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# Caring for waste: Handling tailings in a Chilean copper mine

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**Abstract**
How do we practically deal with the waste produced by industrial processes? Until now this question has overwhelmingly been answered in one way: through the deployment of different kinds of waste management programs, technology-based top-down actions for waste whose ultimate aim is to make it disappear both physically by leaving it in fully enclosed dumps and politically by eliminating it as a matter of concern that must be dealt with. Due to the multiple setbacks that this approach has faced in terms of large spills and continual pollution, this paper states the need to consider a parallel set of practices that have been enacted, that is, the practice of *caring* for waste. Based on current developments in science and technology studies, care is presented as a way to deal with waste that, based on everyday practices and the inescapability of failure, proposes temporary and experimental ways to involve all the concerned parties in the search for alternative ways to live with our waste, in material, ethical and political terms. In order to explore the challenges that such an approach entails this paper will present some examples of caring for waste developed by the personnel of a large copper mine located in central Chile.

**Keywords**
Waste, care, infrastructure, mining, waste management

## Management and care

One of the most pressing questions of our time is how to deal with the waste produced by human activity. From households that continually discard items that its members no longer want to countries who "outsource" millions of tons of different kinds of toxic wastes, the way we deal with waste is usually seen as one of most visible materializations of the ultimate unsustainability of our current production and consumption patterns. Among the different types of waste, industrial solid waste (ISW) occupies the utmost central position, amounting to 97% of the total waste produced in countries such as the US (Liboiron, 2013).

Until now the heterogeneous set of practices and devices devoted to dealing with ISW have been largely understood as different materializations of Waste Management (WM) programs. According to the editors of the eponymous journal, WM can be defined as

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"the generation, prevention, characterization, monitoring, treatment, handling, reuse and ultimate residual disposition of solid wastes" (Anonymous, 2014). In practice WM has been conceived largely as "a technical issue, a concern mainly for local authorities with a statutory duty to provide" (Davies, 2008: 3), an emphasis that "circumscribes discussions to focus on better WM technologies (longer serving landfill liners, better ways of disposing of incinerator fly ash, and so on) and diversion (primarily recycling), the latter being something for which members of the public are largely held responsible" (Hird et al., 2014: 3). Although this approach has introduced important innovations in the way wastes are treated, recent years have witnessed several important setbacks. As affirmed by a recent review of the literature on WM, "a number of serious and highly publicised pollution incidents associated with incorrect waste management practices led to public concern about lack of controls, inadequate legislation, environmental and human health impact" (Giusti, 2009: 2229).

However, the issues with WM, as growing social science literature on waste has explored, are far from being solely due to "incorrect" WM practices. According to several authors, the limitations of WM as an effective way to advance towards higher levels of sustainability can be found in the very basic notion that waste can be "managed" at all. As noted by Alvesson and Willmott (2012), the word management derives from the Italian word 'maneggiare', "which means 'to handle a horse'" (p. 20). Such a root is clear in the usual presentation of management as "a set of techniques and disciplines that promises to address problems that are defined as soluble by the technical solutions that it provides" (p. 3).

The application of this notion to the issue of waste has led to a situation in which, first, "waste is defined by, and discussed in terms of, 'disposal' technologies, or—more correctly—waste treatments, and their connection to policy" (Gregson and Crang, 2010: 1027). For this reason, any non-technical actor or entity is automatically excluded from its management, rendering the whole issue as utterly apolitical, as identified by Hird et al. (2014), or a particular kind of politics that "emerges from objects that are so naturalized they do not appear to raise issues" (p. 8). However, and as the relevance of waste in contemporary fights against global warming and for environmental justice shows, our handling of waste in its "silent, ordinary, fully routinized ways . . . are perversely the most important aspects of what we mean by living together—even though no one raises hell about them" (Hird et al., 2014). Waste, and its handling, must become political if we are going to seriously engage with the issues raised by our unsustainable patterns of production and consumption, and the notion of "management" is a limit to such politicization.

Secondly, and as noted in the definition by Alvesson and Willmott, at the very center of the concept of management is the notion that the problems faced in WM are ultimately "soluble," once and for all, if the right tools are applied. In practice such a notion engenders the "illusion that solutions to all problems are to be found in a more determined application of rationally organized expertise encapsulated in management theory and practice" (Bavington, 2011: 116). In the case of WM, this implies that "the waste problem is presented as not only manageable but already being managed, thus solved" (Gille, 2007: 18). In most cases the solution is based on different materializations of the "ultimate sink" principle (Tarr, 1996), or the notion that the solution for the issue is to lock wastes in ever more sophisticated containers, in the hope that they will remain there forever. Therefore a key issue of WM is to prevent other entities (especially human beings) from engaging with components labeled as "waste," because of certain negative consequences and to stop some (potential) relations. This means going against the redundant cycles of nature, freezing the circulation and mutation of organic and inorganic matter for a certain amount of time. However in practice, and regardless of how much knowledge and how many technical devices are introduced, WM's preference for sinks generates new wastes and their related

issues, given "the tendency of wastes to migrate and transform [that] is often overlooked in the attempt to stow away wastes indefinitely" (Gabrys, 2009: 668). Waste in sinks is alive; it leaks and permeates barriers, transforming into different entities in the process: leachate, polluted water, dead soil, toxins, etc.

Beyond these critiques, this paper addresses a key point that is seldom mentioned in the literature on ISW: there is much more happening with waste than WM practices. As soon as one starts paying close attention to the practices enacted in and around waste one realizes that many of them do not remotely comply with the tenets of WM programs; rather they emerge and develop in ways completely unexpected by them. To perceive everything that happens with ISW as different versions of WM programs is to radically simplify the utter vitality surrounding large waste dumps. More seriously, such a narrow focus limits the possibility of politicizing our current ways of dealing with ISW only to arguments for and against WM, as a significant part of the literature on the issue has done until now.

