



Building a park, immunising life: Environmental management and radical asymmetry



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ABSTRACT

This paper engages in a critical assessment of environmental management as a way of rethinking our co-habitation with earthly powers. Focusing on the post-disaster reconstruction of Constitución, a Chilean coastal city severely damaged by the 2010 tsunami, we argue that environmental management theory has not fully recognised that, sometimes, we humans confront excessive forces that cannot be diplomatically managed or assumed as manageable objects that will readily accept our invitation to compose a common world.

Thinking with Sloterdijk's notions of atmosphere and immunisation, this paper proposes a theoretical programme to re-frame post-disaster environmental management as the creation of life-enabling membranes to contain, isolate and immunise human existence from indifferent forces such as tsunamis. More specifically, we follow the technopolitical controversies around the design of an anti-tsunami park in Constitución to draw attention towards two crucial moments of this process: the definition of the park's composition and the debate around the park's fallibility. We argue that these moments point to a type of environmental management engaged in the articulation of an immunising atmosphere to secure an interior for human dwelling. Moreover, these two moments specify empirical challenges not fully developed in Sloterdijk's atmospheric philosophy: the *rearrangement* of science, politics and materials that is brought along in the process of erecting an immunological membrane; and the *bioeconomy* of life (and death) that emerges upon the possibility of an immunitary breakdown. In the concluding section we turn to the ecological and ethical challenges opened up by an atmospheric approach to environmental management.

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1. Introduction

Making thoughtful decisions about environmental challenges that involve wide-ranging and potentially irreversible consequences is of profound importance for current and future human wellbeing.

[Polansky and Binder, 2012]

As economists Stephen Polansky and Seth Binder remind us, nature, far from keeping a peaceful distance from our political life, has been increasingly challenging it. The augmentation of technological disasters, the geological uncertainty regarding new energy solutions such as fracking, and the almost inevitable consequences of climate change delineate a future in which nature, an adamant

force not ready to be tamed, disrupts the project of the moderns (Latour, 1993).

In the face of this 'revenge of Gaia' (Lovelock, 2006) a renewed interest on environmental management (EM) has emerged in diverse domains. EM can be defined as a set of knowledges and practices oriented towards the purposeful mediation in human–natural relations (Barrow, 2005). And as such, EM has gained a central place in the governance of social life. "Environmental threats", indicates the United Nations Environment Programme, "will require new global, regional, national and local responses", namely "rules, practices, policies and institutions" capable to re-shape "how humans interact with the environment" (2009). The assembling of new market devices for emission trading, the organisation of better and faster post-disaster humanitarian help, or the development of novel geoengineering solutions such as carbon capture and storage, is just but a few examples of the importance of EM practices to ensure the long-term ecological balance of the planet. These practices, in turn, confirm the entanglement of politics and

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nature. EM, put differently, has emerged as a way of establishing new arrangements between the human species on the one hand, and uncontrollable and threatening geological/meteorological forces on the other.

In this paper we want to engage in a critical assessment of EM as a way of rethinking our co-habitation with earthly powers. The crucial role of EM in the current state of affairs offers an opportunity to reflect upon the human/natural divide and the ontological assumptions sustaining such a demarcation. To this end, we connect with the literature inspired in actor–network theory and other strand of material semiotics that has called for the recognition of the relational and hybrid nature of both the environment and its management. But while this work has thoroughly described the many ways nature and technosciences are enmeshed, it has not fully recognised that, sometimes, we humans confront situations of radical asymmetry: occasions in which nature does not behave as an entity ready to be hybridised in our articulations but, on the contrary, acts as a recalcitrant and even inhuman force. Geological, biological, meteorological and chemical eruptions stubbornly remind us that we, humans, live in and are dependent on “earth and cosmic processes that have gone on since long before our species made its appearance, look likely to go on long after us, and continue to happen all around us”, as put by Clark (2011: xiv). The terrestrial excess upon which our existence depends often proves to be unmanageable, indeed violent and deathly in the case of earthquakes, tsunamis and other disasters. Here we confront the limits of collective human action vis-à-vis nature's exuberance, and thus a paradox when thinking about EM practices: to what extent the increasing recognition of nature's agency via all sorts of material relationalities brings along, at the same time, the expansion of the (imagined) dominion over which humans have purchase. The critical point here is the implication – distilled from both EM and relational theories – that “‘being’ or ‘reality’ or the ‘cosmos’ is thereby renegotiable *without remainder*” (Clark, 2011: 51. *Emphasis in the original*).

In this paper we utilise Sloterdijk's (2011) notion of atmospheres to think about EM as an immunising practice in the context of disasters. As extreme natural events in which humans are withdrawn from, disasters reveal the limits of the grammar of hybridity: EM appears as a form of relationality sustained on the logics of containment and human-ambient building. Through disasters, EM emerges as a practice not so much oriented towards the articulation of a diplomatic and balanced co-existence between the geological and the social, but involved in protecting, separating and preserving human life from inhuman environmental powers. Sloterdijk's emphasis on atmospheric forms of conviviality can be useful for enhancing our imagination about the type of human/inhuman relationality put forward in post-disaster EM practices.

More concretely, in this paper we describe the efforts done by heterogeneous environmental managers (Krause, 2015) to design an anti-tsunami park after the 29-m wave that devastated Constitución (Fritz et al., 2011), a coastal city in south-central Chile, during the 2010 earthquake and tsunami. Specifically, we draw attention to two moments in the making of the park: the definition of the park's composition and the debate around the park's fallibility. Each of these moments points to the empirical particularities – the challenges, questions and controversies – of a type of environmental management that engages in the articulation of an immunising atmosphere. In doing so, moreover, our account also brings to the fore two considerations about the situated practice of atmosphere building not fully developed in Sloterdijk's accounts: the *rearrangement* of science, politics and materials that is brought along in the process of erecting an immunological membrane to keep violent earthly forces away from human habitats; and the *bioeconomy* of life (and death) that emerges upon the possibility of an immunitary breakdown.

