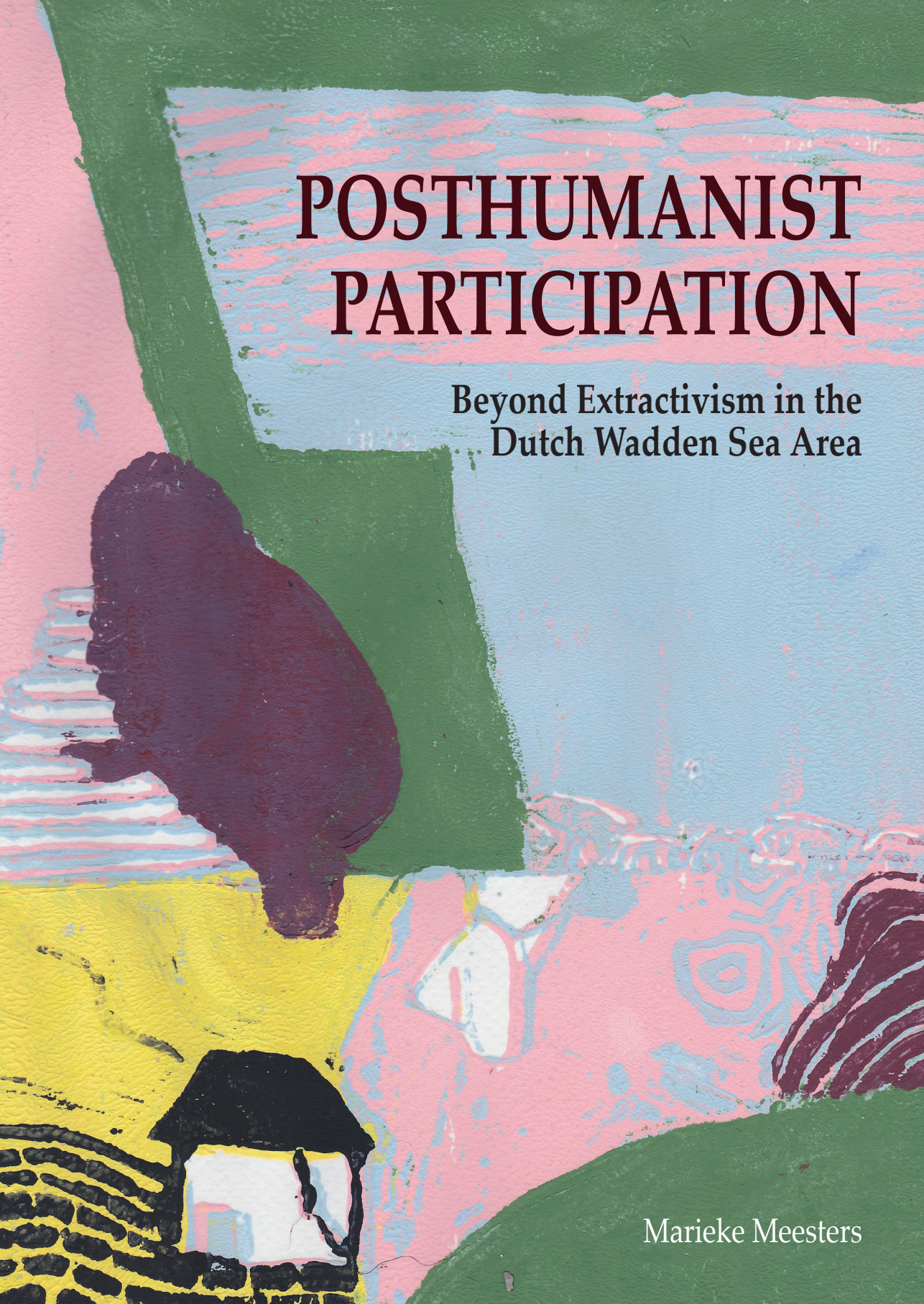
POSTHUMANIST
PARTICIPATION
Beyond Extractivism in the
Dutch Wadden Sea Area
Marieke Meesters

Propositions

1. Science is always activism.
   (this thesis)

2. Ontological exclusions are inevitable, structural ontological exclusions are not.
   (this thesis)

3. Quota for citing marginalized communities of scholars are necessary to counter neocolonial knowledge production.

4. Science based on extractivist methods is bad science, even when the outcomes benefit society.

5. Local aesthetics committees obstruct a swift energy transition.

6. Human poo is a vital ingredient for vegan food systems.

Propositions belonging to the thesis, entitled
Posthumanist Participation: Beyond Extractivism in the Dutch Wadden Sea

Marieke Evelien Meesters

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Posthumanist Participation: Beyond Extractivism in the Dutch Wadden Sea Area

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Posthumanist Participation: Beyond Extractivism in the Dutch Wadden Sea Area

Marieke Meesters

Thesis

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A feminist posthumanist approach to participation

1. Participation in natural resource management

Participation has become a central pillar in the management of natural resources and extractive sectors (Hartley & Wood, 2005; Mtegha et al., 2006; World Bank, 2001). Participatory procedures have increasingly been called upon in institutional contexts to deliver just and inclusive transitions towards sustainability (European Commission, 2019), and governments, industries and the public increasingly express the ambition to enhance local and other societal actors' awareness of, engagement in and acceptance of natural resource projects (Mercer-Mapstone et al., 2019; Owen & Kemp, 2013). This results in participatory processes that are organized by firms and governmental organizations that aim to ensure that natural resource operations either adhere to formal (international) legislation or aim to obtain an informal social license to operate (SLO) as part of a Corporate Social Responsibility strategy, which often includes ensuring human rights and mitigating environmental damage (Dare et al., 2014; Rodhouse & Vanclay, 2016). Through these participatory processes, non-profit organizations, neighboring residents and citizens have – at times – been able to influence mining and quarrying projects (Floor, 2018; Prno & Slocombe, 2012; Richardson & Weszkalnys, 2014). At other times, state-led or corporate-led participation has been criticized for its top-down character and for failing to ensure the rights of marginalized or local communities, failing to diminish power imbalances, and failing to account for protests and the production of counter expertise (Demajorovic et al., 2019; Kurniawan et al., 2022).

Most of the academic literature on participation in extractive industries focuses on describing which processes and practices constitute "good participation" and which have failed to meet these standards (Kurniawan et al., 2022; Owen & Kemp, 2013; Rauschmayer et al., 2009). This literature evaluates whether participation procedures have followed engagement frameworks that are set by financers or governments, or that are described in academic and grey literature. Some of these studies offer a pragmatic approach to participation and aim to establish procedures for and assess levels of engagement (Boutilier & Thomson, 2011; Hanna et al., 2016; Van der Ploeg & Vanclay, 2017). This literature describes factors for successful participation, including engaging the public early on in projects, exchanging knowledge between project managers and residents, and fair compensation for those who experience damage because of natural resource management (henceforth, 'resource management'; Hartley & Wood, 2005; Jijelava & Vanclay, 2017). Other studies critically assess the application of participatory frameworks in natural resource governance and describe cases where participatory processes were

lacking or failed (Delabre & Okereke, 2020; Demajorovic et al., 2019). These critical evaluative studies show that participation tends to prioritize well organized, privileged and local communities and groups over marginalized, dissident or non-local publics (Le Billon & Middeldorp, 2021; Owen & Kemp, 2013). Accordingly, they advocate for including more (marginalized) groups in public engagement processes as a way to enhance participation.

While authors tend to differ in tone and display various levels of trust in the ability of participation frameworks to effectuate change, the potential of participation – if done properly – to redistribute influence over resource management is widely acknowledged. The literature described here defines good participation as the intentional processes that lead to the empowerment of publics, particularly those at local levels, and their ability to influence living environments. Participation is therefore explicitly or implicitly instrumental; it is considered to be a means to enhance democratic, just, and open politics. This means that participation is considered as a political and democratic device in natural resource sectors that operates through widening the scope of actors who can set agendas and influence final decisions (Marres, 2007). Ultimately, participation processes are believed to constitute possibilities for a wider range of actors to influence decisions about landscapes and resource management, and enable better solutions towards sustainability, while arguably also mitigating corporate risks. In short, participation is considered to be a device for making resource management more responsible by enhancing its democratic valence.

The democratic quality of participation is operationalized in a particular way: it pushes for specific predefined achievements (e.g., collaboration) and is based on specific assumptions about who the relevant participants are and what the issue is. The public-to-be-engaged-with is in most literature assumed to be an aggregate of individuals that can be selected based on predetermined and objective factors such as the proximity of their houses to the project or their close relationship with the landscapes affected by the natural resource operations. The opinions and interests of these publics are considered to exist before the project commences and to remain stable over time (Chilvers & Kearnes, 2016; Harvey, 2009). These publics can participate at defined times with beginning and end points through discrete events in particular places (e.g., community centers) and have the possibility to not participate (either by choice or by exclusion). This type of participation can be assessed along a priori normative models (for example, norms about deliberation or a move upwards on Arnstein's [1969] famous participation ladder) and is considered able to deliver "democracy in neat packages" by participation experts (Stilgoe, 2007, p. 7). In these processes, participation professionals rather than local communities become

authorized to negotiate because the professionals are familiar with the participatory structures set by governments or firms (Chilvers & Kearnes, 2020; Kesby, 2007; Stilgoe, 2007). To ensure that community interests fit the desired templates, participatory procedures sometimes involve practices that aim to teach participants how to 'do participation'. This implies that such participatory procedures cast a public's ability to exert influence on a project as flawed when it is untrained (Harvey, 2009). The process of transforming a community into a good participatory public can also be understood in a more ancillary sense: enacting good publics can prevent protests and mitigate corporate risk (Harvey, 2009; Owen & Kemp, 2013; Turnhout, 2022).

Highly structured and predetermined processes of participation have been described as laboratory participation because it conforms to the institutionalized and hygienic conditions of laboratories for credible results (Bogner, 2012). Laboratory participation is problematic because it places the possibility to determine the issues, publics and sites of participation in the hands of the government or industry actors that initiate participatory processes. This hierarchy within participatory processes forecloses any possibility of other political projects to come to fruition, even before any participatory activity is undertaken (Chatterjee, 2004; Ehrnström-Fuentes, 2016).

1.1 Participation in contexts of extractivism

The limitations and failures of participatory procedures have been linked to a form of oppression that results from a political economy of extraction, or extractivism. Extractivism signals a way of thinking that prioritizes extraction and commodification of materials into resources for maximum corporate or governmental revenues or use (Chagnon et al., 2022; Wilson & Stammler, 2016). Extractivism is underpinned by a set of attitudes and practices that organizes and encourages removal of materials out of their original place (Durante et al., 2021; Tynan, 2021). Extractivist modes of production generate temporary value in exploitative ways until the landscape is exhausted and barren (Ye et al., 2020), and they have been associated with (neo)colonialism, violence and exploitation (Chagnon et al., 2022; Global Witness, 2022; Yusoff, 2018). Historical as well as contemporary mining, forestry, infrastructure and other resource related projects are

characterized by dispossession of poor or indigenous[1] communities (Acuña, 2015; Banchirigah, 2008) and violence against local communities and in particular (indigenous) women (Bashwira et al., 2014; Whyte, 2017). In resource management, extractivist practices stimulate a slowly unfolding violence that involves sacrificing regions, often those that provide a home to the already marginalized (Davis & Todd, 2017; Nixon, 2011; Rosiek et al., 2020; Shapiro & McNeish, 2021; Simpson, 2004; Sundberg, 2014). Resource sectors are responsible for over 90 per cent of global biodiversity loss and about half of greenhouse gas emissions (International Resource Panel, 2019). This demonstrates that the scope of extractivist harm is more-than-human, and that it generates inequalities and destructions that go beyond the human. Extractivist resource management destructs the relationships and knowledge systems of indigenous and other land-dependent people when it turns more-than-human homes into a source of capital (Joks & Law, 2017; Tuck & Yang, 2012; Watts, 2013; Yusoff, 2018).

Laboratory participation has been critiqued for being designed in ways that do not counter the extractivist modes of resource management that lie at the foundations of extractivist harm and violence (Chagnon et al., 2022). While participation is embedded in democratic rhetoric, participation processes themselves tend to undermine democracy when they end up reinforcing extractivism (Blesia et al., 2023; Delabre & Okereke, 2020; Ehrnström-Fuentes & Bohm, 2022; Lehtonen et al., 2022). Laboratory participation is based on the idea that some beings are exploitable and sacrificable. Some categories of humans and nonhumans are not considered as participants but are cast as the background against which participation processes play out (Ehrnström-Fuentes & Bohm, 2022; Latour, 1993; Yusoff, 2018). Participants in laboratory participation are often restricted rather than empowered in their abilities to influence resource projects because they have to adhere to

[1] Recognizing the politics in the use of the concept of indigeneity and indigenous peoples, I reluctantly use the term indigenous to avoid that this dissertation is weighed down by extensive qualifications. The term 'indigenous', and the binary it creates between indigenous peoples and non-indigenous peoples hides many complexities and differentiations within the category as well as in its antipode. Nevertheless, and given its broad recognition in international institutional contexts (e.g., United Nations), I use the word as a shorthand to refer to those groups who recognize and are recognized to have interconnected, interdependent, historical and spiritual relationships with particular territories.

the terms set by the initiators of the processes and are shaped by participatory processes that conform to corporate interests (Ehrnström-Fuentes & Bohm, 2022; Meesters & Behagel, 2017). Also, dominant conceptions and methods of participation often reflect specific western or European models of policy, society and democracy (e.g., Habermasian ideas of deliberation). For these reasons, participation tends to exclude groups whose worldviews, ways of life, modes of expression, or interests are incommensurable with the dominant ways in which participatory processes are shaped (Banerjee, 2008; Ehrnström-Fuentes, 2016), making them subaltern (Spivak, 2005) in relation to Anglo-European understandings of participatory realities.

Thus, laboratory participation processes can perversely stimulate marginalization if they fail to recognize their limitations and claim to fully represent issues related to resource management (Cooke & Kothari, 2001; Kesby, 2007). The institutionalized space of laboratory participation can overshadow, discourage, and delegitimize other types of public engagement, such as: mundane activities through which people shape personal living environments, more outspoken political activities such as civil disobedience or boycotts, and their political character and potential for transformative change towards democratic resource management. These other forms of participation have been described as public engagement that is *uninvited* (Cornwall, 2017), *organic* (Gehrke, 2014) and *wild* (Callon & Rabeharisoa, 2003). Wild participatory publics have been documented to emerge through techno-scientific controversies that ignite at all kinds of non-laboratory sites, such as industrial locations or in the home (Marres, 2007). This shows that issues that trigger participation in the wild, importantly emerge and develop outside of the formal participatory arena and unfold through a wide variety of practices, including practices of knowledge creation and sites of consumption (Bijker & Latour, 1988; Wynne, 2007). Such issues do not always find a place in the formal spaces of lab participation, and vice versa, laboratory participation often does not succeed in forging a connection to public controversies (Bogner, 2012; Chilvers & Kearnes, 2016; Krzywoszynska et al., 2018).

When laboratory participation indeed reinforces and propels extractivist futures, it is necessary to further scrutinize current participatory practices and understandings in resource management. Together with many scholars studying participation, I believe in the potency of the notion of participation for fostering post-extractive relations (Chagnon et al., 2022; Kesby, 2007; Svampa, 2015). Yet, some of the fundamental conceptual underpinnings of participation need to be thoroughly reworked. To explore how participation can provide a conceptual orientation that does not reinforce extractivism but instead resists harmful extractivist dynamics, we need to rethink what participation is beyond the conventional confinements of laboratory participation. This entails a

reconstruction of participation that is able to account for the different attributes and valorizations of materialities that are maintained outside of the reaches of the market (Blaser & De la Cadena, 2018; Svampa, 2015).

This dissertation seeks to develop an alternative notion of participation that may be better equipped to resist extractivism than conventional understandings of participation in resource management. To this end, I introduce the notion of *posthumanist participation*, which draws on scholarship that starts from the idea that resource management inescapably deals with multiple existing material realities. This idea has recently gained traction in post-extractivism and degrowth agendas (Demmer & Hummel, 2017; Kothari et al., 2014) but has a longer history in Science and Technology Studies (henceforth, 'STS'; e.g., Barry, 2013; Chilvers & Kearnes, 2015; Chilvers & Longhurst, 2016; Mol, 1999) and an even longer history that is rooted in indigenous, post-colonial and feminist thinking and movements (De La Cadena, 2010; De la Cadena & Blaser, 2018; Law, 2015; Todd, 2016). The key point is that material realities are constituted by the historical, material, economic and social relations in which they are situated, and that these realities are often incompatible and therefore lead to political contestations about what exists and how to relate to it. The analytical challenge, then, is to study who and what take part in these contestations and determine which realities become dominant. For this latter point, the next section turns to STS literature on participation, and feminist posthumanist literature.