In order to challenge this state of affairs this paper will focus on another set of practices that commonly emerged while carrying out fieldwork about waste-related practices deployed by the personnel of a Chilean copper mine: care. In social theory, care has increasingly been seen as a key component of our collective being in the world, especially regarding human and non-human interrelations. Problematizing its traditional (and usually derogatory) pre-modern and feminine connotations, several authors have started to see care as engulfing a wide range of ways to relate in which a concern for the wellbeing of some other (human, animal, material, conceptual, etc.) occupies a central position. What these efforts have showed us is that care can, and generally is, many things at once, some of them even quite contradictory: care can be ethical but also practical; intimate but also global.

As the recent encounters between care theory and science and technology studies (STS) have highlighted, an important part of the value of care lies in this multiplicity, in its suggestion of "different political commitments, inspiring a range of different ethics and forms of intervention" (Martin et al., 2015: 634). Thus our starting point in studying care should be the recognition that "there can be no singular vision of what care is or what it might become" (Martin et al., 2015: 634). For this reason, instead of offering a singular and well-rounded definition of care, in this paper I am interested in exploring three versions that have occupied particularly salient positions in the STS literature on the topic and that appear especially apt to challenge some of the assumptions behind WM: care as tinkering practices, care as a form of affective entanglement and care as a particular kind of power.

While doing research on the issue of patient choice, Annemarie Mol (2008) identified care as a focal point for the understanding of the myriad of quotidian and humble practices and discourses through which patient's health is dealt with in hospitals. In stark contrast with the so-called logic of choice, and its managerial optimism, care "starts out from the fleshiness and fragility of life" (Mol, 2008: 11). Instead of always aiming for an ultimate solution, it is understood that "what characterizes good care is a calm, persistent but forgiving effort to improve the [problematic] situation . . . or to keep this from deteriorating" (Mol, 2008: 20), an effort that she characterizes as "persistent tinkering in a world full of complex ambivalence and shifting tensions" (Mol et al., 2010).

Care seen as *tinkering practices* appear as "a mode, a style, a way of working" (Mol et al., 2010: 7) that is characterized as being non-linear, open-ended, recursive ("Try, adjust, try again", p. 20); never solely a transaction but a back and forth interaction. In them, the cared-for entity is not a passive object but fully participant, along with a series of non-human entities, among them technologies. However (and in opposition to the "technical fixes" that WM hold so dearly) technologies are understood as unruly entities that usually achieve ends that were never planned in the first place. Given this, technologies are "not

asked to explain what the world is like, but asked to suggest what might be *done*. [They are] made to answer practical questions'' (Mol, 2008: 38). As a result care as tinkering is always experimental and tentative, reflexive of its own presence and limits. In care as tinkering practices, ''nothing is taken to be entirely fixed or entirely fluid. Technologies, habits, hopes, everything . . . may have to be adjusted'' (Mol, 2008: 53).

In her research on scientific practice, Maria Puig de la Bellacasa (2011, 2015; Latimer and Puig de la Bellacasa, 2013) understands care as ''an ethically and politically charged *practice*. . . . to care signifies: an affective state, a material vital doing, and an ethico-political obligation'' (Puig de la Bellacasa, 2011: 89). Then besides its practical component, care should be understood as an *affective entanglement* with the world from which political commitments emerge, especially when addressing the multiple ''matters of concern'' (Latour, 2004) attached to the entities we enter in contact with, a process from which ethics emerge as a ''the practical responsibility to take care of the fragile gathering they constitute'' (Puig de la Bellacasa, 2011: 90). In doing so we become affected by them, they become matters of care to us. And because of this we have a commitment towards them, ''we are in *obligation* towards something that might have no power to enforce this obligation upon us. In other words, actions of care are performed even if we are not forced to it by a moral order or policy'' (Latimer and Puig de la Bellacasa, 2013: 170).

What is relevant to take into consideration is that caring is not only ethical but also ontological. To become affectively entangled with something is not only to valuate it in certain way but also to enact it anew: ''there is nothing *before* care that comes to be determined by it: rather ontology has care hardwired in it'' (Latimer and Puig de la Bellacasa, 2013: 161). Such a process is not limited solely to enacting the object/s of our affect but several other entities, even the ones that we openly oppose or criticize. In this sense, and beyond developing attachments to particular things, ''generating care means counting in participants and issues who have not managed or are not likely to succeed in articulating their concerns, or modes of articulation'' (Puig de la Bellacasa, 2011: 90), from disempowered communities to toxic components. To care is to enact a particular version of the world, an ecumene populated by all kinds of entities, from the ones we feel most attached to the ones we utterly despise.

Finally, there is caring as a particular *form of power*. The starting point here is the recognition that caring ''is political, messy and dirty, not an innocent category, and even less so in technoscience'' (Puig de la Bellacasa, 2015: 707). The fact that caring is practical and, especially, ethico-affective does not mean that it leads always to good, or more ''human,'' results. After all, ''care is a selective mode of attention: it circumscribes and cherishes some things, lives, or phenomena as its objects. In the process, it excludes others'' (Martin et al., 2015: 627). For this reason ''we must be careful not to become nostalgic for an idealised caring world: caring or being cared for is not necessarily rewarding and comforting'' (Puig de la Bellacasa, 2012: 198–199). In evaluating care as a form of power it is key to keep in mind is that even ''positive feelings, sympathy, and other forms of attachment can work with and through the grain of hegemonic structures, rather than against them'' (Murphy, 2015: 719).