Our account is organised as follows. In the next section we briefly delineate the literature on EM and summarise the critiques EM theory and practice has encountered – mostly coming from ANT-inspired scholars. Then we turn to Sloterdijk's concepts of immunisation and atmospheres as a way to rethink EM. In the third section we introduce our case and describe how the tsunami mitigation park came to matter. In the fourth section we zoom-in and turn to our empirical material. Finally, in the fifth section some concluding remarks are rehearsed.

2. Environmental management: from hybrids to immunology

2.1. The ontological turn in EM theory

The definition of EM is diverse as the terms ‘environment’ and ‘management’ themselves.¹ But one key assumption marks the practice and theory of EM since its emergence in the 1960s: the expectation of an intervention with the capacity to *mediate* between human activities and natural forces. If anthropogenic development has already altered the Earth's equilibrium then human capacity, seems to be the assumption sustaining EM's expectation, can be equally mobilised to manage, enhance or rearrange the co-implications between the human and the natural. In the face of the ecological degradation of the planet, the deployment of technologies, practices and institutions to repair rapid, irrevocable and deathly human-induced bio-physical alterations is urgent, and thus the salience of EM in the last decades.

But the renewed importance of EM has not gone without criticism. Broadly speaking, EM practices and theories have encountered three main zones of contestation. First, critical scholars have questioned the conflictive relation between EM and the legitimisation of industrial corporate stewardship – deflecting, therefore, the possibility of more radical change to economic and social systems (Levy, 1997). In addition, EM has been criticised for its positivist assumptions and its self-definition as a practice done by state agents, utilising quantitative data and mobilising expert knowledge (Bryant and Wilson, 1998).

Finally, scholars inspired in actor–network theory and other material semiotic approaches have called for an ontological turn in EM, particularly when it comes to the concepts of ‘environment’ and ‘management’ (Lippert et al., 2015). It has been stressed that EM, as a situated practice, is not about an environment external to the manager but about the always-precarious assemblage of disparate elements – from data recollection to administrative practices to financial devices. The environment is hence a relational entity in which the social and the natural cannot be demarcated. So, as argued by Lippert, “environmental management studies would better recognise the ultimately hybrid character of the objects deemed to be managed as well as their managers and their instruments” (Lippert, 2014: 96).

This understanding is embedded in a long tradition within science and technology studies that has questioned the ontological fixity of concepts such as the ‘social’ or the ‘natural’ – and that has recognised the ontological inventiveness at work in laboratories, experiments and other forms of technoscientific labour (cf. Latour, 1988). Any entity populating our world, the argument goes, is a precarious and processual achievement, an effect that is made into being through the work of multifarious elements. And EM is not outside this ontological politics. Nature only exists via the mediation of heterogeneous devices, institutions and actions. As Lippert brightly summarises, “[natural] entities are not simply pre-existing, waiting for environmental management practice, but have to be somehow brought into existence, [then] we can

¹ See Barrow (2005) and Colby (1991) for some typological and definitional efforts.

speak of environmental management as enacting entities into reality” (Lippert, 2014: 101; see also Lippert, 2015).

2.2. The limits of relationality and radical asymmetry

This ontological turn has allowed the de-essentialisation of nature (and society) and the recognition of the inter-mixity of the social and the natural. However, voices coming from the new materialities genre, speculative realism, critical feminism and other strands of critical thought have suggested that the ontological turn has, paradoxically, also extended the humanism deemed to be surpassed. On the basis of the material semiotic account, the natural can only be thought in *correlation* to human subjectivity, technology or politics: it is only with, in or through human action that nature gains ontological consistency. Nature is not anymore external to the human, but there is neither anything else *beyond* the human: humanness is ubiquitously implicated in the ontological existence of everything, including the natural.²

The basic question is whether material semiotics has confounded ontology with access (Harman, 2012). Material semiotics, it is claimed, has been timid recognising the existence of regions in which humans are substantially and irrevocably *absent*. No everything is ready to be acted upon or enlisted in our networks and experiments, since some natural things, like bacteria (Hird, 2009), galaxies (Harman, 2002) or tectonic plates (Clark, 2011) can simply not be thought from any human parameter of time, space and power, nor can they be smoothly enrolled in our affairs.

This is not to say that we humans do not engage in the ontological production of bacteria, stars and tectonic plates in and through our political debates and scientific practices. We do, and this has been one the main contribution of the STS turn: to move away from the epistemological questions of the philosophy of science to gain a better empirical insight on how technoscientific practices re-articulate science, technology and society. The experiment, the fundamental apparatus of scientific knowledge (Hacking, 1983; Rheinberger, 1997; Stengers, 2000) does not just act upon things, it also invents them. Hence Latour’s (1988) preoccupation about where was bacteria before Pasteur. But Latour’s question is not about the thing-in-itself independent from human activities (Bryant, 2011). Latour, strictly speaking, is interested in the *publicity* of bacterial worlds, in experiments as sites of demonstration, in the techno-political life of microorganisms – since bacteria has done quite well without humans for millennia (Hird, 2009). It would seem, then, that the principles of generalised symmetry mobilised by ANT and other material semiotic approaches has certainly helped in eliminating the binary clash between humans and non-humans. The cost, however, has been certain incapacity to think the non-human side without the human one (Meillassoux, 2008).