2. Posthumanist participation

Within a framework of posthumanist participation, participation is not limited to processes that are explicitly organized under the title of participation. Instead, participation refers to all processes in which actors collectively shape resource management (Gehrke, 2014). These processes can take place in a wide array of relations and occasions, which largely evolve outside of institutions, formal political systems, and spaces associated with conventional understandings of participation (Lodato & Disalvo, 2016; Marres, 2012). These spaces can be seen as sites of participation that together shape what resource management looks like in a particular landscape (Richardson & Weszkalnys, 2014). Such participatory sites co-produce relations in which matter can be abstracted, simplified and reduced to some useful physical characteristics and which render the material extractable (Johnson et al., 2021). However, other sites of participation are also productive, and together they enact a plurality of relations in which materials are enrolled, meaning that these materialities are *not only* resources (Blaser & De La Cadena, 2017). This implies that participation is a more-than-human, decentralized and ongoing

process that determines – in conjunction with other sites of participation – how matter comes to matter. This dissertation coins the concept of posthumanist participation to describe such processes, based on three key insights from studies in STS, posthumanist theory and postcolonial scholarship. These insights hold that participation is 1) performative, 2) material and 3) situated in humanist categories that reinforce extractivism. To resist extractivism, these three aspects of participation need recognition. I will discuss each of these below.

2.1 Performativity

Performative theory is premised on the idea that knowledge, materiality, technology and society are inherently intertwined (Butler, 1990; Foucault, 1978). The key insight of performative theory – that knowledge, politics and material reality shape each other and are interdependently produced – has also been brought forward in studies of participation (Cornwall, 2017; Gehrke, 2014; Kesby, 2007; Lezaun et al., 2016; Michael, 2016; Turnhout et al., 2010). Over the past two decades, performative studies of participation have challenged the presumption that actors are autonomous individuals, that issues of participation can be defined outside of participation, and that participation can be measured along predefined lines (Krzywoszynska et al., 2018; Marres, 2007; Venturini, 2010). In practice, actors, issues and procedures shape each other during the process in which they become entangled, and they are not predefined at any given moment (Barry, 2012, 2013; Chilvers & Kearnes, 2020). This means that participation is an ongoing process in which actors, issues, and procedures mutually shape each other and evolve, and they would not have existed in the exact form and shape were it not for the entanglement itself (Chilvers & Kearnes, 2015).

Performative studies draw attention to the ongoingness of processes of participation in resource management. This implies that there is no clear start or end for participation, and instead participation (as well as the study of it, to which I return later) always happens in the midst of numerous participatory processes. A multitude of entanglements produce material realities simultaneously in diverse sites. This means that these realities are multiple: actors and issues are differently enacted in different participatory constellations (Mol, 2002). Although actors and issues may appear as stable when they travel between constellations – seemingly having an essence – this is only because similar activities repetitively enact actors and issues in recognizable ways (Law, 2004). Entities are endlessly *made* singular (Law, 2015; Mol, 2002). This promulgates the idea that it is possible to distinguish between accurate and inaccurate enactments where different incompatible enactments of entities intersect. This incompatibility gives rise to a political process in

which different actors negotiate the realities in which they are entangled (Yates et al., 2017). In many contexts dominated by extractivist logics, such struggles are reduced to disagreements between different interpretations of entities – disagreements that are usually won by those interpretations that can claim to be scientific – rather than revolving around the diverse relations that are constitutive of these entities (De La Cadena, 2010; Law, 2015). As a result, conflicts over the very being of entities are brushed over and rendered technical: in order to know what entities "really" are, the idea goes, they must be mapped and categorized through specialized techniques and by specialized (western) experts who are then able to reveal entities as they really are (Cech, 2013; Li, 2011; Yates et al., 2017).

A performative approach understands participatory techniques as constitutive of the process rather than simply revealing interest and demands and sees struggles over reality as a matter of ontological politics – negotiations about what exists – rather than pure epistemic debates. For this dissertation, this implies that a study of posthumanist participation needs to focus on the activities that shape and stabilize the entities that exist, and that it needs to take seriously the performativity of sets of relations and the multiplicity of realities[2]. Those realities in which materials become resources are, then, taken as possible realities, amidst a diversity of alternative realities that render these materials differently: for example, as participants in the unfolding of the world, enabling care and knowledge transfers (Martuwarra River of Life et al., 2022; Simpson, 2004).

2.2 Materiality

An implication of performative theory in participation is that participation is actively steered and shaped by matter. Materials often animate public controversies and are central

[2] In this dissertation, I use multiple terms (enactment, performativity, coming into being) for referring to the process through which entities and reality come into existence as an effect of relations. Some scholars prefer one term over the other. For instance, Mol (2002) prefers enactment over performativity because the latter is, according to Mol, tied to processes of human identity formation against an inert material background. However, quantum-physicist and philosopher Karen Barad (2007; 2011) has explicitly challenged the human focus in the term performativity, which allows them to use performativity for describing more-than-human processes of becoming. Following Barad, I will use the terms enactment and performativity interchangeably.

in the development of issues and actors in participation processes. Material objects play a political role in processes of participation because of their relations with other entities and the actions that connect and shape them, giving rise to the terms material participation and material politics (Meijer, 2019; Marres, 2004; Barry, 2013). Because materials are pivotal in resource management, they structure and shape the issues of participatory procedures and steer how humans relate to these issues (Bennett, 2010; Braun & Whatmore, 2010; Hawkins, 2014; Marres, 2012; Throndsen & Ryghaug, 2015). Performative approaches that have let things into their analyses of political engagement (Marres, 2013) have demonstrated that matter can function as an active mediator that shapes who can become a participant and with what capacities in processes of public engagement. Materials situate the political in a physical location and shape debates based on understandings of those materials (Barry, 2013; Throndsen & Ryghaug, 2015).

How materials participate in public controversies is not straightforward because material entities themselves are sites of controversies[3]. The formation of materials is itself a process that requires analytical scrutiny because how materials are understood co-constitutes how they shape how participation is performed. What things are is not predetermined and accessible but tied to knowledge practices and measurements. Different understandings of these materials, their characteristics and functionalities, can become key in political controversies (Ballestero, 2019b; Birkenholtz, 2018; Smith & Smith, 2018). This means that materiality itself is performed through historical formations in combination with understandings and ideologies of the material (Ballestero, 2019b; Richardson & Weszkalnys, 2014).

Hence, participation is part of an ongoing historical process through which some participants, materials and issues emerge and through which others are marginalized or even excluded. Who and what becomes a participant in public engagement is intertwined with resource management activities and with larger and historical discourses and understandings of who exists, who can act and who deserves moral consideration. This means that processes of participation should be analyzed within their historicity and as

[3] Another note on terminology: I will use the terms *things, entities, materials, bodies, individuals* and *beings* somewhat interchangeably. In this dissertation, all of these terms signal a temporary stabilization of relations that generate particular individuals within a continuous process of becoming. I will revisit the conceptualisation of individualization (Barad, 2007) throughout the dissertation.

part of wider societal configurations to be able to situate what gets included and excluded. As I will discuss in more detail in the next section, an influential and problematic societal configuration for current understandings of participation is the ideological project of humanism.

2.3 Humanist categories and posthumanist interventions

Humanism has been described as an intellectual and moral project that stresses human agency and personal responsibility for enhancing one's well-being. Human self-development, autonomy, rational thinking, and dignity are key concerns in humanist engagements with the world (Durkin, 2022). While humanism has a complex history and is used in diverse contexts with distinct connotations, concepts such as self-determination, deliberation and rationality have appeared as key within humanist thought and practice (Davies, 2012). Many practices that initiate participation are influenced by humanist thought and practice, because they – like humanism – lean on the idea that people need to be able to self-determine their lives and their environments and that procedures and protocols can help ensure such self-determination (Plouin & Preis, 2014; Tasioulas, 2022).

While the liberal idea of self-determination that is so central to humanism is at first sight convincing, and the embedding of participation in humanist thinking seems recommendable, humanism presents a problematic idea of how humans should be understood, assessed and regulated. Feminist and post-colonial critiques of humanist practices have discerned a limited conception of what it means to be human. Humanism has a colonial legacy that privileges the human, white, male, straight, able-bodied body and implicitly or explicitly renders this body as the universal standard to which other bodies are to be compared (Braidotti, 2022). Over the years, humanist scholarship and practice has responded to this critique by broadening the figure of this standardized human to include categories of people who used to fall outside of the category, in particular women, people of color in the Global North and people living in the Global South (D'Orville, 2016; Douzinas, 2000; Plouin & Preis, 2014). Yet, despite this strategy, the humanist human still does not represent all the beings that the term ostensibly describes, which is evident in the continued discrimination and exploitation of those other than the humanist human (Badmington, 2004; Davies, 2012; Shaw, 2016). This patterned discrimination and exploitation is perhaps most clear in the allocation of sites of extraction; sacrifice zones are generally found in national and global peripheries which are predominantly inhabited by others than the humanist human (Badmington, 2004; Davies, 2012; Shaw, 2016; Yusoff, 2018). This suggests that humanism presents an "enlightened false consciousness" as it paints a picture of liberalist protection against

injustices but is often ineffective in preventing human misery (Sloterdijk, 1994, p. 5 in Douzinas, 2000). Part of the reason behind such ineffectiveness, critics say, is that extractivist regimes have evolved with humanism, and they have thrived by exploiting those who continue to fall de facto outside of the domains of the humanist human (e.g., cheap laborers; Tanasescu, 2022). All in all, humanist strategies have as yet not posed fundamental threats to the organizing principles of extractivism.

The ineffectiveness of humanist interventions has been linked to the core strategy of humanism for more inclusiveness, namely that of *moral extensionism* (Whatmore, 2002). In this strategy, identities diverging from the humanist human are increasingly included in moral considerations. This strategy assumes that including more identities in moral considerations ultimately leads to an ever-expanding circle of subjects that can autonomously and rationally influence their own lives. However, moral extensionism has been critiqued for not being sufficiently forceful to counter the century-long privileging of the humanist human. In this strategy, values and normativity continue to be organized around the humanist human, despite intentions to the contrary, because it relies on the original humanist human for determining which groups of beings can be included for moral consideration. The more similar beings are to the humanist human, the more likely they are to be considered for moral consideration. This also means that the more someone or something differs from the central figure, the more exclusion and exploitation is justified (Braun, 2004; Oliver, 2008). This shows that, in a strategy of moral extensionism, inclusion and exclusion of moral consideration and the assigning of valence continues to fail to decentralize the figure of the humanist human.

Alternative justifications for determining inclusion and exclusion of beings have been proposed that rely less on resemblance to the humanist human. For instance, animal rights scholars have used the criterium of sentiency or the possibility for suffering as a basis for determining whether a being should be free from oppression and exploitation (Singer, 1975, 2013). Although it may intuitively be appealing to adhere to criteria of sentiency for evaluating moral value, these criteria are still not able to decenter the humanist human because ultimately humans are decisive in the selection and assessment of these criteria. In other words, humans choose which factors are relevant, which is always based on a human valuation of beings. This implies that creatures not considered worthy of moral value in dominant frames of humanist moral extensionism may pose radically different indicators in other systems of valuation that would have very different implications for moral extensionism (De La Cadena, 2010).

Moral extensionism is also flawed because it presents the same oppositional thinking that separates the haves and have-nots (Ko & Ko, 2018; Oliver, 2008). It continues to create

sharp and stable categorizations between entities (Braun, 2004). However, bodies are not neatly separated from other bodies: they are entangled and live in and through each other (Badmington, 2004; Neimanis, 2017; Westerlaken, 2020). This point is obvious when we place our focus on ecosystems but is increasingly accepted to also apply to bodies that are usually rendered as singular, such as the human body. Even the human body is a multispecies, more-than-human endeavor, in which water, bacteria and microbes enact the collective that we call human (Deloria, 1986; Haraway, 2008, 2016; Neimanis, 2017). Besides being a crude simplification of bodily relations, drawing sharp distinctions between subjects and objects may enact harm in itself (Ko & Ko, 2018) or may present a first step in thinking of and acting upon a dichotomous hierarchy between categories of beings (Braidotti, 2013).

Posthumanism presents a more productive strategy for addressing inequalities by drawing attention to the activities that produce and stabilize distinctions between bodies and identities (Oliver, 2008). Feminist posthumanists, including Braidotti, Haraway and Barad, have as their explicit aim to not just assess the binaries that structure contemporary politics but also to disrupt them and (re)make new categories that contribute to enacting "different differences" (Barad, 2007a; Oliver, 2008). They have formulated ways to think of different categorizations of and demarcations between bodies, such as a figure of the human as fluid and relational, to which I will turn shortly. This (re)making of categories is not a matter of modifying them by individual free choice because political forces have left – in Karen Barad's words – "marks on bodies" (Aigner & Čičigoj, 2014; Barad, 2007a). In extractivist contexts, the distinctions and hierarchies between bodies that were produced by humanism still structure how bodies are understood, how they can be grouped and what they can do. The dominance of the humanist human still consciously and unconsciously steers the privileges and possibilities of different groups, which is apparent in humanist processes of participation (e.g., under the label of 'new humanism'; Bokova, 2010; D'Orville, 2016). This means that bodies are being haunted by the inequal hinterlands of humanism, even in the work that has dismantled the categories as being produced rather than explanatory (Shaw, 2016). In other words, how bodies come into being is still very much an effect of humanist categorizations, and this continued influence requires recognition to further the possibilities of participation to resist extractivism.

Acknowledging and working through the hinterlands of humanism is exactly what posthumanism brings to the participatory table: posthumanist scholarship addresses the inequal negotiations that determine which realities and bodies are brought into being, and which are not, thus turning to the ontological politics of humanist categorizations (Boucquey et al., 2016; Giraud, 2019; Mol, 1999). While there are more bodies of literature

that could facilitate a relational, performative approach to participation, I argue that the term posthumanism is appropriate for my purposes here because it explicitly responds to the limitations of prevalent humanist assumptions in participation and because the term has become a broadly used and therefore recognizable signifier for the range of work I build on in this dissertation (Giraud, 2021).

Besides posthumanism's productivity in addressing binary oppositions, the term posthumanism has also instigated confusion which needs to be addressed before moving to the research questions. In my engagements with posthumanist scholarship, I have noticed that the term posthumanism provokes confusion because there are at least two different bodies of work that use the term to point to two very different human figures. The posthumanism on which this dissertation builds is *feminist* posthumanism, which sees humans as an outcome of their more-than-human relations of the world, and which proposes to seek post-binary ways of being and doing by emphasizing fluidity and entanglement (Braidotti, 2022). This take on posthumanism is not to be confused with *transhumanist* notions of the posthuman, which seek to technologically enhance the human body to execute the humanist agenda of perfecting individual human abilities (see Castree & Nash (2004) and Braidotti (2022) for an overview of the different understandings of posthuman/ism). Feminist posthumanism considers transhumanist posthumanism problematic because it perpetuates and intensifies the inequalities of humanism, and because it is closely connected to neoliberal and capitalist ideas of profit-seeking self-interested individuals.

Equally important to mention is that feminist posthumanism has been critiqued for failing to redress colonialism in academia, in particular in citational practices and intellectual engagement. Feminist posthumanism has been critiqued for not engaging with post-colonial theories and indigenous scholarship, and thereby, for being complicit in reproducing the inequalities feminist posthumanism supposedly challenges (Rosiek et al., 2020; Todd, 2016). This critique makes clear that feminist posthumanism does not automatically weave anti-colonial storylines into academic analyses, and extra attention is required to ensure that colonial academic practices are not reinforced in this dissertation (Todd, 2016). Taking up this final point, I now turn to the research objective and questions of this dissertation.