This last point has been thoroughly explored by Miriam Ticktin (2011) in her study on asylum policies in France. For her, care practices can also enact a particular ''regime of care,'' a kind of government based on ''a set of regulated discourses and practices grounded on this moral imperative to relieve suffering'' (p. 3). Such regimes can have positive effects on the affected population but, quite commonly, they could also ''work to displace possibilities for larger forms of collective change, particularly for those most disenfranchised'' (Ticktin, 2011). When functioning in this second sense, the stabilization of care as the ultimate tenet of

political action configures a kind of antipolitics that operates on two levels: ''first, those who act in the name of the moral imperative generally claim to be apolitical—beyond or outside politics; second, rather than remaining outside the system in their desire to not engage with politics, they work to reinforce the status quo, the established order'' (p. 19).

Each one of these three versions of care offer an alternative path to engage with the complexities involved in dealing with ISW. First, care as *tinkering practices* forces us to give a new centrality to all the humble maintenance and repair practices needed to keep the infrastructural systems through which ISW is produced, mobilized and stored working. Although such practices have long been considered a component of WM, here the focus on them is shifted. In contrast to top-down and triumphalist approaches, care as tinkering forces us to acknowledge that in dealing with ISW ''good'' order is always precarious and tenuous, beset with ''normal'' accidents (Perrow, 1999) and, hence, needing continual tinkering practices to be momentarily achieved. Such practices are characterized by their intuitive and experimental character; always escaping (and challenging) WM set scripts and formal procedures. Finally, tinkering practices related to ISW are never solely focused on technical or material fixes, but also on performing ''social repair'' (Henke, 2000), or the tinkering with the social relations that are intimately embedded in waste infrastructures along with technologies and other materials.

Secondly, the notion of care as an *affective entanglement* with the world involves the ethical command of taking into account all the entities involved in ISW, even the ones we dislike or are opposed to. Such an approach is materialized, first and foremost, in the dictum that caring for waste necessarily means *living with it*, as Hird reminds us (2012, 2013). Instead of WM's ultimate aim of making waste disappear, caring for waste necessarily recognizes that waste is not going to go away, no matter how much we wanted it or planned it. Therefore, caring for waste ''requires knowledge and curiosity regarding the needs of an 'other'—human or not—and these become possible through relating, through refusing objectification'' (Puig de la Bellacasa, 2011: 98).

Finally, the notion of caring as a particular *kind of power* demands that those in charge of dealing with ISW pay ''attention and worry for those who can be harmed by an assemblage but whose voices are less valued, as are their concerns and need for care'' (Puig de la Bellacasa, 2011: 91). Especially in a context of effervescence about corporate social responsibility (CSR), the handling of ISW must be carried out in a reflexive fashion in order to avoid enacting antipolitics in the name of care. To a certain degree this would mean to ''unsettle'' (Murphy, 2015) the practices enacted to care for waste, to explore their ''purposeful undoing and troubling of particular arrangements so that they might be acknowledged and remade in better, less violent, more livable ways.'' (Murphy, 2015: 722).

All in all, caring for waste should not be seen as necessarily contrary to managing it but as complementing some of its deficiencies to produce a more well-rounded way to deal with our contemporary wastes. In order to explore the challenges to our understanding of waste practices that such an approach entails, the rest of the paper, based on a recently completed ethnography,[1] will explore the contrast between managing and caring for waste through the analysis of some of the daily work practices of the WM department personnel of El Teniente, a large copper mine located in central Chile.

## Not a single drop

El Teniente mine is located 100 km south of Santiago in the Andes Mountains. Its industrial operation started in 1905 and it is currently owned by the state-owned company Corporación del Cobre (CODELCO). It consists of more than 3000 km of tunnels and is

usually considered the largest subterranean mine in the world. It mainly produces refined copper (450,000 tons in 2013). Besides this valuable mineral there is something that El Teniente produces in a much larger amount: waste.

Like in any other mine, mineral processing in El Teniente "is a segregative process by which a relatively small amount of a valued substance is isolated from a much larger mass of less valuable material" (Bridge, 2004: 210). A substantive part of this waste, usually reaching around 50% of the whole material extracted, is technically known as "tailings" (*relaves* or *colas* in Spanish). Tailings are "a fine-grained sediment water slurry . . . consist[ing] of the ground-up gangue from which most of the valuable mineral(s) or coal has been removed" (Lottermoser, 2007: 153). Besides gangues, tailings include several chemical additives, some of them highly toxic, used to depurate the desired minerals. For this reason tailings are usually identified as the main environmental threat associated with mining operations, especially given their huge volumes (in the case of El Teniente around 130,000 tons daily). Their safe handling occupies a central place in the concerns of mining companies such as CODELCO. As in most mining operations worldwide this handling consists mainly of transporting and storing tailings in very large sinks known as tailings dam. Usually such dams are built to contain waste in an indefinite way, and as such are the utmost example of what Tarr's (1996) has named "the ultimate sink."