It is important to note that the critique to ANT and other forms of material semiotics does not imply a re-invocation of an essentialised vision of the human – or the non-human to that extent. In a pragmatist move, ANT has focused on how things (including humans) are processually arranged and constituted as such. Things as an *effect* of assemblages, relations, and practices. The point made by the new materialities genre is not to re-install a foundational ontology but to insist that whatever a thing is and how it is constituted, there is always a remainder, a resistance that forces the recognition of the thing-in-itself – and not just of the thing as a passive and malleable object always ready to be networked, assembled or enrolled. Here lays the (speculative) realism invoked by the new materialities genre: things summon a ‘real’

ontology not because they exist in a positive and objective realm, but because they are constantly exerting a difference, an interference, an ontological recalcitrance that problematises the limitless expansion of assemblages. The realism of things lays on the fact that their existence is not always explicated by or exhausted in the relations they establish with human practices and knowledges. In this sense, things are never fully understood; they are never fully apprehended by assemblages, their reality is always hidden from us (Bryant, 2011; Harman, 2012). While they are real, we can only speculate about what is their condition as such.³

Restoring to the challenges of EM, the material semiotic approach may eclipse forms of human–nonhuman relationality that are not based on symmetric inter-action but on radical (in)difference. This is the case, for example, of disasters, excessive processes (Law and Singleton, 2009; Tironi, 2014a) that fall outside from any human biological and political parameter. Against the claim that all things are ontologically constituted by their relations in symmetrical networks of translations and agencements, Clark (2011) proposes the idea of radical asymmetry to localise our human position within complex and changing ecosystems. “Follow the threads that weave in or out of these matters of concern”, proposes Clark thinking about natural disasters and climate change, “trace their lines of causality or ripples of consequence and they lead us back to epochs before humans emerged, take us deep into micro-ecologies too tiny and too multitudinous to even imagine, drag us down to the molten and lifeless interior of the earth, whip us up into the stratosphere and out into the solar system” (2011: xvi–xvii). Clark’s critique to ANT account on ontological symmetry⁴ is that when it comes to the management of environmental forces, we need to recognise the abyssal difference between human volition and natural capacities: we need to reckon that “the impression that deep-seated forces of the earth can leave on social worlds is out of all proportion to the power of social actors to legislate over the lithosphere” (2011: xvi).

We take this notion of radical asymmetry not to deny the ontological inventiveness of the laboratory, or to fix a human essence beyond politics. Or to argue that there are objective elements that we can isolate, positively know and therefore act upon them. Radical asymmetry, we argue, may be an appropriate point of departure or contextual stance to recognise that EM deals with things whose reality is independent from our science and politics.

2.3. Atmospheres

The location of human existence amid irresistible forces requires a re-installment of EM theory and practice. We propose to utilise Sloterdijk’s (2009b, 2011) sphereology as a way to think through this radical asymmetry, and thus to imagine EM practices enabling social/nature relations not just via the performance of heterogeneous entities, but also by tracing boundaries to *immunise* them.

There are three elements in Sloterdijk’s theory of anthropological existence that are crucial for a revision of the EM. First, for Sloterdijk a key existential condition of humanness is the fact that

³ To be sure, other critics have also questioned the ontological rigidity of some ANT premises. Even ANT scholars have recognised the always-precarious stability of things and networks. Law (2007) labels as ‘post-ANT’ the strand of material semiotics that, inspired by the work of Donna Haraway (1991), acknowledges that there is an ontological remainder that is constantly exceeding and resisting, while partial versions of nature may be enacted into reality as stable effects of human and non-human entanglements, interferences and othernesses.

⁴ The symmetry assumption of ANT has also being questioned from other angles. Ingold (2011) uses the idea of “meshwork” to think about connectivities that do not assume fixed entities existing prior to their connections. Star (1991) has questioned absence of “monsters” – heterogeneity, multiplicity, differences – in ANT accounts, while Strathern (1996) has highlighted the always partial nature of networks.

² For a reflection on the role of non-humans in environmental management see Rodríguez-Giralt (2015), Rojas (2015) and Beisel (2015) in this issue.

we are thrown into a world that is completely indifferent to our fate. We are enveloped by inhuman dynamics that shape and change the cosmos irrespective to any human consideration: humanity is surrounded by and subjected to violent and aloof forces whose existence is not only independent from human life but also a perpetual threat to it. In this sense, Sloterdijk stresses, the history of humanity is the process by which we “had to learn to accept and integrate new truths about an outside not related to humans” (2011: 21). Indeed,

Every view into the earthly factory and the extraterrestrial spaces provided increasing evidence that mankind is towered on all sides by monstrous externalities that breathe on it with stellar coldness and extra-human complexity... [since Enlightenment] being-in-the-world has meant having to cling to the earth's crust and praying to gravity.

[2011: 23]

Confronted to this “cosmic frost” (Sloterdijk, 2011: 24) and to the absence of old forms of protection, Sloterdijk's philosophy of being emphasises the need of constructing spheres within which life can unfold. Sloterdijk reminds us that we are always held by a topos, surrounded by a space, by spheres that allow our liveliness to realise itself. From the placenta to the city, our life is only possible if animated in and sustained by atmospheres. The possibility of human life rests on a “deliberate greenhouse effect” (2011: 24): the ability of creating an interior, a “comprehensive house-building operation” (2011: 24) that would contain life against the outside:

Human inhabitation can be explained as settling within a common and personal immunity system [...] From an immunological perspective, inhabiting is a defence measure by which an area of well-being is demarcated against invaders and others carriers of malaise

[Sloterdijk, 2006, our translation]

Humanity, then, is fundamentally created in interiors. “In this sense”, points Sloterdijk, “spheres are by definition also morpho-immunological constructs. Only in immune structures that form interiors can humans continue their generational processes and advance in their individuations” (Sloterdijk, 2011: 46).