3. Research objective and three questions

In the previous sections, I have argued that laboratory participation is a humanist response to extractivist harm, which means that this type of participation has limited abilities to address the harm produced by extractivist logics. This is because important negotiations about resource management, including negotiations about what exists, are kept outside of formal participatory processes, and because laboratory participation is organized by humanist categorizations that distinguish between bodies that matter and bodies that are exploitable. Laboratory participation therefore lacks the conceptual rigor that is required to address extractivist logics in resource management. I propose the notion of posthumanist participation as an alternative concept to engage with negotiations about what is real, what should be enacted and how this should take place. As such, the term posthumanist participation may be productive for recognizing the ontological politics in participation and for resisting reinforcing humanist categorizations in research. Yet, the potency of posthumanist participation within the field of resource management has yet to be explored. Therefore, the remainder of this dissertation investigates whether a posthumanist reorientation of participation can resist extractivism in resource management, which is indicated in the research objective of this dissertation:

The research objective of this dissertation is to explore how posthumanist participation in resource management takes place and whether and how it can resist extractivism.

To this end, this dissertation draws on situations of ongoing resource management practices to learn about posthumanist participation 'in the wild'. This dissertation is situated in and around the Dutch Wadden Sea, where gas, salt and sand are extracted, relocated and transformed. Most performative studies about (resisting) extractivism are situated in sites where radically different worldviews exist and conflict, mostly in Latin America, New Zealand and Australia (e.g., Blaser & De la Cadena, 2018; Ehrnström-Fuentes, 2016, 2022; Verran, 2014), and conflicting ontologies in western European contexts of extractivism have been less explored. In the Wadden Sea region, diverse processes of laboratory participation take place. These will be touched upon, but they are not the central focus of this dissertation. Instead, I analyze participatory processes that manifest outside of laboratory participation and that steer relations between people and natural resources. Specifically, this dissertation discusses controversies in practices related to knowledge and measurement, coastal management practices, and dredging practices. In these practices, humans and natural resources are relationally shaped and

distinguished, and this determines which bodies become agentic participants and which bodies are ignored or rendered as inactive, invaluable or non-existent.

Which bodies exist and how they can participate requires situated analysis. Therefore, the first research question focuses on the processes through which participating bodies are enacted, as well as which bodies have been neglected or denied existence. This determines who can participate in the un/making of realities. The first research question for this dissertation is:

How are participants enacted and excluded in the Wadden Sea's resource management?

With this question, this dissertation investigates how and why some bodies come into being as agentic participants and can exert influence, while other bodies are excluded or sometimes denied existence and limited in their ability to give shape to the way reality unfolds (Giraud, 2019).

Understanding bodies as relationally produced implies that humanist conceptions of the predetermined bound human no longer hold (Shaw, 2016). This also has implications for how responsibility in resource management is understood, as participation is broadly considered as a prominent device for safeguarding responsible resource management. Current conceptions of responsibility in resource management are closely tied to humanist ideas of both autonomous and agentic individual humans and inanimate and unintelligible natural resources. The assumption that only humans can act goes hand in hand with the idea that responsibility is also restricted to human actions. However, while the humanist human provided a stable bodily basis for assigning responsibility, the figure of the fluid, emergent and relational human does not sit well with more static notions of responsibilities (Shaw, 2016). This ambiguity is addressed in the second research question:

In a context of posthumanist participation, what does responsibility look like?

A scattered plumage of participatory processes ongoingly steer relations in resource management. One site in which realties are shaped is research. Research practices that engage with resource management, such as this dissertation, co-produce how materials and humans relate (Van Bommel & Boonman-Berson, 2022). This means that research on natural research management has an important role to play in conceptualizing resistance to extractivism because knowledge practices bring realities into being and powerfully articulate specific imaginaries. When I allow these insights to influence my own research practices, it becomes necessary to acknowledge and account for the co-productions that are shaped through the activities of this PhD research. If research co-produces the reality it describes, the distinction between researching resource management and participating

in it becomes blurred. To flesh out this point of tension, the third research question is as follows:

How do I participate, and how does this enhance understanding posthumanist participation?

4. Research encounters in the Wadden Sea region

The Netherlands is involved in historical and contemporary colonialist and extractivist practices, both overseas and within the western European mainland (Wekker, 2016). The cases presented in this dissertation illustrate Dutch contemporary extractivist practices that take place within the boundaries of the (Europe-based) Netherlands.[4] This dissertation describes my research encounters in and around the Dutch Wadden Sea.

The Wadden Sea is the world's largest unbroken mud and tidal flats ecosystem, stretching an area of approximately 9500 km^2, with a transition zone to the North Sea of some 4000 km^2 of area (International Maritime Organization, 2002). Ethologically, the name of the Wadden Sea is linked to the Latin word vadum, which refers to a place where people can cross the water. Today, it is still possible to wade through the sea when the sand banks fall dry at low tide.[5] The region is characterized by highly intertidal dynamics, with tidal ranges often exceeding three meters and with approximately 15 cubic kilometers of water flowing back and forth through the tide channels and inlets (Common Wadden Sea Secretariat, n.d.). The Wadden Sea includes complex geomorphologic features including dunes, beaches, estuaries, salt marshes, mussel beds, channels, river deltas, and a transition zone to the North Sea (Common Wadden Sea Secretariat, n.d.; International Maritime Organization, 2002). The Dutch Wadden Sea also harbors eight barrier islands, of which five are inhabited by humans, with a total of approximately 24,000 residents (Ecomare, n.d.; Sijtsma et al., 2012; Texel.net, n.d.). At the coastal municipalities of the mainland, which is considered part of the Wadden area, live another 234,000 residents (Sijtsma et al., 2012).

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[4] The Kingdom of the Netherlands consists out of four constituent countries: the Netherlands (western Europe), and the Caribbean islands: Aruba, Curacao and Sint Maarten. The Netherlands has three overseas provinces: Bonaire, Sint Eustatius and Saba, which are also islands located in the Caribbean. In this dissertation, I use the term *Dutch* or *the Netherlands* to refer to the western European part of the Kingdom.

5 Wadlopen, or mudflat hiking, is a popular activity for both Dutch and foreign tourists.

The shallow sea is an important site for millions of migrating birds on a yearly basis, who rest and feast in the sea, eating billions of creatures that find a home in the relatively warm and muddy seabed, such as algae, crabs, shrimps, worms, and fish (Persoon, 2008). The global importance of the Wadden Sea is recognized as a UNESCO natural heritage site and under the Ramsar convention and protected on a European level through the Water Framework Directive, the Directive on the Conservation of Wild Birds, and the Habitats Directive. These last two directives form the basis of the Natura 2000 ecological network, and these directives mark large parts of the Wadden Sea as Natura 2000 sites (Lambooy et al., 2019). The entire Wadden Sea region falls under the jurisdictions of Denmark, Germany and the Netherlands, with respectively 10%, 60% and 30% of the area (International Maritime Organization, 2002). Although the Wadden Sea is split under the three jurisdictions, a strong trilateral governance system has been in place since 1978. The Trilateral Wadden Sea Cooperation is in charge of balancing the protection of the Wadden Sea with the various economic activities that take place in the region, including diverse forms of fishery, tourism and resource extraction (Floor, 2018). The Dutch have regulated the management of natural resources primarily under the Mining Act (*Mijnbouwwet*), the Environmental Protection Act (*Wet Natuurbescherming),* the Water Act *(Waterwet)*, the Fisheries Act *(Visserijwet),* the Shipping Traffic Act (*Scheepvaartsverkeerswet)* and the structural vision document for the Wadden Sea (*Structuurvisie voor de Waddenzee*; Bos et al., 2018). These acts and policies inform the activities related to the practices that are central in this dissertation, namely gas and salt mining and sand relocations through dredging and sand suppletions.

4.1 Gas, salt and sand

The Dutch Wadden Sea is rich in gas and salt. In the 1970s, a number of gas and oil reserves were found across the region (Schultze & Nehls, 2017). At that time, mining activities were prohibited in the Wadden Sea, but explorations were allowed. These explorations and the following discoveries of reservoirs of gas and salt underneath the seabed led to heated debates about the potential impacts of mining and related activities, such as oil spills, seabed disturbance, and soil subsidence. After a decade of lobbying by NGOs and mining companies, lawsuits filed by NGOs and eventually, a series of dialogues, gas exploitation in the Wadden Sea was allowed (Persoon, 2008). This decision was based on the expected revenues of primarily the gas extraction, which were so large that mining was given priority to nature protection, and in the 1980s, gas exploitation near barrier island Ameland started (Persoon, 2008). Eventually, this development also opened the possibility for salt mining in the area, which was permitted in 2007 in the coastal town Harlingen

(Veldboom et al., 2014). Currently, mining under the Wadden Sea takes place at six gas mining sites and one salt mining site, under the condition that they will not cause environmental harm or unsafe situations (Staatstoezicht op de Mijnen, n.d.).

A second important field of resource management in the Wadden Sea is related to the management of the coastlines, in particular at barrier island Ameland and the dredging of the gully between Ameland and the mainland. Both sites are heavily influenced by the Zuiderzee's embankment made in 1932. This embankment was an engineering effort of global importance, which was intended to secure the coastal safety of the towns nearby the Zuiderzee (now called the Ijsselmeer). The embankment of the Zuiderzee did indeed increase coastal safety but also had negative impacts that continue to influence the region today. The embankment significantly changed the sand and water flows that shape the tidal system of the Wadden Sea. This has led to a so-called hunger for sand of the Wadden Sea because the gullies and sandbanks have, after ninety years, still not adjusted to the currents and tidal flows after the embankment. Water that flows to the Wadden Sea brings sand to the Wadden Sea, resulting in an addition of sand to the Wadden Sea seabed. The Wadden Sea's hunger for sand also affects the barrier islands because the sand is drawn in from the North Sea. When there is a shortage of sand in sand banks or other sand reservoirs for the currents to take, the currents erode parts of the islands.

Coastal erosion of the islands is primarily countered through sand suppletions: large amounts of sand placed on the foreshore, beaches and dunes of the Wadden islands. The sand that is used for suppletions is extracted from sites that are deeper than -20m in the North Sea because dredging here arguably does not affect the system of the Wadden Sea but is still cost-effective in terms of shipping (Dutch Ministry of Infrastructure and Environment & Affairs, 2015). In recent years, sand extraction is only allowed for coastal protection and for dredging of the main shipping lanes in the Wadden Sea (Waddenzee.nl, n.d.-a). Until 1999, sand was also extracted commercially for construction works and to serve the deepening of all shipping lanes to ensure smooth shipping of goods and people that is independent from high tides (Dutch Ministry of Infrastructure and Environment & Affairs, 2015; Waddenzee.nl, n.d.-b). Thus, dredging has increasingly been limited and regulated because it causes environmental harm by disturbing the seabed (Waddenzee.nl, n.d.-c), and because it increases coastal erosion of the Wadden islands through generating faster and stronger water flows.

I study this area and these activities for three reasons. First, mining, dredging and sand suppletion are controversial in the sense that they provoke different knowledges and claims on what is real (Floor, 2018; Marres, 2007). These activities and emerging contestations signal that we are dealing with places where trade-offs and conflicting sets

of more-than-human relations surface and where decisions are made that steer the unfolding of the areas. Moreover, contestations can be seen as a sign that established institutions are incapable of handling certain issues, and that societal innovations are desired (Marres, 2007). In other words, contestations exist because no adequate governance answer exists for ongoing political, technological, environmental and societal transformations. Controversies often allow for experimentation in governance (Marres, 2007).

Second, the Wadden Sea area provides a site where diverse forms of extractivism have been embedded for a long time. When we take a long-term perspective, it becomes clear that extractivist destruction has burgeoned in the Wadden Sea since the late medieval ages. Lotze et al. (2005) describe how, from that moment onwards, commercialization of resource management has largely structured the landscape and seascape. This has resulted in a largely impoverished and deteriorated region compared to a 1000 years ago; many species and habitats have been destroyed and lost. Complex food webs have simplified, including those that were once of importance to human coastal dwellers (Lotze et al., 2005). While the Wadden Sea's contemporary regulations and environmental protections arguably reduce the rates of destruction, recent assessments of contemporary nature conservation in the Wadden Sea show that nature improvement targets are not being fulfilled due to extractivist activities, including those related to mining and dredging (Bos et al., 2018). This hints at a continued pattern of extractivist destructions in the area, which continues to lead to severe losses in the Wadden Sea. The environmental losses of the Wadden Sea are symptomatic of wider extractivist destructions.

Third, although the Wadden Sea has long been characterized by extractivist destruction, the violence at this site is relatively mild in comparison to other sites of resource management. This is both in terms of environmental destruction and violence towards human protestors. In many places across the globe, destructions of habitats and socio-ecological realities occur at faster rates and on vaster scales. Furthermore, worldwide, the extractive sectors are the deadliest to protest against. In the Netherlands, the political climate for protest is considerably less violent. This relatively mild extractive climate offers the possibility for somewhat open discussions about contestations around resource management, as well as a focus on nuanced ontological politics that subtly reinforce extractivism in the area and focus on how bodies are made and how responsibility functions (cf. Blaser & De la Cadena, 2018). In cases with explicit or physical violence towards humans, non-human animals, trees or plants, it requires much more analytical focus to be able to look beyond grave injustices and instead look at deeply embedded structures of extractivist harm that affect every being in these areas. The relatively mild

case of the Wadden Sea allows us to explore the role of some of the most unlikely entities to qualify for participation, materials that are understood by many as lifeless, abiotic and inanimate: salt and sand.

5. Making bodies

The sections above have shown that traditional notions of participation in resource management are incapable of resisting extractivism because they enact partial processes that are considered as representative and because they are based on problematic humanist ontological categorizations of who are participants. Posthumanist participation is an alternative conceptualization of what participation in resource management is and could be, based on relational understandings of how reality comes into being. With this understanding, the usual ideas of who can participate and what issues should be negotiated on are no longer predetermined. If bodies are enacted because of their relations, as suggested when participation is performative, material and posthumanist, how should we distinguish between participants in the ongoing unfolding of the world? This section provides a conceptual basis for studying the processes through which participants are enacted in the different sites of resource management within the Wadden Sea region, which enables us to trace which bodies do and do not materialize and stabilize and what their boundaries and capabilities are for participating in the shaping of reality.

To understand how and which bodies materialize, I draw primarily on feminist posthumanist scholarship, in particular Barad's (2007) framework of agential realism. Agential realism offers a conceptualization of how bodies materialize and how they become able to participate, without linking them, a priori, to humans or human sense-making. While agential realism runs like a thread through this dissertation, it is not enough to fully address the objective and research questions of the dissertation. Importantly, agential realism does not provide conceptual guidelines to situate emerging bodies within existing extractivist relations. To account for the ontological exclusions and destructions that are brought forward by extractivist contexts, I orient my work in line with the conceptual projects of postcolonial, crip and queer feminist studies, political ecology and indigenous scholarships, to which posthumanist feminism is indebted and alongside which it develops (Neimanis, 2017; Todd, 2016). These works make clear the politics in enactment/exclusion, they point out how capitalism and extractivism is inscribed in the materialization of bodies, and they clarify where points of resistance can be found.

In a feminist posthumanist approach, bodies are material associations that come into being in relation to other bodies (Ahmed, 2004; Braidotti, 2022; Grosz, 1989). Barad's (2007) agential realism provides a detailed conceptualization of how bodies emerge, change and stabilize within their wider relations by focusing on the constitution of boundaries between bodies. Informed by the work on performativity by Foucault and Butler and on quantum physics by Bohr, Barad presents a posthumanist, material notion of performativity. In this approach, boundaries between bodies are constituted through actions. The actions that shape boundaries between bodies are *intra-actions,* and not interactions. While the latter assumes discrete bodies that exist in the same way before and after their encounter, agential realism sees bodies as ontologically unseparated, and actions perform only temporary distinctions between one body and the other. These temporary distinctions *cut* two bodies apart by making a meaningful distinction between a body and its environment. The body and its environment are not ontologically separate; they are simultaneously together and temporarily separated.