Besides the complexities involved in storing them in a safe way, the management of tailings in El Teniente has another layer of complexity: the location of its tailings dam. More than a century of continual industrial operation has meant that every couple of decades tailings fill up the designated dam and a new one has to be devised, located farther away from the mine. The current dam, known as Embalse Carén, was inaugurated in 1987 in a mountainous zone known as Altos de Cantillana, located east of the mine across Chile's central valley, as can be seen in Figure 1. To bring the tailings there, it was necessary to build an 87 km long canal (the green line), which includes several bridges and tunnels. Besides the geomechanic complexities involved in moving the tailings across such a distance, the canal passes through an area of intensive agricultural activity and several urban areas, including the city of Rancagua, the regional capital with 240,000 inhabitants. Given this situation, for most of the actors involved, the safe transport of tailings from the mine to

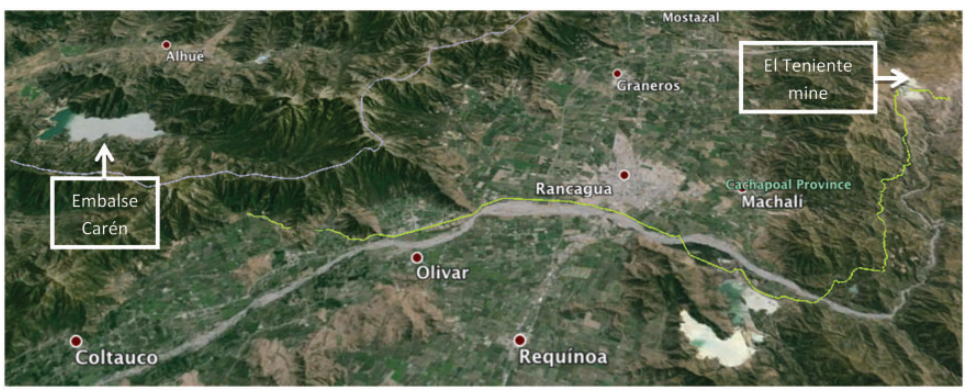


**Figure 1.** Outline of the tailings canal. Source: Google Maps and information provided by CODELCO Chile.

Carén is much more critical than its storage and occupies the greater part of their daily efforts. In doing this, tailings and the infrastructures through which they travel from the mine to Carén became a tightly coupled assemblage, usually taken as a singular entity.

The handling of El Teniente's tailings is the responsibility of the Superintendencia de Aguas y Relaves (Superintendence for Water and Tailings), SAR. Traditionally this task meant removing tailings from the industrial area of El Teniente as fast (and cheaply) as possible. This mandate remained more or less unchanged until April of 2006 when a massive spill occurred in the Carén area, with tailings heavily polluting 17 km of the river basin downstream from the dam. This accident, which received ample coverage in the press and caused demonstrations by residents of the area, besides costing CODELCO several million in clean up and compensations, forced the mine to take seriously the issue of tailings management becoming properly "sustainable."

Given the SAR emphasis on transport above storage, for most of the involved actors the sustainability mandate translated into one key dictum: that "*not a single drop*" of tailings should fall from the canal during its transport from the mine to Carén, as several SAR employees recalled during fieldwork. If tailings remain inside the canal, if they reach Carén without escaping along the way, then sustainability has been achieved, no matter what happens with the tailings afterwards.

The adoption of this mandate was heralded by the arrival of a couple of young engineers to head the SAR, replacing personnel who had been in charge for decades. This change marked, using the terminology developed by Gille (2010), the shift from one waste regime towards another. Such a change is visible in the words of Lautaro Rozas, one of the incoming heads of the division, when evaluating their current situation:

> In general, and being myself quite critical, I believe we are now in a good standing, quite robust, we are quite preoccupied about the issue [of having no spills], our costs have increased a lot as well, before [the superintendence of] tailings spent a quarter of what it does today, it was just people to deal with events, with holes, and nowadays it is maintenance which has triggered a nice stability, a nice reliability of the canal.

Making a distinction between terms that are usually taken as synonyms in the literature (Graham and Thrift, 2007), Rozas understands repair and maintenance as two different ways to deal with waste. On the one hand, repair is a waste regime focused mostly on dealing in an efficient and fast way with occurring accidents and spills. On the other hand, maintenance is focused mostly on avoiding such accidents through the continual surveillance of the system's components, approaching the ideal model of a WM system.

Although both regimes have long cohabited in the daily action of SAR, the change in the emphasis was not meaningless. In contrast to occurring events, possible ones constitute a highly heterogeneous collective surrounded by high degrees of uncertainty. In the long run every single component of a system can fail, so a maintenance regime necessarily has to exponentially expand the number of entities to be taken into account. Quite expectedly, this change received resistance from several components of SAR, especially the so-called "*viejitos*" (old guys), the existing personnel of the superintendence. These employees, most of them over forty years old and with several years (even decades) of experience in dealing with tailings, were quite reluctant to adopt the new regime, as Juan Parra, another of the incoming engineers, recalled.

> For example today we finished checking one of the bridges, I have two canals on them, so every month I divert [the tailings] through one of them to inspect the other. And they still question me about why I do that. "But boss!" And they cannot understand that I make procedures just for

> inspection, because they are accustomed to the "*cagazo*" [mess], not to making messes but to repairing them. They are very committed and if they have to clean for three days without sleeping, they stay for three days cleaning, shoveling, supporting, coordinating. But they are more reactive, they are accustomed to that because that was the way they used to work.

What is key to note from Parra's words is the contrast he makes between the maintenance practices they have introduced and the "commitment" he notes on the part of the *viejitos* regarding the former ways of dealing with waste, a perception that later in the interview he explicitly connects with "caring:"

> Then my *viejos* really care about this thing, they love the canal, they are very caring, they have an attachment. There used to be a small village for the people who operated the dams, and several of them grew up there. They remember when they were little, that their fathers worked in the dams, that they lived there, that they went inside the dams, that they were fooling around, that they made a mess, they have an attachment.

We have a clear contrast here. On the one hand, we have traditional and eminently reactive repair practices very much based on the *viejitos* "caring" for the canal. On the other there are contemporary maintenance practices, based on prevention principles and planning, very much in the logic of WM. Tradition against modernity. Simple.