Interestingly, for Sloterdijk the notion of the ‘environment’ is explicated by the increasing necessity of morpho-immunological interiors to sustain life. For Sloterdijk this necessity became evident in the advancement and application of chemical weapons during WWI; that is, weapons that targeted not the body but the “breathable milieu” (2009a: 23) of living organisms, the “primary media of existence” (2009a: 50) upon which life rests. The capacity to comprise violence against the human-ambient “without which people cannot remain people” (2009a: 25) also visibilised the need of “atmotechnics” (2009a: 23), knowledges, practices, apparatuses and technologies to design climates for human life, atmospheres for human dwelling.

The crucial point here is that life, in order to secure its basic conditions of reproduction, needs to immunise itself. Whatever humans are and however they are constituted as such, we need to create interiors to protect our natal vulnerability against the incommensurable violence of the exterior. So as in the emerging speculative realist genre, Sloterdijk is interested in the limits of human ‘correlationism’: not how everything-that-is-not-human intermingles with and is enacted by humans, but how the existence of the latter depends on its ability to immunise itself from the former. Without the earth's troposphere rich in oxygen, or the lithosphere making the earth a living planet, life is literally unliveable – and thus the need to create atmospheres that *exclude* tsunamis or other uncontrollable forces from them.

Hence Sloterdijk's sphereology allows a double movement especially pertinent for rethinking EM. On the one hand, spheres are relational formations: they articulate a coexistence among affective human beings, nonhuman entities and their outsides; on the other, this conviviality rests upon the reality of an excessive, inaccessible and merciless cosmos that needs to be contained. Sloterdijk's immunology, in other words, offers an alternative scheme to think EM, one in which nature is granted with full, asymmetrical agential powers and therefore where humans are required to build morpho-immunological containments. Through the lens of Sloterdijk's sphereology and in contexts of excessive earthly powers, EM emerges as a type of atmotechnical intervention. And as such, EM puts forward questions about nature, risks and death that have been not yet fully addressed. In an attempt to explore these questions empirically, we now turn to Chile's 2010 earthquake and tsunami.

3. Constitución and the design of a tsunami mitigation park

The night of February 27, 2010, an 8.8° Richter earthquake shook south-central Chile. While Chile is one of the most seismic regions of the world and mega-earthquake hit the country regularly, a new, unexpected entity disrupted the precarious human-geological arrangement achieved in Chile: the tsunami that followed the earthquake and heavily damaged several coastal cities and settlements. Earthquakes are well represented in Chile, dully accounted in policy regulations and scientific production. This is not the case with tsunamis, elusive entities that have proved to be extremely difficult to represent, not just in the sense of recognising their ongoing occurrence (Farías, 2014), but also in the sense of including them in building and land-use regulations. Thus after the 2010 event tsunamis became both a new zone in intervention and a new unknown territory for EM in Chile – with Constitución as the main site of experimentation.

Constitución is a medium-sized city of 45,000 inhabitants located on the southern side of the Rio Maule estuary. Since the mid-1970s the city is the home of a cellulose manufacturing plant managed since 1985 by Arauco Corporation, one of the world-largest producers of wood derivatives. A few years before the earthquake and tsunami hit Constitución, and after various environmental controversies in other localities, Arauco radically changed its corporate social responsibility strategy, separately supporting some local actors and associations.⁵ In this context, the 2010 disaster appeared as a unique opportunity to expand Arauco's collaboration with the city, establishing a consortium with the municipality to manage the elaboration of a reconstruction master plan and the reconstruction process (Tironi, 2014b).

Funded by Arauco, this consortium hired top national and international professionals to elaborate the master plan, among them three companies that played a leading role: Elemental, a worldwide recognised Chilean architecture office was in charge of elaborating the design proposals and coordinate the work of other offices, such as the global company ARUP, in charge of the most technical aspects of urban engineering proposals, and Tironi Asociados, which designed and organised the citizen participation process. These three companies were hired to develop the master plan within a 90 day period, which infused the whole process with a sense of urgency. While the reconstruction plan triggered a number of controversies around the participatory process (Tironi, 2014b), it also propelled an intense conflict over the plan's flagship intervention: a tsunami mitigation park.

⁵ For a description of the conflictive relation between Arauco and Constitución, see Farías (in press) and Tironi (2014b).

The tsunami had entered the city through the estuary, at which the city is located, heavily destroying the northern riverside of Constitución. The first four rows of blocks were heavily damaged and many houses simply disappeared. Accordingly, one of the key issues for the design team involved precisely the future use of the riverside, evidently a high-risk area (Gesche Ingenieros, 2011). From the beginning, a prohibition of residential uses of the risk area was deemed as being not just undesirable, but also impossible, as the expropriation of more than 500 houses and land sites would find strong citizen resistance and be very expensive. Even if expropriation could be achieved, it would be difficult to avoid future informal, illegal and even riskier uses of the area. Hence the solution, and the most important project to be developed in the master plan, was a tsunami mitigation intervention that could allow residential uses in the risk zone (PRES, 2010). The question, then, was what kind of mitigation work this could be: what type of artefact could stop an unpredictable and excessive hyperobject, to use Morton's idea (2010), from ravaging the city. Building an anti-tsunami wall, which had to be at least 7 m high, was considered a rather bad solution, and not just because of its negative aesthetic effects on the river landscape. Anti-tsunami walls, it was argued, can be overflowed by large tsunamis and function like dikes, impeding the water that enters the city from flowing out again. Instead, the option chosen by the design team was to develop a tsunami mitigation work that, unlike anti-tsunami seawalls, could be integrated into and enhance urban life (Gesche Ingenieros, 2011).