Bodies can only be distinguished in a situated matter because they are constituted by their relations in ways that are meaningful to that particular situation and set of relations. The boundaries between bodies are meaningful when they fulfil a particular purpose in situ, which Barad describes as one "part of the universe making itself intelligible to another part in its ongoing differentiating" (2007, p. 176). Which part of the world, or which body, becomes intelligible to another body is one way through which reality becomes articulated. Bodies become intelligible, and thus temporarily distinct, when one body becomes the observer and the other the observed. To illustrate how this process of intelligibility takes place, Barad gives two examples. First, drawing on a thought experiment of quantum physicist Bohr, Barad (2007) describes a person who holds a wooden stick in a dark room. When the person uses the stick to navigate the room, the stick becomes part of the navigating subject. This means that there is a distinction between the body of the observer and that which is being observed: the room becomes intelligible to the observer. In contrast, when the person investigates the stick itself, the stick intra-acts differently with the human. The stick is the object that is investigated, the human subject investigates[6]. In this case, the stick and the person are temporarily distinct because

[6] This thought experiment can also be interpreted, in a more humanist way that considers entities to be bounded individuals, as interaction rather than intra-action, in which case the outlines of both human and stick are in fact two singular bodies (determined by the outside surfaces of the bodies) which temporarily collaborate. However, this notion relies on unsatisfactory humanist categories as

the stick becomes intelligible to the investigating human. This distinction temporarily and meaningfully resolves the ambiguity about where bodies begin and end and which bodies are observing and which are being observed [7]. The second example Barad (2014) gives is about the brittle star, a cousin of the sea star, who can adjust in form and shape in response to potential predators. The brittle star breaks off a body part when it is endangered and can regrow the limb afterwards. In the encounter between brittle star and predator, the boundaries between brittle star and its limb are complicated and negotiated, resulting in a differentiation between the body of the brittle star and its environment. In one action, the limb is part of the brittle star, in the next, it is meaningfully separated for the brittle star to survive. This shows how the possibility to discern one part of the world from another is not an endeavor of an individual body but is always a reconstitution of the bodily figurations.

The examples of the stick and the brittle star show that how a body is cut together/apart determines its properties and capabilities to act. A body that consists of a human and a stick can investigate the room in a particular manner, whereas the human body without the stick can investigate the stick, and the stick has characteristics that can be investigated by an observing human. A brittle star changes its form to be able to connect differently to the predator. Thus, intra-actions define the properties or characteristics of the bodies in question, alongside with the emergence of the bodies. Bodies are agentic in their specific relations because these relations afford and restrict differentiated bodies' abilities to act. Barad refers to this process as one of making agential cuts: the bodies that emerge have particular agentic capabilities as a result of the differentiation of bodies within their relation. Agency, or the capabilities of bodies, are therefore best understood as affordances

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well as on a limited ability of visual information for determining where a body starts and ends. Barad's notion is therefore more productive in thinking of bodies as relationally constituted.

[7] Questions have been raised about the extent to which this conceptual idiom is applicable on other scales and in other settings then the quantum level. Pinch (2011) and Morton (2013), for example, questioned whether the results of quantum physical experiments can jump scales to the macro-levels that are the objects of inquiry of social scientists. In reply, Barad asserts that the notion of scale is similarly subjected to the intra-actions as all other things. This means that scale is equally relationally and materially produced. Barad (2007) insists that activities enact boundaries that establish insides and outsides – and thus produce scale. This resonates with the argument that Latour (2017) makes in his essay 'Anti-Zoom', in which he reworks the hierarchies produced in this scalar construction to one of connected difference, and not 'levels of reality [that] nestle one within the other like Russian dolls'.

of relations (Gamble et al., 2019). Another constellation would enact different contours of the body, which afford that body other capacities to act. This is not to suggest a causal relation: the body does not come before the capabilities, but the intra-actions that make cuts determine a meaningful agential separability.

One of the core strengths of Barad's framework for the purposes of this dissertation is that it does not rely on a notion of humanness, liveliness, or sentiency for determining agency, as is the case in some other posthumanist approaches that prioritize the animate over the inanimate (Barad, 2011). This is helpful for an understanding of human-resource relations in situations of posthumanist participation that do not rely on notions of bounded individuals. Agential realism gives primacy to the notion of agency in order to foreground a body's affordances to act within a set of relations. This observation is crucial for a framework of posthumanist participation because it broadens the possibilities for participation beyond humanist categories that classify some bodies as capable of action and other as not. Bodies that participate in the unfolding of the world are not predetermined but need to be scrutinized empirically to see where cuts are enacted and agentic bodies take shape. This practice of empirical determination of agentic bodies helps us to think about natural resources, associated infrastructures and engaged humans as heterogeneous bodies with specific cuts and acting capabilities in that entanglement.

While the above conceptualization of bodily boundaries renders bodies as malleable, this is not to suggest that the boundaries between bodies and their affordances are a result of random intra-actions or can be adjusted by free will (Barad, 2007a). Boundaries are both material and meaningful in the sense that bodies are somewhat self-maintaining. Cuts between bodies are patterned so entities become stable and recognizable. When intra-actions are repetitive, bodies can become fortified in the sense that they are more difficult to change into something different; even when other intra-actions enact different beings, they are still recognizable because of insistent patterns of embodiment. The continued recognizability of bodies, despite slight changes as an effect of different intra-actions, can be seen as a way of travelling. Enactments get re-enacted in other constellations, and, even though their enactment is a unique and temporary effect of its relations, these bodies are still recognizable as the same bodies.

5.1 The figures of the human and of natural resources

Reconceptualizing bodily boundaries and agency as constitutive of bodies destabilizes the notion of the liberal bounded human. At the same time, it is undeniable that there is a powerful agency that we generally recognize as 'the human', which has grand disruptive

and productive capacities in worlding processes. In section two of this chapter, I discussed how, despite posthumanist deconstructions, the bounded figure of the autonomous, singular individual proliferates. The human that begins and ends at the human skin is enacted over and over again in daily practices; the cuts that distinguish human bodies from all others are patterned so they are powerfully recognizable. This singular human is connected to the biological category Homo sapiens and renders all humans equally agentic. Narratives that render humans and nature as binary dimensions reinforce the singular human as a meaningful categorical distinction, with real effects on materializations of the world. A politics based on the singular human maintains that all bodies that fall under the category of Homo sapiens are of equal moral value, as well as equally responsible for the polycrisis currently tormenting the earth. This last point is challenged in the emergence of a differentiated human figure, which recognizes that different (types of) humans have different capabilities because of the relations they are in. A politics based on this human figure asserts different responsibilities for different (groups of) people and asserts differentiated protections, through recognizing discriminatory and colonial forces. This human is generally represented in humanist participation, especially when laboratory participatory processes invite participants in ways to create a representational selection of voices. While recognizing the regional and socio-economic differences in responsibility and culpability for planetary destructions is pertinent for fostering a just response to the crises, merely diversifying the figure of the human in itself can still reinforce extractivism, as I explained above.

Agential realism presents an alternative understanding of human figures. This figure is situated and relational and the result of a particular set of intra-actions. In a posthumanist sense, human bodies, like all other bodies, are not "skin sacs" (Neimanis, 2017, p. 41) but open-ended intra-active fleshy materializations that cut together/apart from other bodies (Shaw, 2016). This figure is not isolated from other material (non-human) bodies, and it is constantly readjusted and permeated. In Baradian terms, the set of relations is an ontological prior to the agentic bodies that come to be known as humans. In this conception, the flesh of human bodies is part of the world, which means that the body that we call our own and the capabilities that we think of as ours are a consequence of the world's ongoing becoming, of the process through which one part of the world becomes intelligible to another. This posthumanist human rejects the idea of humanness as something pre-existing and sees the boundaries between humans and nonhumans as enacted through the establishment of particular cuts through intra-action (Shaw, 2016).

Repetitions in intra-actions and patterned cuts continue to forcefully make and remake the human figure as a bounded individual. They also stabilize relations between humans

and materials. Materials like water, gold and oil are not inherently resources waiting to be discovered and used, but they get enacted as natural resources through interlaced political, economic and technoscientific processes (Kohn, 2018; Latimer, 2013; Richardson & Weszkalnys, 2014; Tsosie, 2012). This relationality means that resource-human relations are patterned intra-actions that agentially separate in such a way that resources become useful for humans. Different intra-actions produce multiple resource-human relations, which can lead to contestations about what exists and how to measure it. Although these questions can appear to be located in the domain of epistemology (for example, how the material in question, often invisibly stored underground, can be measured and identified), they are questions of an episto-ontological bent (Ehrnström-Fuentes & Bohm, 2022; Yates et al., 2017). Episto-ontological contestations are a result of the multiple ways in which materialities are socio-bio-physically constituted through various practices (including knowledge practices). Their ontological character makes clear that such contestations are usually not resolved when more information is included. Instead, opening up the ontological indeterminacies of matter and exploring different ways to respond to them are more productive ways to resolve expectations (Jalbert & Kinchy, 2016; Kinchy, 2017; Rolston, 2013).

5.2 Ontological exclusions

How bodies materialize is inevitably political because the differentiation between one body and another excludes other agential cuts (Braun, 2004). When bodies emerge, other bodies do not emerge (Giraud, 2019). Such ontological exclusions are illustrated in the work of Despret (2004) and Van Dooren (2014), who both take a relational approach in the study of human-bird relations. In experimenting with convivial living with birds, Despret noticed how her intimate engagements with birds generated a profound human-bird attunement, arguably providing a more equal footing between humans and birds and opening up possibilities for an increased wellbeing of birds within their relations with Despret. In contrast, Van Dooren describes how closer human-bird contact can also prevent birds from engaging with other birds, which can negatively influence the birds' social and reproductive abilities. A similar argument is made by Despret (2004) herself when she observed that her sustained contact with birds necessarily diminished her relations with other humans. These examples show that some relations exclude others in given contexts: human-bird attunement can expand birds' agencies in one sense, but simultaneously curtail agentic capabilities in other senses. This shows how ethical and responsible encounters are as much about the constitution of relations and bodies as they

are about those that do not emerge because of that constitution (Ginn, 2014; Hollin et al., 2017).

In contexts of resource management, moving beyond extractivism requires acknowledgement of the politics of exclusion and the ways in which some practices enact bodies that structurally absorb, neglect or dismantle other bodies (Giraud, 2019). In human-material relations, the enactment of materials as natural resources also excludes other potential relations. Human-material relations are diverse, situated and relational and often include bodies that do not fit extractivist categories, such as mountains, subsurfaces or forests that are enacted in ways that they are those things (mountains, subsurfaces and forests), but not only (De la Cadena, 2021). They are also the source of life and death, sentient beings, kin, or home (De La Cadena, 2010; Tynan, 2021). However, because extractivist relations have become hegemonic in the generation of human-material relations, alternative sets of relations are at risk for erasure (Joks & Law, 2017; Watts, 2013). Constitutive exclusions require attention in accounts of posthumanist participation because bodies that are structurally excluded and erased from existence cannot participate in how the world unfolds. While ontological exclusions are inevitable, the patterning of these exclusions is neither predetermined nor freely adjustable (Barad, 2007a; Blaser & De La Cadena, 2017). Some exclusions are, in fact, necessary and desirable for democratic, just and egalitarian resource management; for other sets of relations to come to matter, dominant bodies need to be silenced or foreclosed. This means that some foreclosures can be productive for other relations to come into being (cf. Barad, 2007; Giraud, 2019; Morrill et al., 2016).

6. Posthumanist research is personal research

Adopting the notion of posthumanist participation has implications for this research. Specifically, it becomes important to situate this research in the sets of continuously developing relations that co-produce the research outcomes and to recognize their partiality; other stories could have been told, and other relations, bodies and worlds could have been made part of this research. Which stories are covered by this dissertation co-

depends on my personal commitments and material situatedness, which warrants explicit description.[8]

I will start by describing my confusion when I submitted an article for the first time in the course of the PhD trajectory. In their submission procedures, many academic journals probe whether the submitting author has an interest to declare in order to find out whether competing interests have influenced the work. Elsevier (2019), for example, states on their competing interests factsheet, that "[w]hen an investigator, author, editor, or reviewer has a financial/personal interest or belief that could affect his/her objectivity, or inappropriately influence his/her actions, a potential competing interest exists." Likewise, Taylor and Francis (n.d.) describes that "[c]ompeting interests can be financial or non-financial in nature. To ensure transparency, any associations which can be perceived by others as a competing interest must also be declared." Taylor and Francis distinguishes financial and non-financial competing, which respectively refer to employment, grants or other financial benefits the author has received that relate to the research in question, and to '[p]ersonal, political, religious, ideological, academic and intellectual competing interests which are perceived to be relevant to the published content.'

The probe expresses the assumption that disclosing interests leads to more accountable or objective research and prevents discrediting the journal, the author or science in general (Elsevier, 2019). It presents a persevering belief in the possibility and desirability of objective knowledge generation, which can only be reached when no personal interests can influence the research at hand. From a feminist posthumanist perspective, this call for objectivity through distance and disinterestedness is as impossible as it is problematic. It is impossible because scientists are the result of a particular configuration of relations – a large set of intra-actions – that define the possibilities for research. This includes what Suchman (2002) called the "lived work of knowledge production" (p. 92), which includes mundane parts of doing research such as pragmatic decisions about research possibilities or the embodied state of researchers, which unconsciously steers knowledge practices (Liboiron, 2021). Hence, who does the research, and the bodily capacities, assumptions and desires they bring with them, are inherently part of the research. To generate knowledge, researchers form a direct material engagement with the world to generate knowledge, making it impossible to observe what we are studying without disrupting it

[8] I will revisit this discussion in the concluding chapter by reflecting on the role of concepts in shaping this dissertation.

(Barad, 2007a). In doing research – by posing questions, stirring issues, and shaping futures – researchers themselves are part and parcel of the research they carry out (Letiche et al., 2022). It is also problematic to hinge on a notion of objectivity through distance because it assumes knowledge as coming from nowhere and as having universal applicatory power by eliminating positionality out of the research under the guise of neutrality.[9] Already 35 years ago, Haraway (1988) coined the notion of situated knowledges to propose thinking of the world as relationally produced. In this view, objectivity results from sets of relations and is therefore incomplete and partial.

Regardless of the problematic assumptions underlying the question of interests, the probe in the submission procedure triggered reflection on my ethical considerations and positionality as a researcher. Some commonly mentioned aspects of positionality (Holmes, 2020) are easy to state upfront: this project is informed by my academic training as a political ecologist and environmental criminologist, as well as by my personal trajectory as a white, vegan, feminist queer woman from the Netherlands and a life-long, boundary-crossing commitment to foster just, more-than-human relationships. Furthermore, this research project is informed by earlier research experiences in the mining sector. It is also easy to declare that I have no financial competing interests that could shape my research in a specific way: my PhD research is funded by a grant provided by the graduate school of the university that employs me, the Wageningen School of Social Sciences.

Although I have never stated them in a submission form, I have also identified many non-financial potentially competing interests that have influenced my research practices, which are of a personal, political, ideological, academic and/or intellectual nature. You can consider the paragraph below as a declaration of my never-stated competing interests, if you will.

While designing and practicing this research, multiple interests have influenced this dissertation. Most importantly, I tried to balance environmental sustainability, equity and intellectual research interests and considerations. The current environmental crises influenced how I selected my research area (reachable by car or, preferably, train), the research approach I used (moving by foot or by bike), and which conferences I attended (ones in Europe). I was interested in studying cases related to environmental issues that are difficult to fix because they are embedded in complex interdependencies. For example,

[9] See also the discussion on Haraway's situated knowledge in Chapter 6 and the empirical exploration of situated knowledge in Chapters 2, 3 and 4.

the salt that was the topic of my first paper potentially threatened ecosystems but was at the same time used in a wide variety of industrial processes, including medical applications. This presented me with the complexity of materialities in their enactments as resources and in their diverse relations with humans. Furthermore, the large power inequalities that generally exist between extractive companies and people living close to sites of extraction also informed my research approach. I was interested in case studies in which conflicts or controversies manifested and one of the competing stories was unsuccessful in gaining dominance. My approach meant that I got acquainted with the case through engaging with those that were unsuccessful and used my insights to be able to ask better questions to those in more influential positions.

My research was also influenced through how I am embedded in the Dutch society. Through my case studies, I built a network of professionals working in landscape planning and resource management in the Netherlands, which may be important for my future career. Having this type of skin in the game created a sense of reciprocity in which I could be held accountable if I delivered poor work[10]. The communities that participated in this study were in theory able to discredit my work amongst themselves and amongst the institutions that I worked with. This reciprocity and a commitment to establish good relations also shaped which concepts I selected: a topic that I will return to in the concluding chapter of this dissertation.