This contrast, however, was not so clear when studying the daily practices of safely handling El Teniente's tailings. In order to explore this point, I am going to present three cases of care practices collected while following SAR personnel during their normal shifts. They were selected because each one of them materializes the kinds of care outlined above: as tinkering practices, as an affective entanglement and as a form of political power.

## Tinkering the bridge

To move several thousand hundreds tons of tailings from the mine to Carén daily is not a small feat of engineering. As seen above, in doing so the tailings have to cross through almost 90 km of highly uneven terrain including a large river and two mountain ranges, a densely populated area already crisscrossed by several other infrastructures. This movement was greatly helped by the 2300 m of difference in elevation between the mine and Carén,[2] making it possible to move the tailings all the way using only the force of gravity. Quite expectedly such continual movement causes a lot of wear on the canal's components, a process that is greatly compounded by the chemical composition of tailings. When moving from the mine to Carén, tailings are composed of around 50% water and the rest ground-up gangue along with several reactives. In El Teniente's case, this gangue was quite sandy due to the geology of local soils, which had the kind of composition that most contributes to wear on hydraulic infrastructures due to being formed by relatively large particles.

The need to deal with the continual wear caused by tailings was quite evident one day in November 2013 when I accompanied two *viejitos*, Lucas Zepeda and Carlos Albidon, on their daily duties at one of the canal's bridges, known as Cachapoal 1. Crossing over the Cachapoal River, this bridge marks the border between the "*Zona alta*" (or High Zone) and the "*Zona baja*" (or Low Zone) of the canal, with the steep flank of a mountain on one side and on the other a series of low-lying hills. Even though there are several hydraulic jumps[3] before it, tailings still enter the bridge at quite a high speed and with a significant degree of turbulence. For these reasons the individual components of Cachapoal 1 Bridge tend to wear quite rapidly and have to be maintained regularly. In order to help with this process, the

bridge was made with two canals on it, so each month tailings could be diverted to one of them in order to check and maintain the other.

Although since the introduction of the new waste regime expert subcontractors have been in charge of the whole process, there was one key task in which the experience of *viejitos* such as Zepeda and Albidon was still valued: visually checking the inside of the canal looking for components requiring maintenance. Although not formally stated, this practice was seen by the subcontractors as a compulsory stage following a first wave of repairs, as can be seen in the following fieldnotes.

> We start crossing the bridge. Lucas and Carlos walk slowly, their eyes fixed on the inside of the canal, usually the floor. Every few meters they stop to check the rubber joints between the modules of the canal to see whether there are cracks or the material looks too worn, so as to instruct the people from . . .[the subcontractor] to repair or replace them. They also check whether the rubber carpet that covers the inside of the canal presents any issue. A little bit further, in section 53, they detect a bump in the rubber carpet 30 centimeters in diameter. They believe it formed because of heat. Then Lucas makes a circle around it on the floor with a piece of chalk as a signal for the guy who will give the orders to the subcontractors to replace this section. A little bit further they find a rubber joint between two modules of the canal that is partially broken, so it must be replaced. Another signal is made.
> . . .
> At the other end of the bridge we meet with a subcontractor foreman, and return with him to the other side, stopping from time to time to show him the places in which some repairs must be made. We stop a little longer at the location of the bump, and a small discussion arises between Lucas and the foreman about how repairs should be made, in particular about how much of the carpet should be replaced. Then we continue and arrive to our starting point without further stops.

All in all the process of checking the canal took more than two hours, mainly because of the slow pace of Zepeda and Albidon while doing it. It was a difficult task, in which some minimal visual signs (mostly invisible to me) like an uneven surface or a particular shape made them stop and consider the need to do something about a particular joint or a section of the plastic carpet covering the canal's insides. In doing so they were clearly practicing what Grasseni has called "skilled vision" or a "a social activity, a proactive engagement with the world, a realm of expertise that depends heavily on trained perception and on a structured environment" (Grasseni, 2011: 19).

In a similar way to the maintenance workers studied by Denis and Pontille (2015), such practice goes beyond regular, "professional," maintenance. Their skilled visions were at "the center of the care of things" (p. 356) and needed to "tinker" with the bridge's failing components. This is because its fragility was "not a clearly identifiable state of the world with symptoms accessible and visible to everyone. The workers' trained vision is needed to make them appear" (Denis and Pontille, 2015). And this apparition depended on a lot of factors, not only technical issues but also "relevant aesthetic and moral sensibilities" (Grasseni, 2004: 49) about how the bridge should be maintained in a "right" way, as was demonstrated in the argument they had with the subcontractors' foreman about how bumps should be fixed.

In their skilled vision and complaints we can see how maintenance work involves several different registers. At first, there is maintenance as the conventional technical process done by professional actors in accordance with pre-established and regular planning. However, maintenance would never achieve its aims if it rested solely on this approach. In practice such pre-set schemes "are rarely productive. Instead, local solutions to specific problems need to be worked out" (Mol et al., 2010: 13). On concrete pieces of infrastructure such as

Cachapoal 1 Bridge, being "professional" in a conventional, script-based way is never enough to effectively prevent things from deteriorating. The bridge needs other kinds of maintenance, especially that based on a constant tinkering that involves several non-formal components, from previous experience to a particular attachment to an infrastructure, "loving the canal," as Parra mentioned above, referring to the *viejitos*. For this reason "maintenance work is [also] a care practice (...) because it takes into account decay and the vitality of matter (...), instead of denying or relegating these aspects to a secondary dimension" (Denis and Pontille, 2015: 355). Then, instead of being solely a matter to be devised through top-down, neat, interventions, maintenance practice "draws on a certain engagement with matter and objects, a bodily commitment, which is at the center of taking care of things" (p. 356).