The proposal was to transform the very first line of land at the riverside, although it was unclear exactly how broad this should be, into what was called a Fluvial Park. Such a park would certainly not stop a tsunami, but, with high and robust trees and a specially designed landscape, could significantly diminish the intensity and velocity of tsunami waves. The water would still enter the city, but without great damage, and residents would have time to evacuate their homes (Gesche Ingenieros, 2011). Geographical threats, so the architects argued, are best combated with geographical answers. Different from what happens with an anti-tsunami seawall, or any other isolated mitigation engineering intervention which slowly but inevitably deteriorates in time, producing even riskier shards, the new landscape of the park would strengthen its mitigation capacities in time. Tsunamis can destroy a fixed mitigation technology, but not a distributed and landscaped one.

Such a significant urban intervention could, as well, be designed to solve other key city problems and articulate other urban transformations. The park would, for example, diminish the extremely low per capita rate of green and leisure areas existing in Constitución. The park was thus presented as enhancing the unique natural heritage of the city and its symbiotic relationship with the river, two fundamental demands from the community. Additionally, the frequent flooding of Constitución's central area by the overflowing of an inner city canal, a major problem brought up by neighbours, was to be solved by the park as well: converted into a flood zone, the park would contain the canal's precipitation water discharge. Likewise, the park would also help to reorder the urban system of traffic flows, and especially the problem of inner-city circulation of industrial traffic, for it would incorporate a new coastal highway into its design. This new coastal highway would be the new entrance to the city along the riverside. The park, in a nutshell, was presented as the cornerstone for a new way of ordering city life.

The park, however, involved interfering and interrupting existing urban relationships. The design of the park thus unearthed a number of controversies that entangled proprietary, environmental, heritage and citizen issues. For example, while the creation of a fluvial park would involve the greening of Constitución, it also required a number of expropriations, severely harming the economic stability of homeowners, fishermen and commercial

business located in the risk area (Gesche Ingenieros, 2011). The reshaping of the city proposed by the park thus created its own counterpublics, assemblies and alliances of urban actors engaging in protest and inquiry, in the production of moral claims about justice and in the contestation of expert knowledge. To reach a wide public consensus on the validity, necessity and features of the park, planners organised a large-scale referendum. Unsurprisingly,⁶ the referendum confirmed that neighbours widely supported the park.

During the subsequent process of design and technical approval, technical debates around the park proliferated. These debates, we claim, embody the type of EM not focused on the intermingling of the natural and the human, the oceanic and the urban, but in their separation. Or put differently, the story about post-disaster politics and technoscientific controversies cannot eclipse a fundamental issue: that beyond the intricacies of the conflict, a profound ontological discussion was taking place in Constitución – namely, how to stop disproportionate bodies of water from making the city useless as a milieu for human dwelling. The tsunami proved that life has to be contained, isolated and preserved in concrete ways, and that EM is, in this respect, the art of immunising life.

4. Trees that last: creating and maintaining a plant-made atmosphere

The basic and vital question at stake in Constitución was how to actually devise a park able to stop a tsunami wave. The design of a mitigation forest proved extremely complex because trees, the basic unit in charge of curbing the wave, were nothing but evident. Or put differently, it was not clear whether any tree would be able to safeguard the city: what type of tree could maximise the separation between the ocean and the city? How trees had to be displayed to immunise Constitución? Bottom line, could humans rely on a plant-sustained atmosphere?

How to build a “breathable atmosphere” is a relevant question in Sloterdijk's sphereology. Sloterdijk suggests that early nineteenth century English palm houses (or greenhouses in general) were the first systematic attempt to create an interior in which life could be entertained *in spite of* violent exterior forces – in this case, the crude English winter. Sloterdijk argues that building innovations, such as curved glass and the mastery over casted iron, were fundamental to provide palms, orchids and camellias with appropriate atmospheric and climatological conditions. Since then, Sloterdijk argues, architecture is explicated as an atmotechnical art: palm house inaugurated a “new view of building by virtue of which climatic factors were taken into account in the very structures made” (2005: 945).

The question about trees encountered by planners and environmental managers in post-disaster Constitución follows the same atmotechnical concern: how to provide humans with an interior able to immunise them from an inclement exterior. But, at the same time, the challenge in Constitución was of a different magnitude, since glass and iron – or for that matter any kind of solid membrane – are insufficient to stop a gigantic ocean wave. Planners in Constitución took morpho-immunology to its limits. Given that the park was an unprecedented solution in the Chilean context, ARUP had first suggested its use by referring to South East Asian observations regarding the mitigation effect of coastal forests and justified with evidence from Japanese studies on the effect of pine forests. Local conditions of implementation, however, did not quite correspond to what these models suggested.

⁶ Although all efforts were made to secure the formal, accountable and impartial nature of the referendum, the exercise was devised to imbue the ‘yes’ option with a prescriptive moral tone (Lama and Tironi, in press).

To start with, the width proposed in the master plan did not fully fit the model. Tsunami mitigation forests have a minimum width of 200 m. This thickness secures the progressive break of the tidal force. The proposal for Constitución, however, had only 80 m. Such an extension of trees was unable to avoid the massive wave from entering into the city. Engineers discovered, however, that obliquity was a fundamental factor: in a kind of perspectival move, ARUP consultants argued that since the Park was to be built along a riverside, and not directly on the sea shore, a different model could be used – one assuming a lateral wave entering diagonally into the park. Therefore in this case, the length of the park along the shore would in this case be more important than its width.

What type of trees could better resist the onslaught became then a second focus of inquiry. South East Asian models consider native coastal forests with a high saline resistance, low hydrological requirements, and long roots and strong trunks to resist the wave. Crucially, endogenous forest is easy to maintain: being adapted to the geographic and meteorological local conditions, native kinds require less care. They require very little water and are capable of resisting the summer and the solar radiation with the water they collect in winter. The PRES proposal was then to raise a park with the species of the native Maulino forest, which moreover is in danger of extinction. The Park would thus not only create a hospitable atmosphere for urban life, but provide also a sense of reliability: the confidence that our atmo-protection does need our preoccupation and worries to function as such.