Thus, personal, political, ideological, academic and intellectual interests have shaped this research, just like my situated positionality and my personal trajectory. In their inquiry forms, the publishing houses cast such interests as a failure to create disinterested distance between researcher and research objects, which discredits interested research and renders it unethical. Following Haraway and Barad, however, I underscore that a prerequisite for good research is not a phantasmatic distance or the dissolvement of interests and values in the production of knowledge. Instead, researcher accountability is about tracking what differences research makes (Barad, 2007a; Haraway, 2012; Rautio, 2017). This research ethic also has implications for the methodological choices of this dissertation. Whereas in most scientific inquiry, whether qualitative or quantitative, research methodologies are considered to lead to particular "findings" or "data" that describe a world outside of the research (Law, 2004; St. Pierre, 2013), the posthumanist approach of this dissertation suggests an engagement with open-ended, experimental explorations into worlds that do

[10] In Chapter 6, I will refer to this sense of accountability with the notion of response-ability.

not yet exist. Instead of fixed procedures that posit standardized practices in causal relation with a predetermined selection of possible outcomes, this dissertation is based on more intuitive and situated understandings of knowledge creation. In practice, this meant that I engaged in a diversity of research practices, as is described in detail in the individual chapters of this dissertation. Within each chapter, the goal was not to look for singular outcomes or to give accurate descriptions of local realities, but to add knowledges for opening worldly possibilities and for triggering further discussion (Beaulieu et al., 2007; Westerlaken, 2020).

7. Outline of the dissertation

This section briefly describes how the remainder of this dissertation is structured, to which research questions it provides answers, and which research practices grounded and founded the insights from the chapters.

Chapter 2 addresses how causality claims and impact assessments are implicated in posthumanist participation. Based on a case study of salt mining in the province of Friesland, the Netherlands, the chapter describes how various measurements enacted multiple incommensurable subsurfaces and that a search for a singular real subsurface was unproductive in solving the contestations. This chapter addresses the first and second research questions and is based on qualitative fieldwork, including 42 semi-structured interviews, informal talks, observations of sites, document analysis, guided car tours and frequent bike rides.

Chapter 3 explores why diverse sets of coastal relations in Ameland, the Netherlands were unable to prevent a looming environmental calamity. The chapter describes a shift in coastal management and connects this shift to the failed remediation of a nascent gas exploration site. Thinking through amphibious response-ability, the chapter discusses how the limitations of some flows generated a lack of response-abilities for preventing pollution. The chapter addresses the first two research questions and is based on approximately 40 semi-structured and informal interviews, several guided walking and car tours through the dunes and at the beach, and bike and horse rides across the island. These are complemented by document analysis and several rounds of feedback from respondents.

Based on an arts-based experiment, **Chapter 4** offers an account on the role of affective atmospheres for enabling more affective human-sand relations. The chapter describes (and is itself) an arts-based research intervention called *Remove sand | Re-move, sand!*,

which, in addition to the text, also consists of a wooden installation, a video, a poem, a recording of the poem, and two workshops. In the chapter, I propose that making things, participating in artistic experiments and reading texts can generate affective atmospheres that alter who humans and sand are in their relations. The chapter draws on largely intuitive research practices that share a commitment to making things to make sense of things (Jungnickel, 2017). The chapter addresses all three research questions.

In the context of this dissertation, **Chapter 5** explores whether the literature on the Social License to Operate (henceforth, 'SLO') presents an ally to posthumanist participation in resisting extractivism. The reason to investigate the SLO and not other conceptualizations of public engagement in resource management is that the term has become popular in academic and grey literature. Moreover, SLO-related approaches to participation seem to align with several of the conceptual propositions of posthumanist participation: SLO-related participatory processes are typically characterized as ongoing, informal processes that unfold both in laboratory and in organic participatory practices. These assumptions resemble posthumanist participatory ideas of participation as decentralized and emergent. However, reviewing the SLO literature shows that SLO-related participation draws heavily on conventional ideas of laboratory participation, including understandings of predetermined and restricted participatory procedures, and of static and bounded human participants. Most problematically for our purposes of resisting extractivism is that SLO-related participation tends to separate technical and material processes from participatory procedures, which casts the human as strictly separated from non-human techno-materiality. The latter is then reduced to the backgrounds against which participatory processes play out, which reduces the complexity of more-than-human relations into a reality that suits extractivist singularity. This review shows that the (corporate) impetus for more participation seems to operate on the same extractivist principles as the extractive practices themselves, and as a result, cannot be seen as a useful ally for resisting extractivism through participation. The chapter engages with the first two research questions.

Chapter 6 provides a synthesis and discussion of the research and returns to the research questions and objective. It connects insights of participating by doing posthumanist research to insights that came from studying posthumanist participation. It also makes explicit how the journey of this PhD project was shaped by conceptual and ethical considerations and how these considerations performed the realities described in this dissertation.

2

Negotiating salt worlds: causation and material participation

Abstract

In this article, we analyze the role of measurement practices in a public dispute about the impacts of mining in the Netherlands. Drawing on studies of material participation and agential realism, we analyze how measurement practices shape the boundaries of subsurface objects. We detail how these boundaries become relevant for assessing mining impacts and show how this enables and constrains material participation. Simply put, if a process or entity is not measured into being, it cannot participate in negotiations about causality and impact. Our analysis shows that scientific conventions narrowly determined what measurements are credible and, consequently, limited the participation of other objects and processes in negotiations about damage and compensation. This underscores how ontological disagreements about the existence and measurability of subsurface processes affect what claims can be made. We conclude by discussing conditions for pluralist and equitable processes of material participation in measurement practices.

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1. Introduction

The impacts of mining operations are frequently contested politically. Moreover, questions about what these impacts are, how they come into being, and how they can be managed, are part of scientific and participatory procedures that govern mining, such as scientific assessments of impacts on the immediate environment and stakeholder participation procedures (Lawrence & Larsen, 2017; Meesters et al., 2021). Within these procedures, mining impacts are difficult to establish with absolute certainty and often involve different claims about the cause and nature of impacts that reflect diverse understandings of the behavior of materials (Floor, 2018; Fox & Sneddon, 2019).

Competing causal claims about mining impacts can become part of knowledge controversies (Barry, 2012; Lawrence & Larsen, 2017). Decisions about which truth and whose knowledge are considered legitimate to establish mining impact have direct political, social and economic implications: they prescribe whether mining is allowed or prohibited, what impact mitigation activities are mandatory, and who can be considered an affected community (Barandiaran, 2015; Birch, 2016; Jalbert et al., 2017; Whyte, 2011; Wylie et al., 2017). The measurements of mining impacts can thus be described as a performative ordering between underground matter and political practices that influence both human understandings and material realities (Barry, 2012; Kinchy et al., 2018; Vera et al., 2019).

We apply the notion of posthumanist performativity – inspired by quantum physicist and queer theorist Karen Barad – to make sense of measurements of the underground that are part of knowledge controversies surrounding mining. STS scholarship on underground matters, shows us that knowledges about the subsurface shape how we get to know the 'world that can never be seen', and that these knowledges translate into decisions about where to dig (Ballestero, 2019b, p. 780; Bijker & Latour, 1988; Chailleux, 2020; Kinchy et al., 2018; Porter, 1995; Smith & Smith, 2018). Some STS Underground scholars have also focused on the inclusion and exclusion of knowledges and demonstrate that the selection of models and maps matters for the ways in which material resources are brought into being (Kinchy et al., 2018; Kroepsch, 2018; Kroepsch & Clifford, 2021; Smith & Smith, 2018). We further explore this aspect of the social and political lives of knowledge practices via Barad's understanding that measurements are *in situ* performative within processes of materialization. This means that we consider matter to be responsive to measurements and possible interferences, and that those measurements and knowledges themselves have political – i.e., inclusionary and exclusionary – effects, in addition to the actors who use them and the disciplines they are part of (Barad, 2013; Hollin et al., 2017).

Embracing the notion of posthumanist performativity means recognizing that measurements and materials co-constitute each other at the moment that matter is measured (Barad, 2007a). Materials and measurements therefore do not *interact*, which assumes preexisting entities, but they *intra-act*, as measurements interfere with the material, alongside related processes in the domain of human politics. Hence, measurements of the underground can be considered performative in multiple directions: in shaping human politics and knowledge, which STS has richly documented (see e.g., Kinchy et al., 2018; Smith & Smith, 2018; Vera et al., 2019), but also in shaping the material world itself, which we find has been less explored in STS Underground scholarship. Accordingly, this article scrutinizes how measurements impact the *matter* that is being measured in parallel with human understandings of that matter (Barad, 2013).

In political contestations about mining, measurements are used to establish mining impacts and causality, which are subsequently used to attribute blame and responsibility. Thus, measurements shape what humans understand as causal relations, for example between an activity and its presumed environmental impacts, and in so doing, they (re)order relations between and among the underground matter by casting some parts as causes and other parts as effects (Barad, 2007a). This (re)ordering happens in relation to the particularities of the measurement, including prevalent assumptions and routinized practices that determine what should be measured and how (Panikkar & Tollefson, 2018; Singleton & Law, 2013; Stengers, 2010). These assumptions and routines enact specific socio-material realities, which become inscribed into methodological standards for measuring mining impacts. Standardized measurements stabilize how we understand things and how we order the (causal) relations between things.

This article draws on studies of material participation, agential realism and STS Underground scholarship to examine how measurements shape which matters are brought into existence, what their political capacities are, and how these capacities shape and distribute stakeholders' influence in participatory processes. To explore how measurements are performative in the constitution of the material world, we analyze how causal claims that are expressed by impact measurements are addressed and how they become contested, via an in-depth case study on salt mining in the Netherlands. Our analysis centers on how measurement practices constitute the boundaries of objects, such as soil, water, and houses and the relations between these objects.

2. Material participation and causation

Our conceptual approach connects studies on material participation with work informed by Barad's agential realism. Studies of material participation have shown how "entities can acquire political capacities in certain settings and associations" (Hawkins, 2014, p. 5), and help enact arrangements of influence and authority (Hawkins, 2014; Winner, 1980). Such political realities are both discursive and material, as reality is performed rather than observed (Birkenholtz, 2018; Mol, 1999, 2014). In this conception, material participation is the process of shaping what matter comes becomes relevant and how (Barry, 2012; Chilvers & Kearnes, 2016; Chilvers & Longhurst, 2016; Grove & Pugh, 2015). While many studies of knowledge controversies situate contestation in the epistemological domain, focusing on competing knowledge claims about a singular reality, studies of material participation suggest that the role of measurements and knowledge in controversies is not just a matter of perspective, but also a matter of being (Chilvers & Kearnes, 2020; Watts, 2013). Thus, they understand scientific controversies as an expression of ontological politics involving the clashing, coordination or exclusion of multiple emergent worlds (Mol, 2002; Singleton & Law, 2013; Verran, 2018). This means that things or entities can be multiple things at once, depending on how they are practiced and enacted and what knowledge constellations they are enrolled in (Mol 2002, 2014). For scholars of material participation, multiplicity involves the embodied enactment of objects in practice, while epistemological understandings of controversies consider multiplicity to be about the existence of multiple perspectives on singular objects, which leaves the objects themselves untouched, only watched.

Barad's agential realist framework can be seen as part of this conceptual lineage as it equally rejects the separation between ontology and epistemology. The framework is particularly well suited for an in-depth analysis of material participation because it emphasizes "the processes through which particular material properties emerge and other realities are excluded from being" (Hollin et al., 2017, p. 933). Barad draws on insights from Bohr, the pioneering quantum physicist, to conceptualize measurement as a process that generates boundaries between entities in assemblages. According to Barad, worlds come into being when relations between different elements are materialized in entanglement (Barad, 2007a). Such entanglements are established by what Barad calls intra-action: the activity of assembling and re-assembling. In contrast to the idea of interaction that assumes pre-existing entities, the concept of intra-action emphasizes that entities only emerge as separate as a result of their engagement with each other. This occurs by establishing what Barad calls agential cuts. Agential cuts enact distinctions so

entities become separately recognizable – the observer and the observed, the one that acts and the one that is acted upon (Kaiser & Thiele, 2014). The cuts are agential because one part of the world makes itself intelligible to another part of the world through the intra-action. This means that when the observer and that which is observed intra-act, both change (Barad, 2007a). Agential cuts result from boundary making practices that selectively enact how matter comes to matter. Measurements are such boundary making practices; they separate the measuring entity from the object that is being measured (Pranckunaite, 2019). Thus, in Barad's understanding, the practices through which we come to know the world are inseparable from the constitution of material reality – the fundamental inseparability of entities makes that no "propertied entities exist [.. .] 'behind' or as the causes of phenomena" (Barad, 2007, p. 128).

Repetitions of similar intra-actions over time stabilize agential cuts between entities, thereby creating stable practices and measurable qualities of entities (Singleton & Law, 2013). Importantly, this includes the constitutive exclusions that are simultaneously enacted. Once specific measurement practices become institutionalized, their patterned and material consequences can crowd out alternative agential cuts from becoming meaningful (Giraud, 2019; Schwartz, 2021). This is why Barad refers to an inseparable ethico-onto-epistem-ology (Barad, 2007a, p. 185). For example, the invention of the microscope enacted a world filled with bacteria and metamorphosing larvae, which led to dismissal of theories of spontaneous generations of organisms such as fleas from sand (Encyclopedia Britannica, n.d.; Reitsma, 2011). Before this invention, the material had been agentially cut by hitherto existing measurements into separations between sand and flea. The microscope enabled measurements that could and did make distinctions between sand, larvae, and winged insects carrying the flea eggs, fostering completely different relatings with the world. In other words, measurements and instruments discover, invent, and exclude at the same time – they enact one possibility, where a plethora of possibilities had existed before. Moreover, when one possibility is brought into being, this also enacts political significance and determines whether an entity can participate materially. Larvae became political actors that could change practice, but only after new cuts had been made and new measurable entities were created.

In this article, we focus on intra-active causality to empirically shed light on how measurements are performative in a posthumanist sense and how agential cuts are made. The establishment of cause and effect gets iteratively routinized and institutionalized by measurements, measurement instruments, and what is measured (Wagensveld & Jolink, 2018). Intra-active causation then is the new (re)enactment of agential separations through agential cuts (O'Brien, 2016). In other words, some entities ('effects') in a practice become

marked in their intra-action with other entities ('causes'). Intra-active causation then, is the practice through which entities are meaningfully distinguished from one another, which enacts a separately recognizable cause and effect. This notion of causation helps us to understand the causal claims we encounter in our empirical material as intra-active and performative practices (Wagensveld & Jolink, 2018).

The sections below offer an analysis of two causal claims to demonstrate how measurements separate entities and the consequences that brings. We look at claims that emerged in stakeholder participation settings in mining to engage with disputes about causation. Stakeholder participation involves politics about the very being of things and thus, they can provide an open setting for evoking different and conflicting worlds (Grove & Pugh, 2015; Yates et al., 2017). However, as we will show, the scope for participation is inevitably limited and exclusions are always at stake; specific worlds are raised on the basis of some causal claims at the expense of others. In our analysis, we first introduce what causal claims are mobilized and what measurements underpin them. Subsequently, we discuss what material constitution of the subsurface these claims and measurements performed and how this affects human political contestations. Then, we discuss this understanding of posthumanist performativity in terms of political participation.

The empirical research for this article was carried out between August 2019 and December 2020 by the first author (the "I" in this article) and included 42 semi-structured interviews, numerous informal talks, observations of sites, document analysis, guided car tours and frequent bike rides. I conducted interviews with people active in citizen initiatives, architects, the salt mining managers, a mining technician employed by Frisia, governmental agencies and politicians at the provincial, regional, and local level, including the water boards and technical committee for soil movement (TCBB). I held more informal conversations with city tour guides, secretaries, farmers, and shop owners. The research included two observations at agricultural fields, three at drilling sites, and three houses, and during two stakeholder meetings. The assessed documents included nine technical reports the homeowners and TCBB drew on and produced (see section 4), as well as reports of stakeholder meetings and city council meetings. Car tours as well as bike rides served to get acquainted with the landscape and relevant locations and allowed these sites to prompt unexpected stories. More formal interviews were transcribed. Informal conversations and observations were recorded in fieldnotes. All conversations were in Dutch, which was the first language of almost all research participants. One research participant's first language was Frisian, Dutch was his second. Transcripts and fieldnotes were analyzed with Atlas.ti through a priori and in vivo coding. The research initially focused on the relationships between stakeholders and mining company, the

official participatory possibilities for residents and the labor of protesting residents. However, efforts to stay empirically and conceptually open to the particularities of unfolding worlds turned the analysis to the causal claim's content presented below (Rosiek et al., 2020).