## (Un)wasting dogs

Everyone at SAR seemed to have several stories concerning unexpected things falling into the tailings canal, stories that usually came up shortly after our acquaintance. At first most of them involved human beings falling due to a variety of reasons and reappearing in bad shape (almost drowned, bruised, even naked). Making a recollection there seemed to be no more than three or four cases of people actually falling into the canal, but each one was told to me in multiple different versions, changing some parts here and there.

In contrast there were other kinds of things falling in that were much common: discarded entities. However, and in contrast with the amusing tone of the first stories, the attitude towards them was quite critical, as a *viejito* called Pedro Alamos exemplified one day in the control room.

> Then Pedro comments to me that "*people believe tailings are garbage*" and this is why they use [the canal] as their dump. All kinds of things have been extracted from the canal, even a complete set of living room furniture, first an armchair, then another, then a sofa and finally a stove, we clean it and the people mess it up immediately, even dogs fall or are thrown in, pigs, chickens, even a calf that arrived alive!

When speaking Alamos' tone was quite annoyed, even exasperated. Tailings are not garbage. Garbage is what people throw inside the canal, these unwanted animals and stuff. Only when this garbage is put into the canal do tailings become waste in the form of a dump, an entanglement characterized not by WM's intended clear demarcations but by "wastes that do not conform to a clear trajectory or network, but, rather, express more formless (and parasitical) geographies (Law and Mol, 2001)" (Gabrys, 2009: 667).

It is not strange, then, that to separate tailings from these discarded entities became a central activity in the new waste regime enacted at SAR. At its core, the aim was to enforce the existent buffer zone surrounding the canal through fencing and the introduction of multiple remote monitoring devices (a CCTV network, infrared sensors, etc.). In parallel, the top of the canal was covered with heavy concrete blocks in the areas nears populations. However, the success of these measures was only partial, in large part due to the financial impossibility of monitoring and covering the canal in its entirety. For this reason discarded things still ended up inside the canal, forcing the SAR personnel to be constantly on the lookout for them.

The most relevant node in this demarcation policy was called Quimavida station. Located just one kilometer from the canal's final tunnel before reaching Carén, this station was the last point at which the items thrown inside could be removed. For this reason one of the key tasks of the personnel stationed there was to constantly check the rake through which all

tailings had to cross at this point and in which all entities above 10 cm of diameter got stuck. If something strange was detected, it had to be removed right away and thrown into a proper dump located on the side of the station; tailings and discarded entities became different kinds of waste at last.

However there were situations in which this process came to a halt: when the trapped discarded item was alive. This aliveness challenges the notion of these items as merely refuse needing to be disposed of, as recognized by a *viejito* called Marcos Sepulveda on our way to Quimavida during a night shift in June 2014.

> We have a lot of dogs [at Quimavida station] and we have to buy them food; we cannot just leave them there. Sometimes we take them to the vet as well. Normally you leave them there and the dogs depart on their own; sometimes muleteers pass and as they pass with a lot of other dogs they join them, but there are some that remain there for more than a year.

The aliveness of animals coming through the canal, mainly dogs, transformed them into something that the SAR personnel "cannot just leave ... there." On the contrary, they became objects of care through a series of practices that usually took the following path. Firstly, and after being noticed, the dogs had to be removed alive from the flow of tailings, a complex operation involving the usage of several tools (and whose success was never fully guaranteed). Once the dogs were extracted they must be carefully washed to remove tailings from their bodies, a process in which they reemerge transformed from a uniform grey mass into an animal who has a particular dog-like features: color, fur, etc. In some cases, as Marcos recognizes, they even have to take them to the vet (especially if they have swallowed tailings along the way). Finally, and if the dogs are well, the process becomes a matter of regularly caring for their wellbeing through the weekly collection of money among several *viejitos* in order to buy them food.

Through all these practices the dogs are gradually (un)wasted, transformed from "matter out of place" (Douglas, 1966) into a "matter of care" (Puig de la Bellacasa, 2011), as the SAR personnel gradually became affected by the dogs' wellbeing. This affection was reciprocated by the dogs themselves, as I could witness that night when they started to follow our truck barking when we were arriving to Quimavida, jumping happily around Marcos when he stepped out of it and then patiently waiting to be fed, as can be seen in Figure 2.

All in all, the arrangement between SAR personnel and the dogs in Quimavida constitutes a particular kind of care that Latimer (2013) has called "being-alongside" or "a form of relations that preserves a sense of difference at the same time as it performs partial connectedness and mutuality" (p. 99). These dogs were not pets. As Sepulveda recognized, sooner or later they were going to suddenly disappear and no one seemed to grieve over this, as they were replaced in due course by new dogs-as-waste arriving along with tailings. But while their relationship lasted they cared for each other, the SAR personnel through the practices described above, and the dogs reciprocating by accompanying them during their long and lonely shifts, especially at night, and even playing a role in patrolling the station against potential vandals.[4]

However, the SAR bosses did not recognize caring for these dogs as valid, as Parra confided to me in one of our interviews:

> Now we have much more sensors ... Naively we thought they [the *viejitos*] were going to take care of [the data produced by] them, but no. ... they say to me 'this is too much,' now they have to concentrate on the little numbers and whether to make diversions [of tailings from the canal], but they are much more worried about the food for the dogs! In Quimavida, at the last barrier

**Figure 2.** The dogs of Quimavida waiting to be fed. Source: the author.

> [before Carén] some dogs have arrived and they have put them in a doghouse, now they are worried all day about dog food!

