning system with mining activity would, in this regard, would have reflected the climate of mistrust surrounding companies like Antamina and Barrick.

Mega-mining projects have multiple territorial impacts, radically transforming their surroundings and causing environmental degradation, yet typically bring scarce benefits to local communities in the region. According to Guillermo Salas Carreño (2008), companies like Antamina have constantly projected the image of a new type of mining in the country, operating under modern standards – in direct opposition to the 'traditional' mining – and have expressed concern about the territories in which they operate. Yet, unlike traditional mining, which used to create strong dependencies amongst the direct communities as spaces of precarious work and around which various services are arranged, projects like Antamina in Conchucos, the largest mining investment in Peru's history, have operated as closed environments, enterprises with scarce labour interaction with the neighbouring communities. Mega mining companies like this normally bring their own qualified workers from other areas, and make little use of local labour for their activities. Despite the massive flow of resources that these consortia represent for provincial and local municipalities in Ancash, and despite the diverse works of so-called corporate social responsibility they claim to promote and develop in neighbouring areas, the resulting regional profits scarcely benefit immediate populations. According to Salas Carreño (2008), Antamina's corporate social responsibility measures were of the highest standards for the time the mine was open. Yet, the company based the negotiation processes with the communities for the land on major promises that were hardly achieved. The company's promises of strong economic development were impossible to fulfil over time, due in large part to the great secrecy with

which it operated the site. This situation, along with other mining conflicts in the region, would only strengthen local notions of external actors sucking up resources from the land without recompense. Mining conglomerates are hence themselves a foreign figure, a *pishtaco*, whose activities threaten the welfare of the land and its population.

Given the presence of these foreign figures in the highlands, it is no surprise that *comuneros* in Shonquil Pampa referred to any technical intervention in the Cordillera Blanca as an external threat. Devices like the early warning system or meteorological stations came to operate as a continuation of the colonial regimes reproduced by *pishtacos*, *Chilenos* and *gringos*. The monitoring stations embodied centuries of extractivist politics and colonial relations with the lands. Those supposedly benign and even beneficial scientific instruments would instead become associated with an otherness interrupting the seasonal rhythms – and thus the amount of rain – in the mountains, threatening local livelihoods as other figures had in the past.

Resisting foreign forms of temporal control

In this chapter, we have seen how the management of mountain lakes in the Callejón de Huaylas has been a long-standing effort involving institutional arrangements, engineering works, programmes, preventive plans, training and education. Since the first deadly event that struck Huaraz in 1941, projects to reduce the risk of outburst floods in the Cordillera Blanca have increased over decades, inaugurating a full institutionality aiming to protect cities and villages of the Callejón against extreme events. Supported by scientists, engineers and a local population conditioned to the rhythms of shift-work, state agencies would be in charge of classifying water bodies in the Cordillera Blanca while developing engineering solutions to cope with the possible collapse of unstable lakes. In doing so, they would develop diverse forms of temporal control in the highlands, both for water bodies requiring infrastructural interventions and also the subjects around them. The local *laguneros* populations working at the lakes had to be trained in the concepts of working time – the timing of shifts, maintining fixed working hours and regularity, even in precarious conditions.

The installation of the SAT, moreover, came to define a new form of temporality for the highlands, relying on preparedness instead of mitigating threats. Preparedness, as Andrew Lakoff and Stephen Collier (2010) affirm, does not aim to prevent an extreme event from occurring but rather assumes that it will happen. Instead of seeking to control the outflow of lakes threatening cities downstream, technologies of preparedness such as the early warning system would operate more as a sentinel device (Lakoff and Keck 2013), warning about a threat without estimating the probability of that event beforehand. This sentinel aimed to provide the exposed popu-

lation in Carhuaz sufficient time to escape to safer areas, increasing the warning period from ten minutes (under the human-based communication system) to 30. Complemented through educational programmes and activities, the early warning system operates as a form of *gaining time*, of expanding the chances of surviving a deadly event by removing the previous flood warning system's main problem: human fallibility.

As Adams et al. (2009) affirm, anticipation is a method of controlled speculation, but also a moral impulse, an epistemic orientation towards the future, pursuing a will to look ahead. As a technology of anticipatory action, the early warning system creates a future based not only on prevention but also on a techno-scientific regime. Its installation obeys the production of a future that can be managed and anticipated. The destruction of the monitoring stations, in this sense, is related not only to a failure to properly inform the population of its advantages, but mostly to the failure of a governmental project in its Foucaultian sense: a project incapable of controlling subjects. 'We warn that flood safety for the city of Carhuaz now depends *solely on human vigilance*. … The estimated evacuation times will be considerably reduced from 30 to ten minutes, as there is no technological component to support the alert and alarm', reads the press release from the directive of *Proyecto Glaciares* (2016, own emphasis) following the destruction of the SAT. The attack was not only the destruction of technological instruments; it was, above all, the disarticulation of a foreign form of controlling the future – even one intended to provide more time for people to escape disasters.