3. Delving into the world's deepest salt mine

Our analysis concerns a case study of salt mining and soil subsidence in the Dutch province of Friesland, where Frisia Salt B.V. manages the deepest salt mine in the world (Breunese, 2010). Frisia dissolves high quality salt from a kalium layer, then transports it with pipelines to the salt plant where water evaporates, and a pure salt remains. The kalium layer is located at an unconventional depth (about 3000 meters below soil surface), where the soil's high temperature and pressure turn salt into a gel-like substance. Extracting salt at this depth required Frisia to engage with techniques that were untested in practice. The biggest issue for salt mining is soil subsidence, which was only predicted, tested, and translated in models and in the laboratory. Importantly, the models predicted that the soil would subside less than ten centimeters over ten years. However, the soil subsided almost thirty centimeters in the ten years after salt mining started (Alterra, 2006). To explain this unexpected subsidence, Frisia assessed the subsidence allocation, did additional laboratory measurements, and produced new models to account for the subsidence (De Waal et al., 2016). Based on these adjusted models, the government permitted to continue mining on land, with a maximum soil subsidence of 35 centimeters (Fokker et al., 2018).

Soil subsidence can lead to flooding, damage to agricultural fields, infrastructure, and buildings. For these reasons, the mining activities sparked protests by neighboring farmers and homeowners. In response to these protests, Frisia decided to shift their operations from under land to under the Wadden Seabed. In 2014, Frisia received a governmental permit to mine under the UNESCO heritage site the Wadden Sea, and production started in September 2020 (Harlingen Courant, 2020). The new location incited protest too, particularly considering potential damage to the cultural heritage sites in the nearby town (Sys, 2019; Veldboom et al., 2014).

Below, we present two variations of the causality claim that link damage to buildings to the salt mining. We describe the material participation processes that emerged around these claims. We will see that soil, houses, and water are recurring central entities with fluid boundaries between them. In each claim, these entities take a different shape relative to each other. The claims concern 1) houses in the village Wijnaldum, and 2) monuments

in the town Harlingen. The claims relating to houses in Wijnaldum emerged during the ongoing land-based mining, the claims about monuments refer to the sea-based mining that was about to start at the time of writing. Thus, while the first claim is about materialized impacts, the second is about future potential impacts of mining activities. In our analysis, we show how soil subsidence relates in diverse ways to damage to houses and monuments. Measurements importantly co-constructed all causal claims. We first identify the causal claims that are put forward and highlight how measurements and agential cuts shape the claims. Subsequently, we focus on the performative effects of measurements and thus on the material, social and political implications of causal claims and the measurements that underpin them. We conclude with discussing the implications of measurements' material performativity on public participation.

4. A story of material participation in two claims

Two causality claims emerged that connected salt mining and damage to buildings. Both claims concentrate on salt mining as the cause of soil subsidence, which in turn can lead to damage to houses and monuments. Both claims had mobilized (groups of) citizens who had to convince governmental authorities about the link between salt mining and damage to establish a rational for receiving compensation. The homeowners in Wijnaldum and the monument owners in Harlingen differed in strategy and political status. Although strategy and status were relevant aspects for the claims' political influence, we focus on the materially performative aspect, i.e., the role of measurements in allowing or substantiating particular claims and disallowing others. Together, they showcase different modes of participating in ontological matters: a hierarchical choosing between two sets of proofs to determine which one counts as evidence and a collective process to determine how evidence is created. Below, we describe how each of these claims got substantiated with scientific measurements and how evidence came to count.

4.1 If walls could talk

In 2012, cracks emerged in houses in the salt mining's neighboring town Wijnaldum. The owners of these houses related the cracks to salt mining and asked for compensation. They presented their claim as a link between salt mining, soil subsidence, and damage to houses. The homeowners based their causal claim on multiple sources of longitudinal data of soil movement in the entire area, including GPS measurements. Primarily, they based their causal claim on two logics: 1) they calculated that during and after mining, the soil in the area subsided twenty-eight times faster than in other areas further removed from

the mining activity, and 2) their houses showed cracks after mining while they had not shown any signs of damage in the decades before salt mining had taken place (Personal communication architect, 2019). This causal claim was therefore based on the argument that in the past, no cracks occurred, which demonstrated that the houses had a solid foundation, whereas after mining, cracks did appear. The homeowners based their claims on publicly available reports (Alterra, 2006; TCBB, 2018) and on data they accessed through befriended experts in the field (mainly geologists, hydrologists and architects). Importantly, the homeowners resorted to these data and the indirect causal reasoning, because no baseline measurements had been taken before mining started. Even though the houses were located within the prognosis area where damage could occur (ESCO, 2006), no official monitoring system was set up at the start of the mining operation to measure impacts on buildings, and therefore, only indirect measurements could demonstrate the longitudinal effects of salt mining, expressed in a reversed causal claim ('no cracks before mining started'). This lack of baseline knowledge was not a coincidence. A geologist who owns an independent advisory company explained that his firm had advised and offered to install meters that can accurately measure soil subsidence close to the salt extraction sites and that could have generated up-to-date maps prior to mining, but that this has not occurred. This geologist regarded this as unwillingness and incompetence of Dutch mining companies, ministries, knowledge institutes, and the governmental regulator.

Although governmental authorities failed to provide baseline information, governmental authorities did not readily accept the claim that salt mining caused the cracks and did not grant the requested compensation. Instead, they asked a technical committee to determine whether a causal relationship between mining and damage to houses could be established. The TCBB was a multidisciplinary committee (including legal experts, architectural engineers, geo(hydro)logists employed at governmental knowledge institutes and universities). The TCBB's role was to formulate an expert judgment in the form of an advice to homeowners and governments. The committee considered it possible to decide about causality without baseline measurements and drew on measurements and data that differed from the homeowners' information sources. While the homeowners had focused on long term soil subsidence in general, the TCBB's research included data about the houses' construction and foundation, water streams, salt extraction and (historic) changes in ground water levels (Personal communication employee, Water Board Wetterskip Fryslân, face to face interview, February 5, 2019; personal communication, TCBB secretary, telephone interview, April 22, 2020). These data had not featured in the homeowners' assessments, because they considered it either inaccurate or impossible to establish causality based on these crosscutting measurements.

While differences in causality assessments are sometimes linked to scientific disciplines and respective connotations (Kroepsch, 2018), the controversy studied in this article rather pointed to differences in (temporal) understandings of how causality could be established (e.g., cross-sectional or longitudinal data, causality without adequate data) and at what point such established causalities would make sense beyond the members of the measuring committee. Thus, what we see here is the entanglement of ethics and measurements that goes beyond disciplinary boundaries – similar disciplines were engaged in both the homeowners and TCBB's impact assessments, with different causal outcomes. The differences in causal claim seem to be stooled on diverse understandings of the very possibility to measure the impact or not. The political implications of how the subsurface is understood and measured were recognized by the homeowners. One of them said: 'that's why the TCBB rejects all compensation applications. The only assumptions and facts that the committee uses, are the ones that suit her well'[11]Based on measurements that were rejected by homeowners, the TCBB concluded that the most likely cause of the cracks is the inadequate construction of the houses, which implied that no compensation was granted. While the TCBB was tasked with establishing a causal relation, the committee also recognized that it is impossible to determine the cause with absolute certainty. As one member of the committee explains: 'There are always twenty other potential causes. It is always about defining the possibility' (Personal communication TCBB secretary, telephone interview, April 22, 2020).

The measurements done by the TCBB enabled an understanding of the subsurface as subdivided into different entities with complex inter-relations. Here, the soil-water system and the houses were measured into different entities, which complicated a direct link between soil subsidence and walls of buildings. In comparison, the homeowners' measurements shaped the subsurface into a singular entity that enabled attribution of causality to salt mining. This was grounded in a longitudinal understanding of the subsurface, while the technical commission used a cross-sectional approach to understand the relations. Consequently, responsibility for the damage to the houses became fractured among the multiplicity of processes that were part of the TCBB's measurements. In other words, the TCBB's measurements produced a crowded subsurface full of different processes and water systems, which negated the possibility of a singular causal relation between the subsurface-as-a-whole and the houses. Consequently, this crowded

[11] The TCBB did establish causal relations for damage related to gas and coal extraction (TCBB 2015, 2016; 2017).

subsurface replaced the singular soil that the homeowners mobilized and reduced the homeowners' political influence. We can say that while the homeowners measured the soil *level* as proxy for the soil and enacted a simple relation between soil and houses, the TCBB used a multitude of proxies to identify what the underground was and how different underground processes related. The TCBB never incorporated measurements about the soil level as stand-alone measurements; such measurements were always complemented by assessments about the construction and foundations of houses, water flows in the subsurface and potential earthquakes (personal communication TCBB, telephone interview, April 22, 2020). In other words, the soil as a singular entity was never measured into being by the TCBB, and therefore could not exist in their claims and hence not participate politically. Based on these measurements, governmental authorities decided to not grant compensation to the homeowners because processes of the fragmented subsurface were deemed more likely to have caused the cracks.

What is at stake in the competing causal claims by the homeowners and the TCBB is not a matter of uncertainty but one of episto-ontological indeterminacy (Barad, 2007b) since the different claims relied on different agentic cuts. The measurements that the TCBB deemed necessary were grounded in ontological assumptions of differentiation of and enacted cuts between the below-ground systems. This implied not only that the subsurface was understood as being differentiated, but also that it could only be made relevant by a multitude of measurements. This understanding of the subsurface could gain traction because it was also practically *possible* to measure all these different systems. It is important to note that complex, fragmented subsurfaces prove more difficult to link causally to extractive practices (Kroepsch, 2018; Shackley et al., 1996). Such fragmentation, in combination with the lack of baseline measurements, can be linked to strategic ignorance strategies of the extractive industries, in particular through hindering monitoring and intentional nondisclosure (Kinchy, 2020; Knorr Cetina, 1999; Kroepsch & Clifford, 2021; Lawrence & O'Faircheallaigh, 2022; Mcgoey, 2012; Wylie, 2018). Because monitoring infrastructure lacked at the start, the subsurface processes as well as their relations were not established, and the TCBB had to resort to what they called "technical causality" – a causal explanation that was perhaps not conclusive but – in their words – the most likely relation. The establishment of this 'most likely relation', however rigorous and independent the research process may have been, is inherently limited and exclusive. This is because the procedure to enact the underground was not designed for multiple undergrounds, which meant that the homeowners and their allies were not able to influence what subsurface came into being.

4.2 Monuments and monitors

In response to persisting protests against salt mining on land, Frisia decided to relocate the salt extraction to the UNESCO world heritage site the Wadden Sea. Preparations to start mining from the Wadden Sea seabed started in 2007, including political negotiations and feasibility investigations (Veldboom et al., 2014). Extraction started in September 2020 (Harlingen Courant, 2020). With this relocation, a new causal claim emerged that concerned the possible future impacts of salt extraction on monuments in Harlingen. This claim was again about the possibility of damage to houses, but this time in Harlingen – the town closest to the new mining location. Harlingen is characterized by hundreds of houses and other buildings that have the cultural heritage status of monuments and that are actively protected by their owners. After Frisia obtained the necessary permits, a group of concerned monument owners lobbied for better monitoring and measurements, including baseline measurements (Stichting Bescherming Historisch Harlingen, n.d.). The monument owners learned from the damage in Wijnaldum that longitudinal measurements were needed to attribute possible damage to the mining. The monument owners also learned that "collecting facts" was not sufficient to receive compensation in the future. Therefore, the strategy was to lobby for binding measurement instruments and procedures. The lobby was successful and the monument owners, the company, and the local, regional, and national governments agreed that extra monitoring would start shortly before commencing extraction to secure baseline measurements and the stability of future causal claims in cases of damage.

To support their lobby, the monument owners in Harlingen employed the same causal claim as the homeowners in Wijnaldum. Both identified salt extraction as a cause of (future) damage to the monuments, with soil subsidence as the process linking them. By promising to establish baseline measurements, governments substantiated the possibility of this causal claim for future damage. One aspect of the governments' willingness to do so was because a new measuring instrument had been developed: the so-called tiltmonitor. This device was rendered able to measure causation and had become a conventional monitoring instrument in the decades between mining under land started and mining under sea would start (Bal et al., 2019).

Tiltmonitors detect subtle changes in the earth (IRIS Earthquake Science, 2010). They measure soil subsidence in real time, compare that to model projections, and – in case soil subsidence diverts from the models – allow for the timely adjustment of the amount of extracted salt. In this situation, "the tiltmonitors enable the generation of good soil subsidence maps, measuring the relation between the amount of salt extracted and soil

subsidence, measuring the acceleration of soil subsidence and warn when the soil subsides too fast" (Personal communication with geologist, email conversation, December 11, 2020). In so doing, tiltmonitors are considered able to establish causal relations. However, as a tiltmeters manual articulates, drawing conclusions about causality based on the tiltmonitor implies a large discretionary and interpretative element. According to the manual, the device is designed to "measure differential angles in the X or Y directions" (RST Instruments LTD, 2016). Other phrases similarly stipulate causal attribution of the data as a matter of interpretation and inference.

This recognition of the role of interpretation and inference implies an understanding that tiltmonitors do not in and of themselves measure causality. Instead, a tiltmonitor works to reinforce particular boundaries between entities: it divides the material into multiple processes; it quantifies a difference between above surface and sub-surface; and it renders the distance between location A and B significant. While it cannot directly measure causal relations between these entities, this remains a matter of inference, governmental authorities and stakeholders considered it capable of doing that. We also see that data analysis and data-based decision making are only possible when the public shares the ontological assumptions about the items that are built into and enacted by the device. For example, only when the public agrees with the measuring apparatus about the measuring possibilities as well as its relevance, then can the measurements make sense. Because all parties agreed on the tiltmeter's ability and credibility to measure the relation between soil subsidence and damage to houses, they established a stand-alone measurement of the subsurface-as-a-whole (cf. Ureta, 2018). This had been impossible for the Wijnaldum homeowners, because such a singular subsurface was not measured into being, and therefore did not exist and could not participate. The installation of extra tiltmonitors in the historical town of Harlingen prior to extraction (Frisia Zout BV et al., 2019) enabled the enactment of the subsurface-as-a-whole and its participation in negotiations about and authorize causal claims between salt mining and damage to houses.

Albeit the local government, the mining company, and the group of monument owners agreed to use tiltmonitors to measure subsurface systems, this agreement did not guarantee that resulting causal and compensation claims would also be agreed upon. The committee that would in the end decide about whether causation was proven had not been involved in the ontological agreement and, therefore, might not be committed to the established consensus. In the future, this committee may discard the tiltmonitor data, or complement them with other measurements that enact different agential cuts. This could unsettle causal claims, which may mean that when damage occurs, no direct responsibility could be attributed (Stichting Bescherming Historisch Harlingen, 2020). Also, this

committee rejected the monument owners' request to partake in designing the measurement network, because they considered it inappropriate and not objective to both design the monitoring system and determine causality afterward (Commissie Mijnbouwschade, 2020). This rejection to contribute to the design of the baseline measurements and monitoring system also demonstrated that the committee's members were aware of the politics that exist within the measurements and thus that there was a need to disassociate themselves from the initial measurements.

5. Constituting a material public

Our analysis showed how causal claims about the role of subsurface in damage to buildings proved to be production sites of different material realities (Waterton, 2003). In both causal claims, measurements helped to enact entities and shape the possibilities for participation. Measurements were also a key component in the articulation of the claims and for the establishment of the possibility to be compensated. For the houses, the composition of the subsurface was contested and specific measurements and arrangements of the subsurface were dismissed at the expense of the homeowners. What mattered is that the homeowners understood and measured the subsurface-as-a-whole, while governmental authorities rendered the subsurface as existing of a multiplicity of underground processes. The corresponding multitude of measurements crowded out the possibility to measure the subsurface-as-a-whole. As a result, both homeowners and the subsurface they measured were disempowered to partake in negotiations about compensation of damages to houses. In the causal claim about the monuments, stakeholders agreed that tiltmonitors could measure the subsurface-as-a-whole prior to mining, which enabled the establishment of a direct causal link between salt mining and damage to monumental houses in case this would appear in the future.