But while native species are self-supporting, they are also of slow growth. In order to ensure mitigation before the native forest had grown to an adult age, the proposal was to use exotic species that grow quickly and give high resistance to a tsunami wave, concretely eucalyptus and pine, in the contours of the Park. Introducing exotic species in the early stages of the project was also necessary because some native species can only grow in shaded undergrowth. The arrangement of an immunological membrane would thus be procedural: a native forest would slowly grow under the exotic species, which would then be fully taken out when the native forest could fulfil the mitigation requirements.⁷ So, in the long term, the park could help to save the Maulino forest, lending itself to ecological and educational uses, and could be partly financed by the Arauco company, which, given its forest exploitation, is obliged to restore 25,000 ha of native forest.

In brief, to protect Constitución from annihilating forces, trees had to endure over time: they had to be able to overcome underfinanced municipalities, the ever-growing lack of water and the particularities of local climate. Native species met all the requisites. Moreover, native forest could help signalling the ecological sensitivity of the plan.

The forest envisaged in the master plan was, however, heavily questioned by Moebis, the urban design company hired to prepare and supervise the actual construction of the Fluvial Park. As Moebis' botanic team revised the plan's technical specifications for the park, they realised that it was sustained on a fiction – for Chile currently has no native coastal forest. Along the coastal areas, they observed, one could find various species of bushes and plants, but simply no forests. The botanic expert who had advised the original plan saw things slightly differently. For her, while the current uses of coastal areas had minimised the existence of olivillo (*Aextoxicon punctatum*) forests, they do grow naturally on the coast across Chile's central region. So, even though there currently is no

actual native coastal forest, there once was one and the project should restore it. For Moebis' botanic experts, in contrast, since there is no native forest on the coast, but only behind the coastal mountain range and towards the Andes, the plan involved an unnatural and 'strange' composition.

Moebis' alternative proposal was to design a highly dense core of exotic species that would grow fast and resist the tsunami. Only in the surroundings, native tree species could be planted, irrigated and pruned. They would not conform a forest but, like an external ring, would coat the exotic forest. This external layer of native species was to implement the concept of an urban inhabitable park, a more welcoming landscape associated with the local ecosystem, designed in a human scale for recreational uses. Thus the forest as protecting membrane of urban life was not anymore mono-functional. A kind of operative density was granted to it with at least two programmes developing at unison: the containment of the tsunami and the reproduction of sociability; protection for critical events, pleasure for times of normality.

Moebis' proposal included among the exotic species of the core some such as *Tamarix pentandra* and *Acacia melanoxylon*. These species have high saline resistance and mitigation capacity, but were heavily criticised by the CONAF's (National Forest Corporation) experts for their highly invasive character and tendency to expand along riversides. The co-habitation between exotic and endemic species was indeed more difficult than expected, as exotic species could easily escape from the park, colonising nearby habitats and displacing native species. Even the multi-programme nature of the park was endangered, as trees sought to protect the city were at odds with those with recreational objective. The park membrane as device for the securitisation of the urban sphere in war times, and as a green space for public use during peace periods, were incongruent.

In sum, containing a tsunami with trees proved to be difficult. First because a precise combination of width, length, positionality and resistance is needed. And second because trees need to last, if not forever at least for the next catastrophic event. Water, care and appropriate climatological conditions are needed for trees to develop. Trees, moreover, have a life of their own. They grow, expand and colonise at their own pace and will.

What we would like to highlight is the *rearrangement* of politics, materials and knowledge when questions shifts from administrating natural forces that co-habit with us, to the management of entities with which any conviviality must take the form of a territorialised containment. Sloterdijk views modernity as the process of proliferation of enhanced atmospheres for human life. The case of Constitución indicates that such a proliferation, moreover, brings along new matters of concern and new zones of public debate. The question about the capacities of trees to contain a tsunami articulated science, politics and non-humans in novel ways for planners. The tree became an infrastructure for the protection of Constitución, much like the curved glass enveloped palm tress in nineteenth century England, and as such botanical knowledge, outside the epistemologies of planners and engineers, became critical to cope with the building of a morpho-immunological separation against uncontrolled water masses. Trees, through botanic knowledge and practice, brought along their own controversies and politics: how trees grow, what type of habitat they need, which trees are indigenous, who should take care of trees, how trees behave. This is, in a way, a type of atmospheric politics – politics about the climatological membranes – that needs to be accounted for to expand the inventory of EM in context of radical asymmetry.

4.1. Failing ambient: bioeconomy and the expanding causes of death

While the park was thought to stop the tsunami, engineers and planners never assumed total containment. Trees are, after all,

⁷ Attending such criteria, the selected forest composition included: *Nothofagus*, *Nothofagus alessandri*, *Nothofagus glauca*, *Nothofagus obliqua*, *Maytenus boaria*, *Quillaja saponaria*, *Schinus latifolius*, *Aextoxicon punctatum*, among others. Not all are of the Maulino forest, such as *Schinus latifolius* and *Maytenus boaria*. Mixtures were made considering their ecological relationships.

weak contenders against the abysmal forces of the ocean. Human life would always be at risk: its atmosphere, however protected with plant membranes, would always be vulnerable to the penetration of tidal masses.