He claims caring is a distraction, a problem, because it diverts the *viejitos'* attention from what they should be doing, from properly enacting the new waste regime in accordance with the WM mandates, from overseeing up-to-date surveillance devices to making decisions based on data. In this arrangement the dogs seemed to have no place, and were only a curiosity to be reluctantly tolerated.

## A good neighbor

However, and contrary to what would be expected based on the above cases, not all kinds of caring were considered irrelevant from the standpoint of the new waste regime. There was one particular kind of care that everyone at SAR, even the new bosses, agreed was relevant: to care for the communities surrounding the canal. As expressed in a 2011 corporate manifesto, "El Teniente's sustainability commitment also involves communities located nearby our facilities, taking care of the development and quality of life of their inhabitants" (CODELCO, 2011: 71). In contrast to their former indifference, the new waste regime included the aim of becoming "*un buen vecino*" ("a good neighbor"), as claimed by CODELCO's 2008 slogan for their new strategy towards communities in the wake of several damaging incidents, such as the tailings spill at Carén. In making this move,

CODELCO was taking part in the worldwide craze for CSR programs, a boom that has been especially intense in the mining sector (Rajak, 2011).

In order to carry out this mandate El Teniente created a ''Community Relations'' unit with the aim of working ''in a close fashion with social organizations and establish[ing] collaboration links with neighbors associations, local authorities and the community in general'' (CODELCO, 2011: 71). However, most SAR actors were quite critical of this unit's work, seeing its members as ''people in a suit and tie'' who do not really know how to deal effectively with communities. For this reason they set up their own ''community relations'' unit, as told by Rozas:

> I would not be able to tell you if half of [our work]... but a lot of work is caused by people's actions—maybe they broke a gate, maybe a car crashed—this is the consequence of being right in the middle of towns... where we have people on both sides of the canal, and they are ones who complain the most... then there is a lot of that in the [*viejitos'*] job, a role of homeowners, to prevent people from causing damage, acting as the first response to people's demands. There were two *viejitos* who became famous after the earthquake [of February 2010] for the simple fact that they brought them water and coordinated the work of the excavators to demolish [damaged] houses, to clean up, so they are very well-known there, mainly in Doñihue... they are like really our community management, in an informal and caring relationship, not in terms of those community dialogues or meetings with the mayor!

Clearly dismissing formal CSR activities (''... those community dialogues and meetings with the mayor!''), the SAR has opted for an alternative approach based on the *viejitos'* existent ties with local communities. As mentioned above, most of them were born in the area and/or have been working on the canal for several years, even decades, having as a result amassed an extensive knowledge of the local dynamics all along its route. Taking advantage of this, the bosses had empowered them to, in addition to their daily duties, take charge of dealing with the community's demands. Usually acting from a quite paternalistic standpoint (after all their role is to be ''homeowners'' in each local area), they have enacted an idiosyncratic version of the politics of care characteristic of CSR initiatives, even becoming minor celebrities after the earthquake of February 2010.

At the center of this particular politics of care is Lucas Garces. In addition to being born in the area, he has a naturally easygoing and friendly character, making it quite simple for him to approach almost anyone in the canal's surroundings, from authorities and landowners to people living in the rough shantytowns near Rancagua. For these reasons he was the obvious choice to carry out the new CSR approach, as he explained to me on one of our excursions in July 2014.

> I used to be in the operations [area] but they switched me to maintenance, and I have to oversee the canal from Maitenes to Carén, I have a lot of different tasks to do, and besides Don Lautaro [Rozas] told me, 'Listen man, you know this and that neighbor, the farmers, the neighborhood associations, so also oversee community issues there', and I have no problem doing that... we don't fight with the neighbors any longer, instead we try to help them... the thing is that before they didn't have the canal there, they just went to their houses, and the canal cut off all their passageways, so I have to understand them.

Clearly signaling how maintenance is always material and social (Henke, 2000), in his daily routine Garces combines issues regarding the canal with ones emerging from the demands of the population surrounding it. In doing so, he recognizes the problems in the way community issues were dealt with before and makes an effort to always empathize with the residents, given that the canal was introduced to an already populated area, not the

other way around. In doing so he has become the ultimate ''good neighbor,'' listening to complaints and trying to provide solutions with the limited means available.

This work was not only recognized by his bosses, but also by the people living and/or working in the vicinity of the canal, like Mario Peralta, whom we visited that day. Peralta lives in the zone of Punta de Cortes 10 km west of Rancagua. Both his house and a little shop he owns are located in the slim strip of land running between the canal and the local highway, and for this reason he has constant contact with SAR personnel, especially with Garces, as he recalled.

> I always tell the good and the bad things to Don Lucas [Garces]... 'Don Lucas, listen, a Súper Pollo truck crashed into the fence,' 'Don Lucas, listen, there is a guy who is going around inside the [area enclosed] by the fence'... Then we have all these relationships with [SAR]... we have never had any problem with them since Don Lucas started coming here, not any longer, [he asks me], 'Is there any news?' 'No, no news.' 'Okay, fine'... I have nothing to say against the way the company has behaved so far, on the contrary, they help me, because they pass through my backyard and let me know if there's some ruffian there and I let them know if there's someone stealing their lampposts... I'm glad to help them and glad that they sometimes help me to take care [of my property], help me to take care.

As Peralta recounts, he has never had any problem with the canal or SAR personnel since Garces started coming around. On the contrary the relationship between the two is quite good, even close, as was demonstrated that day through their continual interchange of jokes, the whole episode seeming to be a casual encounter of two good friends.