Our analysis adds to our understanding of the role of measurement and the establishment of harm in political controversies. Studies on material participation have demonstrated that different knowledges and measurements compete and thereby affect the realm of human politics, including who is able to participate in deciding about mining interventions (Kroepsch, 2018; Ruckstuhl et al., 2014). We show that measurements do more than just that: they also affect how matter comes into being. In our case, measurements not only registered but also constituted the subsurface as either a singular or a fragmented entity. Measurements are thus political in their relation to the matter being measured; measurements, the data they produce, as well as their interpretation all become part of controversies, because they enable particular intra-actions at the expense

of others. Our analysis also how matter actively participates by resisting to or cooperating with different ways of making sense of the world. For example, the different subsurface systems under the houses of Wijnaldum were measurable, in contrast to the subsurface-as-a-whole due to a lack of baseline measurements. This resulted for the TCBB in a causal claim focusing on the different subsurface systems, while the homeowners resorted to a reversed causal claim. Twenty years later, the tiltmonitor did allow the subsurface-as-a-whole to participate in negotiations about monuments.

It is an achievement rather than a given for an entity to be brought into existence and to become relevant for participation (Hawkins, 2014; Wylie, 2018). Measurements, mainstreaming measurement instruments and creating agential cuts to enact entities all require work, especially when measurements and the entities they enact do not fit with dominant methodologies and understandings of the subsurface. Our study demonstrates that when dominant actors such as governmental authorities can dismiss the existence or measurability of an entity, participation of this entity and the publics formed around them becomes futile. In the case of the Wijnaldum houses, creating space for the participation of different and competing ontologies would have required the open consideration of the data of the homeowners and the joint deliberation of what is considered reliable evidence and what measurement instruments can produce this evidence. Such a materially informed mode of participation is able to recognize contestation and controversies over ontologies as necessary aspects of doing politics (Barry, 2012; Law & Singleton, 2014). To ensure such ontological political participation, it is necessary to make explicit which assumptions, measurements and agentic cuts are performed through causal claims, prevent the naturalization of dominant classifications, and do justice to the ontological heterogeneity of extractive publics (Santos, 2016; Temper, 2019; Tsosie, 2012).

While scholars showed how certain participatory activities (e.g., consultation) perform a public that responds to those activities (Barry, 2012; Meesters & Behagel, 2017), we demonstrated that coming to understand the world with measurements should also be seen as a participatory activity that performs a heterogeneous public and in so doing prevents others from being constituted. Knowledge practices enact worlds with entities that respond to the activities and the underlying presumptions at hand, while excluding those that do not respond or fit to the measurement or agreement. Agential cuts only enact the agencies that are cut together-apart through the intra-action – other parts of the world do not make themselves intelligible. Matter that is not measured does not come into being as a recognizable entity that can act; the only matter that comes to matter is measured matter. Moreover, the only matter that can join in ontological negotiations is matter that is measured by someone who is in the end able to decide what the world is. This brings

the ethical and political implications of measurements into sharp relief, and it underscores the importance of Barad's notion of ethico-onto-epistem-ology (Barad, 2007a, p. 185).

From this perspective, a more inclusive approach can be based on the recognition of multiplicity; the simultaneous emergence of different material realties. However, the houses example shows that (perhaps strategically informed) limited space for multiple ontologies (in this case, that the subsurface can be both one entity and multiple) hinders mining justice (Giraud, 2019). The houses controversy involved ontological collisions because different worlds were enacted through measurements, whereas compensation claims demanded a singular world. In this controversy, the demand for singularity prevented the participation of alternative worlds and this prioritized science- and business-as-usual over other ways of measuring. In contrast, the monuments example provides an illustration of how multiple worlds can be allowed to co-exist through collective inquiry, by suspending judgment about what the world is (see e.g. Waterton's (2017) participatory knowledge collective). It is not surprising that it is a future-oriented case in which impact assessments perform differently, because impact assessments have been criticized for "aggressively pushing forward and almost never looking back at the epistemic violence int its wake" (Lawrence & O'Faircheallaigh, 2022, p. 1). Our analysis suggests that when there is limited room for the participation of multiple worlds, structural interventions, such as the co-designing of the monitoring system in the case of the monuments, may be needed to support fair ontological negotiations (Giraud, 2019; Law & Singleton, 2013; Van Dunné, 2005). Or, in the words of Haraway, it is important to institutionalize processes that allow to "stay with the trouble" (Haraway, 2010) and critically examine the political implications of different worlds, causality claims or agential cuts (Tollefson & Panikkar, 2020).

6. Conclusion

Negotiations about what exists are not equal, as the possibilities to enact material realities are not equal either. When citizens do ontological work that complicates scientific and governmental procedures, the knowledge they produce and the worlds they enact are easily discredited. We demonstrated that the privilege of scientists depends not only on their networks, backgrounds, or status, but also on their ability to enact specific materialities and exclude others. Driven by an imperative to come to a verdict about causality, it becomes increasingly hard to argue that water flows or the construction of houses are not legitimate factors in establishing causation when they suit scientific conventions and are so easy to measure. As we have seen in our analysis, measurement

strategies easily align with extractivist practices (Panikkar & Tollefson, 2018; Scott, 2010), often supported by appeals to complexity (Lahsen & Turnhout, 2021; Lamb et al., 2020; Lawrence & O'Faircheallaigh, 2022; Shackley et al., 1996).

More democratic and participatory ways to decide about *what is* and *what is relevant* require the deliberation about appropriate measurement instruments and models as much as it requires the mobilization of counter expertise (Kroepsch, 2018; Ureta, 2018). Careful consideration of the agential cuts that are enacted and how, as we have done in our study, can support such opening because it facilitates critical scrutiny not only of what is measured and what comes into being, but also what is excluded and marginalized. This attention to posthumanist performativity and to the political consequences of knowledge practices can further not just epistemological but ontological justice, which is increasingly recognized as a vital component of environmental justice (Kayumova et al., 2019; Temper, 2019).

Our call for attention to posthumanist performativity goes beyond a call for the inclusion of diverse and marginalized stakeholders and knowledge systems. Reconsideration of prevalent measurementalities, and the values and interests they reinforce and reflect are important for fostering ontological inclusivity (Turnhout et al., 2014). One way to do so is to map out and integrate the value-laden *effects* of measurements within the design of impact assessments in terms of the worlds they enact, and the material objects and relations they create and exclude. The inclusion of diverse forms of knowledge and measurement instruments is, then, a way to not just strengthen participatory legitimacy in a traditional and procedural sense, but also to counter structural exclusions by enabling matter coming into being by being known and by being measured otherwise.

3

The politics of amphibiousness: shifting coastal management in the Netherlands

Abstract

This paper explores the consequences of a major shift in Dutch coastal management. This shift involves a transition from a coastal management approach that aimed to keep the sea at bay towards an approach that stimulates dynamic sea-land relations. This shift towards dynamic management can be seen as part of wider trends in both ecological and STS thinking on coasts as amphibious more-than-human entanglements. We draw on a case study of Wadden Sea barrier island Ameland to develop the notion of amphibious response-ability. We show that while dynamic management enabled amphibiousness in the land-sea interface, it limited other types of amphibiousness, with consequences for the possibilities to respond to coastal changes. These consequences for amphibious response-abilities became critical when rapid coastal erosion threatened and partially destroyed a gas platform. Our case shows that even when coastal management regimes are amphibious because they unleash and build on natural processes, they are neither neutral nor natural, and they can in fact limit the possibilities for integrated responses to coastal change. We conclude by suggesting that heterogeneous knowledge alliances are needed to expose and work with the politics in (amphibious) coastal management regimes.

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1. Introduction

This paper explores the consequences of a major shift in coastal management in the Netherlands, with a focus on the Wadden Sea region. The Wadden Sea region is an intertidal system of sand and mud flats. It can be characterized as an amphibious place where land and sea meet and mingle. Through the dynamic interplay between wind, water, waves, vegetation and sand, the area changes constantly in form. These dynamics between land and sea are praised as extraordinary, and they awarded the Wadden Sea its UNESCO World Heritage status (UNESCO World Heritage Convention, n.d.). At the same time, these volatile conditions destabilize coastlines, and such destabilization presents challenges for communities that populate the islands and northern coast of the Dutch mainland and that fare well by coastal stability. Through a case study of Dutch barrier island Ameland, we analyze the shift in management from "keeping stability" towards "managing dynamics", and what kind of responsibilities this enables and constraints.

Since the early 20th century, coastal management in the Netherlands has aimed at enhancing coastal stability and mitigating coastal erosion. To keep the unpredictable, potentially destructive sea at bay, this approach was based on reducing the interplay between land and sea by using solid infrastructures such as sea walls, dikes or dunes (Disco, 2002; Helmreich, 2019; Schmitt, 2018). Particularly in combination with Dutch high-tech engineering, this management approach is well-known and has influenced coastal management regimes across the globe (Morita, 2016; Zwarteveen, 2015). Lesser known are the manual practices of helm grass through which Dutch island communities have long restored dunes and thereby stabilized local coastlines and keep the sea out (Clarke & Rendell, 2015).

From the 1970s, Dutch coastal management started to shift from keeping the sea at bay, to guiding the amphibious interplay of land and sea. This *dynamic management* approach increasingly gains international popularity, and continues to spread Dutch objectives to water management, but this time in the emergent field of managing naturally occurring flows between land and sea (Deltacommissie, 2008; Interreg Northe Sea Region (EU), n.d.; Loffler et al., 2016; Van Slobbe et al., 2013). Moreover, the dynamic management approach is exemplary for a growing attention for engineering more amphibious infrastructural solutions that embrace land-sea entanglements, to better anticipate rising sea levels and storms associated with the climate crisis (Morita, 2017; Wesselink, 2016). As such, dynamic management has been promoted as a more natural approach to coastal management, allowing hydro-morphological processes to run their course. However, despite is promises of

naturalness, the shift to dynamic management does not abandon human interventions. On the contrary, it involves large scale engineering interventions, such as controlled flooding or relocating large amounts of sand to balance and mitigate erosion processes around islands (Borsje et al., 2018; Ebbens, 2022). The dynamic management approach replaced the labor intensive and place-based practices of helm grass planting with high-tech engineering at scale.

Through the conceptual lens of amphibiousness (Jensen 2017; Krause 2017; Jensen and Morita 2015; Pauwelussen 2017), we examine how the shift from helm grass planting to dynamic management has changed the flows and entanglements of water, land and humans in the Wadden Sea. We do so through a case study of the Dutch barrier island Ameland. At the west coast of this island, the contrasts between the stability of the island and the turbulence of the sea are particularly stark. Here, currents, wind and waves erode the coast quickly, and frequent management intervention is undertaken to keep the coastline in place (Ebbens, 2022; Schmitt, 2018; Vermaas et al., 2019). As we will show, the shift in management approach from helm grass planting to large-scale engineering enabled certain amphibious entanglements, but apprehended others. Working though the case enables us to critically interrogate how the dynamic management approach assumes certain flows and entanglements while neglecting others and examine what kind of amphibious relations are enacted in the process. Specifically, we will discuss how the introduction of dynamic management transformed relations of responsibility. We illustrate this argument with an analysis of a specific disruptive event that took place in 2019, when a nascent gas exploration site in the dunes of Ameland was partly eroded and released chemicals into the sea. This event shows that the dynamic management approach enacted distanced relations of responsibility, which stalled an adequate response to an unexpected disruptive event. We conclude by reflecting on the need for the concept of response-ability within amphibious studies and management practices in order to attend to the politics within amphibious entanglements and flows.

Our analysis is based on two months of fieldwork at Ameland, during which the first author conducted about forty semi-structured and informal interviews and undertook several guided walking and car tours through the dunes and at the beach, as well as bike and horse rides across the island. Interviews were held with two current employees of Rijkswaterstaat Netherlands (the executive agency for coastal protection of the Ministry of Transport, Public Works and Water Management) and three former employees of the local Rijkswaterstaat office, a former helm grass planter, the former senior ecological manager of the company that owned the gas platform (the NAM, 'Nederlandse Aardolie Maatschappij', a partnership between

ExxonMobil and Shell), residents of the island, local governmental authorities, politicians, site managers, and researchers studying sand movements (ecologists, hydrologists and geomorphologists). The fieldwork initially focused on islanders' practices related to sand, on sand-sea interactions, on laboratory studies of sand characteristics and on vegetation and fauna in the coastal area. During the fieldwork, the focus shifted to the partial erosion of the gas platform in 2019. Fieldwork insights were complemented with desk research and targeted interviews. After a first fieldwork period in spring 2021, the first author returned to the island in winter 2022 to see first-hand how winter storms can quickly and dramatically change the dunes, to rehear and elaborate on the stories of the islanders, and to receive their feedback on preliminary analyses. The research encounters with Rijkswaterstaat employees and NAM employee also iterated, and several of them commented on earlier drafts of this article.

2. Amphibious response-ability

Conventionally, Dutch coastal engineering projects have managed amphibious environments through strictly separating land and sea (De Vriend et al., 2015; Van Koningsveld & Mulder, 2004). These projects, aimed at protecting land against the sea, reflected a land-sea dichotomy underpinning western science and policy frameworks (Zwarteveen 2015; Helmreich 2011a; Pauwelussen 2017). The last decade saw a growing number of publications in anthropology, science studies and affiliated disciplines exposing the limitations of land-locked theory (Anderson, 2012; Steinberg & Peters, 2015), and experimenting with reconceptualizing the fluid, more-than-human and emergent relationality of coastal and marine environments (Gumbs 2020; Pauwelussen 2021).

In this search for more fluid thinking, the concept of amphibiousness has gained traction as an analytical tool to put center-stage the dynamic entanglement between land and sea, and the practices that these entanglements involve and enable (Gagné & Rasmussen, 2016; Jensen, 2017; Krause, 2017). As such, amphibiousness has been used to challenge dualist conceptions of land and sea and destabilize separations in the governance regimes through which land and sea are managed. As a result, perspectives on coasts shifted from seeing them as borders between land and sea towards seeing them as hybrid land-water interfaces involving both human and more-than human agencies (Krause, 2017). This shift runs parallel with wider trends in ecological thinking, coastal safety, and societal understandings of water, which increasingly move away from the idea that natural forces can or should be fully

controlled (Nelson et al., 2020; Tubridy et al., 2022; Wesselink, 2016). As such, understandings of areas and infrastructures as amphibious has also been taken up in coastal engineering, including dynamic management approaches. Thinking of the land-sea interface as amphibious has helped to understand and intervene in coastal or delta regions in a way that fosters or builds on the intermingling of water, land and human dwelling in these areas (Bijker, 2007; Carse, 2012; Lahiri-Dutt, 2014), For example, amphibiously oriented infrastructures, such as particular forms of dams and dikes, can sustain human dwelling in watery or flood-prone landscapes (Barba Lata, 2017; Morita, 2016).

Beyond highlighting and fostering the hybridity and fluidity of coastal environments and infrastructures, the concept of amphibiousness has also infused theoretical work on rethinking the relational human and more-than human practices through which reality takes shape. Amphibiousness as theoretical concept has been used for its connotation of "ambiguity" and "moving in-between worlds", to put center-stage the junctures between multiple place-making and worldmaking practices (Gagné and Rasmussen 2016; Pauwelussen 2017; Pauwelussen 2021; ten Bos 2009). Amphibiousness as a theory and method thus destabilizes modernity's categorizations of the world into dichotomies; land/sea, mind/body, nature/culture, focusing on their material and conceptual leakiness (Ballestero, 2019a). Along that line of thinking, Neimanis' (2017) posthumanist feminist phenomenological work on "bodies of water" suggests that humans in relation to deltas, coasts and watersheds together form bodies that are always in a process of transformation, where bodies do not have determined contours. Instead, they are porous and *leaky*: they are entanglements that interpermeate and partially flow into each other (Neimanis, 2017; Pauwelussen, 2022). It is through their interpermeability that bodies and entities become entangled. They are indebted to their relations with other bodies for the forms and shapes they take (Barad, 2007a; Haraway, 2008). Amphibiousness, then, is about the flows between different kinds of human and more-than-human bodies and how these encounters shape what they become and what they can do (Barad, 2013; Neimanis, 2017).