Thus post-disaster Constitución poses an interesting perspective to Sloterdijk's sphereology. Indeed, the German philosopher invests his efforts explaining the atmospheric ontology of being-in-the-world and the history of atmosphere-making. His historiography situates Enlightenment as the decisive moment in which humans, divested from any enveloping protection – mythology, religion, traditions – devoted themselves to the enterprise of building new immunising atmospheres. But while human-dwelling interiors are the response to the breakdown of traditional covering membranes, we know little about the failure of such new “breathable milieus”. This is especially relevant when dealing with extreme forces such as a tsunami: how to think about the always present possibility of a failing immunological ambient when what is at stake is existence in its most basic and biological definition?

Constitución offers a tentative answer. The fragility – both physiological and political – of trees could not secure a stable protection against the Pacific Ocean. Put another way, the security of Constitución could not entail just a fortification strategy; it should also convey a different atmotechnical programme, one less related with the articulation of an spatialised immunity than with an economy of conducts and life: in the face of failing membranes, the continuity of life should ensure, where possible, all the elements necessary to minimise the chance of *death* in case of an atmospheric breakthrough.

In Constitución, this contingency programme materialised in the lighting system of the evacuation routes of the park. Since the park cannot stop a tsunami, but only mitigates its arrival, the park requires an evacuation system operating also in the case of an electrical blackout. Following best practice recommendations of FEMA, the US Federal Emergency Management Agency, planners designed evacuation routes assuming an evacuation speed of 2 miles per hour and a maximum evacuation time of 20 min. The result was a plan securing that from any point in the risk perimeter, routes of max. 1000 m should lead the population to safe areas. Simulations and modelling defined that three routes were necessary in Constitución. Thus in case of waves overflowing the containments set to stop them, neighbours still had some chances of keeping alive.

These escape routes needed a photovoltaic lighting system. Testimonies of survivors in Constitución confirm what we know from other post-disaster ethnographic accounts: that the tsunami was experienced as a quite literal disintegration of the world (Tironi, 2014b). The material, affective and cognitive parameters of everyday life that sustain normality are momentarily dissolved. In such an extreme experience of angst and fear, the identification and utilisation of escape routes is a rather optimistic assumption. Thus the deployment of prosthetic tools, such as luminescent, easily identifiable and user-friendly routes able to operate during a total blackout is of vital importance to have minimal chances of helping those in the impact zone.

The construction of such evacuation routes was, however, very expensive. Firstly, since photovoltaic lighting is less bright than normal lighting, the gap between the sidewalk and the street in every evacuation route has to be eliminated to avoid accidents due to reduced visibility. And secondly, the possibility of posts or cables falling and blocking the street or, worse, hitting people while evacuating has to be minimised. Concretely, electric and service cables have to be buried underground.

In order to justify the extra economic investment associated with street levelling and cable burying – seven times the cost of aboveground lighting cabling – planners had to demonstrate that the social benefit of the project exceeded such costs. Since they

were dealing with the last resource to protect life, in the planners' eyes it was clear that there could be no doubts of the necessity of these infrastructural arrangements and investments.

However, demonstrating this rationale with the existing methodologies to evaluate the social benefits of infrastructural projects was a contested issue. The main problem was that the Ministry of Social Development has no specific methodologies to evaluate the cost–benefit of tsunami mitigation interventions. In a typical case of valuing and system disconnections (Star, 1999; Barry, 2001), cable burying has no bureaucratic existence within the evaluation of disaster emergency response interventions. The only way to convert cable burial into an enumerated entity (Verran, 2011) calculable for evaluating purposes was to value it as an intervention in public space. However, calculated as such, street levelling and cable burial would fall into the category of cosmetic interventions, and thus automatically downgraded as a factor in the Ministry's modelling of cost–benefits.

For planners was then crucial to demonstrate that these measures would directly result in saving people's lives, and that therefore they could not be classified as cosmetic. Accordingly, one option was to sustain the need of street levelling and cable burial using the model of project evaluation utilised by the public system of investment, which calculates the social cost of each individual death in approximately US\$8000. The problem, however, was to determine how many lives could be saved by these investments. The figures were unclear. One member of the responsible Reconstruction Agency explained that the difficulty of making the case was in the fact that in Constitución “people didn't die because something fell on their heads” (Interview April 12, 2012). Not *officially* at least. The classification of casualties in Constitución did not distinguish between death *in situ* and death *in route*. It was then needed, planners argued, to re-specify the label of ‘death’ in Constitución and find the particularities of each case. “We need to revise the causes of death in the last tsunami” (Interview April 12, 2012) explains further the responsible Reconstruction Agency.

Although the re-count of deaths in Constitución did not come finally through, the need of photovoltaic lightening systems became a widespread recommendation after the 2010 earthquake and tsunami (see for example UNDP, 2012). And as such, the controversy over the photovoltaic lightening system thus points to a dimension less developed in Sloterdijk's atmospheric programme: the design, organisation, and management of atmotechnics in case of immunological failure. What to do when membranes protecting human-dwelling places fail in their containment work? What empirical challenges face EM when its attempts to stop oceanic forces are overwhelmed? In Constitución an answer was rehearsed: before the incapacity of material spheres to block violent environments, planners and engineers had to resort to behavioural mode of creating an immunological system: a *bioeconomy* of survival. Bioeconomy, first, because the tsunami opened a new repertoire of causalities types – a repertoire linked to the possibility of immunity failure. When the case of trees failing in their task of containing water masses was seriously accounted, the phenomenonology of death expanded. To the traditional ways of dying in a tsunami, a new modality had to be added: dying due to the impossibility of following the procedures set to cope with an atmospheric breakdown. So a new economy of death is invoked, one in which new causes and deadly elements are integrated, but also one in which new recovering procedures, survival statistic likelihoods, and vital public interventions have to be imagined.