Systems like the SAT relate to what Christian Licoppe (2010) defines as notification devices capable of creating interruptions. Such notifications interrupt in order to warn of an exceptional situation – specifically, an anomalous event at the lake under observation. However, the interruption capacity of the system is, interestingly, twofold. For the scientific community, urban population and regional authorities it is a controlled and concrete interruption that warns of a possible danger, whereas for the highland communities it is a conflictive intervention that interrupts the normal rhythms of the land. The presence of the early warning system in the uplands causes irritation, a feeling of out-of-place that in some cases relates to a threat to grazing and agriculture from lack of rain, and in others to foreign practices such as mining expansion. The device loses its warning quality and assumes a hazardous role, embodying the very threat that it aims to avoid in the first place.

The Lake 513 case, together with other instances of violence against meteorological stations and scientific teams, reveals interesting situations of boundary violations that are not so different from the outburst invoked by lowlanders in other times – as seen in previous chapters. As Ben Orlove (1991) suggests, the intrinsic fear of *mestizo* population in urban areas can be referred to the dread of being sieged and 'surrounded' – a relatable feeling similar to that of being 'overflowed' by a uncontrollable mass – whereas the inherent fear among highland villagers has been that

of invasion by other types of external agents. In Shonquil Pampa, foreign machines putting at risk their environments are associated with *gringos* – whether tourists or authorities from international agencies – and mining activities. Both are portrayed as external forces strong enough to impact the land to the point of destabilising water cycles: an outburst that originates not from the highlands but instead from lower altitudes.

In tune with Marisol de la Cadena's (2021) practice of 'not knowing', we can affirm that the destruction of the instruments was *not only* the result of another cosmopolitical order, political opportunism or conflicts between different towns. Neither was it simply the act of angry *comuneros*, nor a symptom of generalised mistrust of authorities due to longstanding corruption in the region, or the consequences of a particular drought that year. It was all that and more. However, in contrast to De la Cadena, in this case we are not dealing with a concrete interlocutor with whom we can determine our limited understanding of the case – our equivocations that we attempt to keep under control (Viveiros de Castro 2004). There is nobody willing to publicly recognise the reasons behind the attack. Everybody and nobody seem to know who destroyed the equipment and for what reasons. Everybody seems to know it was the *comuneros*. But nobody knows (or else they are unwilling to say) specifically whom.

The destruction of the equipment, in this sense, plays an interesting role as part of an ecology of figurations. The attack itself becomes an event that, in the absence of straightforward explanations, produces and re-produces archetypical explanations in the first place. Such an event is excess in the purest sense: 'That which is (as in exists, avoiding the term exist!) outside the limit of what considers itself everything, and therefore is not (as it does not exist!) within it' (De la Cadena 2021, 248). The action itself does not respond to a project of society but to its limit and frontiers. It is at the destruction, and not at a – symbolically or materially produced – community where the boundaries of different projects of society – e.g., an ideal citizenship aware of the dangers of a flood, or *comunidades campesinas* seeking to maintain their autonomy from the nation-state apparatus – are placed. These figurations aim to give a single explanation to a situation in which numerous versions of the event seem to coexist – something that, according to John Law (2004), also happens when forensic analysis must derive solid explanations of open-ended incidents. The act of destruction becomes a form of validating figurations that operate in the realm of society, limiting its understanding to within those boundaries.

The early warning system, as seen in this chapter, operates as a *tinku*, a place where diverse positions collide. In this multiplicity, it is a device that can be related to a boundary object, sufficiently malleable to adapt to local understandings yet robust enough to maintain a shared identity despite its plasticity (Star and Griesemer 1989). Interestingly, its robustness relies not necessarily on its performance or operability – after all, the differences that the early warning system created were so strong that

they ultimately led to its destruction. Its robustness relied precisely on the figures that are capable of mobilising: Lowlands and highlands, civilisation and savagery, progress and abandonment.

This case also shows us how politics of time-control, which risk management systems aim to foster, are sometimes strongly contested by other realities. Yet, those conflicts are not inconspicuous. They can mobilise strong changes in political agendas and programmes, even leading us to redefine the real urgencies in the territory. Rather than places subjugated to the urban as the quintessential space for political definitions (Brenner 2013), rural areas, the other-than-urbans, are also spaces of political proliferation and influence. In the following chapter, we will see how the interaction between these two apparently antagonist worlds, the urban and rural, can lead to novel forms of facing the challenges that outburst flood risk brings – interactions that will allow the articulation of diverse forms of anticipatory strategies for security production.