But in parallel to their mutual goodwill something else is being enacted: a particular kind of political power where ''increased policing... takes place in the name of care and compassion'' (Ticktin, 2011: 21). As Peralta recollects, Garces is at his place constantly, asking if there is anything wrong, offering solutions to past issues, a practice that is reciprocated by Peralta through informing SAR personnel as soon as there is an issue involving the canal. Due to their closeness and regular visits, Peralta would not even think about dealing directly and/or through ways excluding Garces with issues regarding the canal or CODELCO. As opposed to the disruptive practices that emerged in other sections of the canal, here Peralta is happy to leave everything in Garces' hands, practically restraining from politicizing any issue further than letting him know what is happening. In causing this effect, Garces' caring becomes an antipolitical force by ''render[ing]... [its] receiver powerless or otherwise limit their power [by setting]... up conditions of indebtedness or obligation'' (Martin et al., 2015: 627). In a way we could conclude that through this form of politics local populations are entitled *to be* cared for but not *to* care. They are cared for in order for them not to care, so that they can leave all the issues regarding the hundreds of thousands of tons of waste passing near their homes daily in the hands of the experts.

## Conclusions

From what we have seen here we can conclude that management and care cannot be easily disentangled. Although WM aims for purity and clear demarcation, in practice care practices are located at the very center of managerial projects such as the ones carried out by SAR. In particular, in this paper we have seen caring as entangled with WM in three main ways.

The first way is as tinkering practices needed to maintain an infrastructure such as the Cachapoal 1 Bridge. This tinkering, resting on the skilled vision of the *viejitos*, takes into consideration several non-formal forms of knowledge and devices, some of them derived

from their personal attachment to the infrastructure, allowing the actors involved to better deal with the wear caused by the constant passing of tailings. Second, care practices emerged in the efforts made for the wellbeing of the dogs thrown into the canal. Through their affective entanglements, even going against their bosses' wishes, not only were the dogs effectively (un)wasted but also the division between tailings and other refuse was achieved. Finally, in the case of the informal CSR practices carried out by actors such as Garces we could see care emerging as a form of power that is located at the center of contemporary WM schemes. Through its antipolitical effects this caring allowed the members of SAR to reinforce the security of the movement of tailings through populated areas, especially protecting against the possibility of conscious interventions by individuals.

Such entanglements show us the dangers inherent in assuming WM as the only (albeit frequently failed) way to deal with ISW, a notion that could easily lead to considering care practices as belonging to truly different practical, even ontological, realms. This stark contrast blurs our capacity to understand large waste infrastructures like the one seen here, given the inherent hybrid nature of the practices involved in maintaining it, usually moving back and forth from managing to caring. Also, and probably more worryingly, implicit in such a contrast is the choice of one set of practices above the other. Currently, and given the high demand for managerial interventions, care practices are the ones with more to lose as they could easily become invisible, strengthening managerial fantasies of total rational control.

In the case of ISW this invisibility emerges as especially dangerous. As has been noted by Hird, dealing in a safe and sustainable way with waste "requires ethical as well as technological innovation" (2013: 119). It requires both technical innovations located inside the managerial frame as much as care practices, especially when things do not go as expected (as usually happens). However, if we perform a review of current literature on the issue of the sustainable dealing with waste we can note quite clearly an almost exclusive focus on managerial fixes.

With the growing presence of technological mediations it becomes easier "not to care" about what is happening to industrial waste such as tailings, because if anything happens, alarms would ring and some expert mechanism or actor would take responsibility. This exclusive reliance on such fixes makes it quite easy, even for the involved personnel, to "fall back to sleep" (Hird et al., 2014) and simply forget that we have certain responsibilities for waste, that if we are to advance towards more sustainable waste regimes we are forced to *care* about our wastes.

In arguing about the need to consider and value care practices in our current waste regimes, I am not making an argument for the need to return to a more "human" or inherently good handling of waste. As seen in the last case, care practices are not necessarily better or more ethical than managerial ones. In reality caring is always "wet, emotional, messy" (Haraway, 2011: 102), taking into consideration some entities but always at the cost of leaving others behind (Martin et al., 2015: 627). And even when considered, the consequence for the entities being cared for could be less than positive, with the enactment of antipolitical arrangements that could greatly reduce their freedom.

Forgetting their supposed inherent goodness, care practices are central to enacting waste regimes because, and in clear contrast with managerial optimism, they force us to "give up dreams of perfection or control, but keep on trying" (Mol, 2008: 93). Contrary to the usual WM emphasis on ready-made final solutions, from this perspective "there will be no perfection, but there can be ongoing and effective care that stays alert to many sorts of history" (Haraway, 2011: 107). When we care about waste we do not allow it to became invisible nor do we easily delegate it to automatic systems and experts, because we are

conscious of their continual failings in controlling the multiple and unconventional agencies of waste. Thus care is relevant not because of its goodness but because once we start seeing an issue as a ''matter of care'' we cannot neglect it and neither can we simply embrace it or merely feel attached to it. We must see it critically, continually ''unsettling'' (Murphy, 2015) the practices through which we (do not) care for waste. Then we can conclude by stating a simple dictum: if we are not willing to care for waste, it should not be produced at all. The only possible alternative to not caring is inexistence.

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## Notes

1. The fieldwork on which this paper is based was carried out by the author between October 2013 and March 2015 and consisted mainly of participant observation and in-depth interviews with SAR personnel. All the names have been changed to protect the anonymity of the actors involved.
2. The mine is at 2500 m MSL and Carén is at 200 m MSL.
3. Technical devices whose main purpose in hydraulic infrastructures is to help dissipate the excess energy in flowing liquids.
4. Both Marcos and Richard, a subcontractor I met there another night, recalled a situation that occurred some weeks ago in which some people wanted to enter the station at night and the dogs drove them out, barking furiously.

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