We speak about a bioeconomy of survival, as well, because the park and the system of evacuation routes are not thought at the scale of the individual but at that of the population. It is the city itself, the interior created to secure human life as a totality, what is at stake. The mitigation park or the evacuation routes assume

that what is at risk in the situation of a gigantic wave entering the city is not the protection that each individual or collective has privately secured for herself or itself,⁸ but the global environment: the minimal, atmospheric conditions of immunisation. Death, in the perspective of the tsunami, is not individual, but collective, that is the result of a form of violence against the common 'environmental living conditions' (Sloterdijk, 2009a: 29).

5. Conclusions

In this paper we have turned to the tsunami that devastated Constitución, a Chilean mid-size coastal city, to imagine new possibilities for EM theory and practice. Perspectives coming from actor–network theory and related philosophies have claimed that EM is engaged in ontological politics; that is in a constitutive process in which the things deemed to be managed are articulated into being by the management practice itself. This perspective seems insufficient when we face incommensurable entities. Material semiotic approaches, we have claimed, are interested in the pragmatist enactment of things in and through politics and science, thus have not wholeheartedly engaged in an empirical debate about things-in-themselves and the manifold modes they exceed human action and imagination. Before tsunamis we are confronted to a situation in which the capacity to manage, intervene or even access environmental things seems utterly disproportionate. We argued that in moments of ontological disproportion EM cannot assume an ontological flatness in which human action and earthly forces are symmetrically enrolled in assemblages and networks. This is the main hypothesis rehearsed in this paper: a material semiotic approach to EM may overlook the fact that under specific empirical circumstances, EM is engaged in the practical separation between habitable spaces and natural forces.

We proposed Sloterdijk's philosophy of atmospheres to advance an analytical programme for the study of EM in settings of radical asymmetry. On the one hand, Sloterdijk's sphereology grants the surrounding cosmos the ontological withdrawn-ness and indifference that material semiotic approaches are not fully prepared to acknowledge; on the other hand, it facilitates an approach to EM as an empirical practice with the objective of creating immunised interiors within which life can be maintained.

More concretely, in this paper we revised two controversies around the post-disaster planning of Constitución – the design of an anti-tsunami park and the justification of a photovoltaic lightning system for escape routes. These two conflicts point at the multifarious technical practices that had to be deployed in order to immunise Constitución from external violence, while they also specify empirical questions not addressed in Sloterdijk's atmospheric philosophy. Indeed, we discussed how the building of an immunising interior articulates a *rearrangement* of science, politics and nonhumans: the atmotechnical debate about how immunise Constitución brought to the political arena actors (trees) and epistemologies (botanic knowledge) that were outside the realm of post-disaster EM in Chile before the tsunami. We also revised how environmental managers in Constitución took seriously the possibility of an atmospheric breakdown, something not fully considered in Sloterdijk's work. This last resort immunology was thought in Constitución not as a spatialised fix but as a *bioeconomy of survival*: a calculation over the likelihood of life that considered new forms of death, novel deathly behaviours, and the escalation of survival to the level of the population.

The editors of this special issue have called for a renewed approach to EM as a situated practice. By way of conclusion, we would like to address the particularities of the situatedness encountered in Constitución with two further points. First, the theoretical programme here rehearsed opens up a new way of making an *ecological* argument about human existence. By proposing a type of EM aimed at immunising human life we are not favouring on ontology of the human as separated from its ecologies and habitats. Humans are in several ways imbricated in and dependent on the elements, things and forces that surround us (Ingold, 2011). But the powers of those elements, things and forces do not stop at the limits of human life. Rather the contrary, they often surpass them, and violently. Hence an ecological perspective should also acknowledge that we exist in and through a lively and indifferent cosmos that incessantly expands and mutates irrespective of humans, a latecomer in the long process of evolution (Hird, 2009). The creation of immunised interiors is then not signal of foundational anthropology but a call for an extended ecological perspective of the human. This, in other words, is less an argument about what constitutes a human than one about what it means to be a human-in-the-world (Sloterdijk, 2006).

Second, through the lens of Sloterdijk's sphereology EM's *ethical* concern is re-articulated. The planetary ecological crisis calls for an enhanced commitment towards the protection and conservation of our habitat, and EM plays a critical role in such commitment. The case of Constitución opens the question about whether a new protective and careful engagement with the world should not also include a more humble conviviality with geological, hydrological and meteorological forces. If ethics is the capacity to put oneself 'in the presence of' (Stengers, 2005), then EM's ethical commitment should start by a politics of humility: to recognise the irreducible vitality of water, minerals and air and the vulnerable position of humanity among those powers (Clark, 2010; Fariás, 2014; Tironi and Calvillo, submitted for publication). As we write these conclusions, Chile is being shaken by a swarm of extreme geo-meteorological events that have defied scientific calculability and social imaginations.⁹ In contexts of total uncertainty and vulnerability, ethics within EM cannot be reduced to expressing the need of bold and fast actions to save the planet; it has to be also about the humble recognition of excessive forces that cannot be not diplomatically managed. That is the challenge of EM: to invent and imagine modes of ecological conviviality in which earthly powers are located alongside (Latimer, 2013) human artefacts and affects – rather than assumed as manageable objects that will readily accept our invitation to compose a common world.

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⁹ In late March 2015, unprecedented precipitations in semi-arid Northern Chile provoked landslides with the result of 28 casualties and several cities completely destroyed. At the exact same time, a concatenation of 19 wildfires devastated thousands of hectares of protected forests in Southern Chile. A couple of days later, in April 3, the Villarrica volcano erupted, forcing the evacuation of the cities of Villarrica and Pucón. In April 22, the Calbuco volcano also erupted, generating a 15-km column of grey smoke that issued 210 million cubic metres of ash into the atmosphere. More than 6500 people had to be evacuated.

⁸ For a discussion on how flooding, another situation involving uncontrolled water masses, have prompted the deployment of an insurance market as a political technology to responsabilise individuals, see Collier (2014).

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