Applied to amphibious settings, it matters what bodies and coastal entanglements are enacted, as this affects the set of actions that becomes possible in responding to coastal change. Coastal entanglements not only determine how possibilities to act are distributed, but also influence distributions of risks and responsibilities (Carse, 2012). Such distributions are "thick with politics" (Bijker 2007, p. 109), sometimes placing large burdens of responsibility with actors who have few possibilities to act (Kaufmann et al., 2018; See & Wilmsen, 2020). The connection between

responsibilities and possibilities to act is expressed in the feminist posthumanist re-conceptualization of responsibility as response-ability (Barad, 2007a; Haraway, 2012). The term response-ability posits actions as responses, because activities are always reactions to the already ongoing formation of relations (Brown & Dilley, 2012; Fukukawa, 2019). Therefore, response-ability turns our attention to the conditions for action rather than actions themselves (Barad, 2007a, 2010; Giraud, 2019). In other words, response-ability is not about assessing individual actions, but about the entanglements that disable and enable actions (Thaler, 2022). In contrast to a rule-governed idea of responsibility, response-ability draws on ambiguity and situatedness "where to be responsible is to remain receptive and responsive within the encounter" (Beausoleil 2017, p. 294). Thereby, the concept helps to focus on the processes through which agency emerges and is distributed and the politics that are implied in these processes.

While amphibiousness is a powerful concept to rethink and reshape in more fluid ways, complementing it with a notion of response-ability brings to the fore the politics involved in what kind of flows are assumed, desired, neglected or rendered invisible. Amphibious response-ability, then, refers to the relational possibilities for responses in coastal settings that shape which things are allowed to flow and entangle more than others, with consequences for how amphibiousness plays out (Helmreich, 2011b; Jensen & Morita, 2015; Ten Bos, 2009). The entanglements and flows enacted by coastal management regimes are thus politically conditioned, as they prompt possible responses to some futures and not others (Urueña, 2022).

In this article, we compare the amphibious qualities and corresponding response-abilities in the dynamic management approach with those that were present during the preceding approach of helm grass management. We explore the human-land-sea entanglements that are enacted in both approaches and analyze which possibilities to respond emerged because of these entanglements. Acknowledging the politics in generating response-abilities, in what follows, we first compare helm grass with dynamic management to show that the management regimes are similar in the sense that both deliver capacities to respond to coastal change by virtue of more-than-human arrangements. However, they differ in their understandings and enactments of amphibiousness, because of their temporal orientation, scope and definition of safety. These aspects together account for differences in the more-than-human response-abilities the two regimes bring forth, which we subsequently discuss.

3. Maintaining Ameland's west coast

3.1 Planting helm grass

Sand circulates between the large sand banks north of Ameland and the coast of the island (Hoogland et al., 2015). For generations, coastal management on Ameland relied on capturing and stabilizing incoming sand. In the dunes, this was realized by planting helm grass to create a wind lay, which immediately ensured that sand settled behind it. Repeated helm grass planting enables dunes to grow over multiple years by means of capturing sand that is lifted by wind and currents (Arens & Van der Wal, 1998; Clarke & Rendell, 2015), resulting in permanently green, steep dunes. During sea storms, these dunes would be eroded, after which helm grass planning would enable them to build up again (Provoost & Bonte, 2016). However, growth of the dunes is regularly interrupted when the sea eats chunks of the coast due to the winds and springtides that usually peak in the stormy season between December and March. This shows the porosity of the island's coastline, and how efforts to stabilize the coast are situated in an on-going interplay between stabilization and erosion processes. Navigating this dynamic interplay has shaped the situated knowledge of local coastal managers.

Until 1990, ten helm grass planters, employed by the local Rijkswaterstaat office via local contractors, used to meticulously replant bare patches in the dunes on a daily basis with the aim to sustain the coastline. Ten other Amelanders were employed full-time by Rijkswaterstaat to monitor the dunes. The team of helm grass planters and local Rijkswaterstaat employees relied on their situated, practical knowledge and formed a collective of eyes on the ground that was able to determine the design of, and strategy for, realizing and repairing dunes. This practical knowledge had been developed through intergenerational and on-going tinkering with the situated amphibious interactions between water, wind, sand, and grass, and frequent adaptation to disruptions when the coastline was in danger of becoming too leaky. For example, reparation activities involved countering the effects of tourists busting dunes or rodents gnawing helm grass. Likewise, many of the coastal management activities concentrated on preparing for and responding to high tides and storms, for instance by planting helm grass, by putting up emergency barriers, or by repairing monitoring technology during nightly storms (personal communication former helm grass planter, face-to-face interview, April 21, 2021). In this arrangement of localized coastal management, Amelanders enjoyed considerable autonomy in determining

appropriate interventions and responding to disruptions. This resulted in a desire for conserving and maintaining a high dune row at the edges of the island, that could be assessed and maintained by the forces that were present on the island.

The detailed work of helm planting made that every spot in the dunes was regularly checked to the extent that every "rabbit hole was planted with helm grass, so to speak" (personal communication former Rijkswaterstaat foreperson Ameland, face-to-face interview, April 28, 2021). Such monitoring was motivated not only by safety concerns, but also by the valuation of the coastal management work as a shared heritage. To one respondent, the dunes were material expressions of a shared history of land reclamation and coastal maintenance. The landscape thus functioned as an archive for stories of coastal dwellers and dialogues between humans, the island and the sea. Because of this broader range of affective relations, respondents who were not formally assigned to coastal monitoring or maintenance also expressed a sense of collective responsibility to take care of the dunes. For example, one respondent said that even though he was not involved in the practice himself, he felt connected to the dunes because fellow Amelanders used to "help the dunes" by planting them with helm grass (personal communication resident 2, face-to-face interview, April 24, 2021). This shows how the affective relations involved in maintaining and sustaining the stability of the coast in a constantly changing environment also distributed engagement with, and responsibility for coastal management as a community-based practice.

The coastal management system around helm grass planting and dune maintenance is exemplary for the relative autonomy allocated to local and regional governments in historical Dutch coastal governance. Particularly in northern Dutch provinces, there is a long lineage of regional autonomy in water management, in which villages independently organized the maintenance of coasts and dikes, from the start of land reclamation practices in the Middle Ages. This contrasted with the organization of water management in other parts of the country, where feudal lords steered the management of dikes, dams and sluices (Kaijser, 2002). However, the independence of the northern provinces also left these coastal regions with limited resources for ensuring the safety of the Wadden Sea islands (Kaijser, 2002). This became critical in the '80s with the erosion of multiple hectares of dune area by floods, followed by increased attention for the necessity of profound interventions vis-à-vis the projected sea level rise and more frequent and intense storms associated with the climate crisis. This stimulated a growing realization that localized practices would not suffice to safeguard the islands from the accelerating processes of erosion (Arens, Loffler, and Nuijen 2007).

3.2 The shift to dynamic management

Because of intensified erosion of the coast in the 1970s and 1980s, the head office of Rijkswaterstaat no longer considered helm grass coastal management sufficient to ensure coastal safety. Rijkswaterstaat adopted the dynamic management approach as the primary mechanism to ensure coastal safety (Loffler et al., 2016; Ministerie van Verkeer en Waterstaat 1989; van Koningsveld & Mulder, 2004; personal communication Rijkswaterstaat employee 1, face-to-face interview, April 22, 2021). This shift consisted of a transfer in the organization of coastal management from the local Rijkswaterstaat office, with employees living on the island, to Rijkswaterstaat headquarters. It also entailed a fundamental change in understanding coastal safety, from understanding of static dunes that could keep the water out, to an understanding of a sandy coastal base that required a minimum amount of sand to provide safety. This shift in technique was motivated by Rijkswaterstaat's observation that there was a lack of incoming sand that could be captured with helm grass, and that static dunes could therefore no longer offer the level of safety that was required in the face of climate change induced sea level rise. They also felt that the dynamic management approach was more appropriate because it fitted with the dynamic character of the dune system; the dyke-like helm grass dunes were considered less natural because they did not allow for irregular and rough morphological features in the coastline (Arens et al., 2007; DHV, 2005; personal communication Rijkswaterstaat employee 1, online interview, July 1, 2022).

Rijkswaterstaat introduced sand suppletions as a preferred means to ensure the quality of the coastal base. Sand suppletions are large-scale operations where sand is replenished on beaches or foreshores (the area that falls dry in low tide) to sustain a coastline or reclaim land. To replenish the beaches of Ameland, sand suppletions are carried out by vessels that dredge sand from the seabed about ten kilometers north of the island. Subsequently, the vessels relocate this sand to the foreshore or directly onto the beach, after which the wind transports the sand to the dunes and, on some occasions, even to the land behind the dunes. This coastal management technique was considered better able to keep up with sea level rise in the coming 200 years, because sand suppletions are more amenable to centralized control and scaling (Vessem et al., 2006). Determining the locations for collecting, dumping and monitoring of sand is a complex task that involves modelling, engineering and large-scale vessels and machinery (Bruun, 1989; Elias et al., 2022; personal communication Rijkswaterstaat employee 1, April 22, 2021; personal communication Rijkswaterstaat employee 2, online interview, June 17, 2022). These activities require different skills, equipment, and expertise than were available amongst the Amelanders. This meant

that local knowledge and monitoring practices were no longer needed, and the number of Rijkswaterstaat employees based on the island gradually reduced to one part-time relations manager (de Amelander, 1998).

The shift in coastal management sparked initial reservations among Amelanders. Amelanders were suspicious of the loss of jobs and the economic rationale behind the shift and wondered whether the change to sand suppletions was part of national cost-reduction strategies. Some Amelanders also expressed their frustration that "people from the mainland" refused to continue the land reclamation work of their ancestors (personal communication resident 1, face-to-face interview, April 25, 2021). One respondent considered the lack of maintenance for the green, stable dunes as a lack of respect for the historical achievements in coastal management. While these two reservations pertained, a third reservation that related to coastal safety gradually diminished over time. While Amelanders were initially skeptical about the possibility to safeguard the island without stable dunes, at the time of research, Amelanders felt safe in the sense that they believed that "Rijkswaterstaat would not let them drown" (personal communication local resident 1, April 25, 2021). National policy evaluations confirmed that the coastline was stable and that the amount of sand in the coastal system had even increased, which was seen to demonstrate the effectiveness of dynamic management for ensuring dry feet (Ebbens, 2022).

Dutch coastal management thus transitioned from a coastal safety regime based on keeping the dunes stable by using helm grass, towards a regime based on the principle of unleashing natural processes. Both regimes include amphibious entanglements, but they do so in different ways. Helm grass planting functions within the dynamics of existing incoming sand flows, enacting coastal managers with their hands and feet in the sand, and their eyes on the coastline. The helm grass planting practices facilitated diverse, detailed, practical, community and place-based entanglements between humans, sea and dunes. These entanglements can be described as amphibious because human coastal dwellers and the coastal setting shape each other within the dynamics of land-sea relations. However, in this approach, land and sea continued to be visibly separated, and they could only intermingle within the dunes. In contrast, the dynamic management regime denounced a rigid separation between land and sea and actively created an amphibious transition zone in which dunes are shaped by waves and sand suppletions. This approach enacted a relatively dynamic coastline with sand on the move, but with coastal managers primarily operating at a distance from the Dutch mainland and based to a greater extent on scientific hydro-morphological expertise.

The shift in coastal management regimes can therefore be seen as a shift in amphibiousness response-abilities. The introduction of dynamic coastal management enabled new coastal entanglements and disabled other entanglements that had hitherto enabled responses to coastal changes. The way in which the dynamic management approach unleashed natural processes also enacted a change in the abilities to respond to coastal changes. As we will illustrate below, this change in abilities to respond came with risks.

3.3 The sea dismantles a gas exploration platform

Although the dynamic coastal management regime was promoted as a more effective and natural approach to enhancing coastal safety, not all unleashed natural processes were fully under control. While some flows of water and sand were desired – like those enabled by sand suppletions – other flows were unforeseen or neglected. At the southwest coast of Ameland, coastal erosion continued. Rijkswaterstaat accepted that these dunes would gradually diminish at this location because of the sea's exceptional thirst for sand at this site (Roelse, 1994, 2002; personal communication Rijkswaterstaat employee 2, June 17, 2022). Precisely at this location lay an obsolete gas exploration platform, to which the sea gained unrestricted access by eroding the dunes that used to protect it. In 2018, this platform was partially destroyed during a storm.

The exploration platform consisted of a tarmac surface that lay on top of a reservoir of soil containing residues of chemicals that had been used during gas exploration. It was a relic of gas exploration activities in the 1960s by the NAM, a major gas corporation that operates solely in the Netherlands. These exploration activities never resulted in the active production of gas, since the reserve found was not considered profitable at the time. Yet, the NAM kept the platform in place in anticipation of possible economic and technological developments that would make drilling here cost-effective (Arcadis, 2019). For over fifty years, the NAM left the location largely unattended, during which the platform stored contaminants such as mineral oil, xylenes and barium (Antea Group, 2016; ARGUS Milieukundig Ingenieursbureau bv, 1991; personal communication former NAM senior ecological manager, face-to-face interview, June 13, 2022). At the time of construction, the gas exploration site was protected against erosion by a broad line of dunes. This, however, changed profoundly from 2006 onwards because of shifting dynamics in the intertidal Amelander inlet, primarily because a deep gully gradually altered its course and shifted closer to the beach (Hoogland et al., 2015). In December 2018, the

sea eroded a part of the dunes two hundred meters northeast of the platform, and as a result sea water flooded the dune valleys. This erosion was a harbinger of further erosion; on January 9, 2019, a western wind combined with springtide eroded part of the platform, and a portion of the chemicals stored underneath it flushed into the sea.

The decline of the dunes near the exploration site had been a matter of concern amongst Amelanders for multiple years. Several Amelanders were in the habit of monitoring and checking up on the state of the coast and the dunes. Some had been involved in coastal management before and still regularly inspected the dunes. Others kept an eye on the coast while doing mundane activities like walking their dogs, fishing or going for a ride. For example, for one respondent it was "in his system" to monitor the dunes. He and others would regularly take photos, comb the beach, and document coastal erosion by publishing photos on social media, especially after heavy storms. Landscape elements, such as a dwindling bridle path located next to the platform, served as reference points to track the progress of erosion. Stories about this site also transferred over generations. For example, one respondent described how her parents had protested the arrival of gas companies in the 1960s, and how community members who worked on the site in the 1960s made her aware of the storage of chemicals in the dunes. Such intergenerational observation practices enacted an informal monitoring system that was made possible by the entanglements between (generations of) humans, the dunes, the sea, and fossil fuel related economic activities. Because of these entanglements, several Amelanders had been aware of the risks of erosion, and they had warned local governmental authorities, including Rijkswaterstaat employees, about the speed of erosion and the risks for the platform.

Rijkswaterstaat had been aware of the decline of the dunes for at least a decade before the event in 2019, because they frequently and regularly monitored the development of dunes, especially at the west coast of the island where the exploration site was located (personal communication Rijkswaterstaat employee 1, email conversation, August 17, 2022). In 2014, five years before the destructive event, the regional Rijkswaterstaat department had already informed the Rijkswaterstaat head office that they were concerned about damage to the platform due to erosion (Hoogland et al., 2015). Despite this concern, Rijkswaterstaat did not respond with an intervention to counter the erosion. A regional Rijkswaterstaat employee explained that it is not part of Rijkswaterstaat's formal responsibilities to mitigate risk for pollution because of erosion. Only when erosion poses a direct threat for flooding of the island, Rijkswaterstaat needs to respond and intervene (personal communication Rijkswaterstaat employee 1, July 1, 2022). This also meant that an extra sand

suppletion was not considered as option to prevent damage to the platform, as Rijkswaterstaat's policies prescribed that sand suppletions could only be deployed to target structural coastal erosion that threatened coastal safety in the sense of flooding. According to Rijkswaterstaat's policies, flooding and erosion at this site were accepted risks within their management approach, because of the exceptional dynamics at this site. The fact that the platform was located outside of the inner row of dunes (*buitendijks*) also mattered. The boundary between *buitendijks* and the area within the inner row of dunes (*binnendijks*) demarcated different safety regimes that regulated the responsibilities, dismissing Rijkswaterstaat from being responsible for maintaining this site (personal communication employee Rijkswaterstaat 1, written comments in early draft, Aug 8, 2022).

As a result of these considerations, the risks involved in the erosion were legally and contractually exclusively the responsibility of the NAM. The regional Rijkswaterstaat employee therefore warned the former NAM environmental manager and explained about the declining coast and the NAM's responsibility for the platform. The Rijkswaterstaat employee described this warning as a "request to intervene in order to prevent risks *for the NAM"* (our emphasis). However, this warning was not interpreted by the former NAM environmental manager as a matter that required an immediate response (personal communication former NAM environmental manager, June 13, 2022). According to the former NAM manager, this interpretation was partly because Rijkswaterstaat had initially downplayed the safety risks, to not cause further concerns among Amelanders about coastal safety under dynamic management. For one Rijkswaterstaat employee, the failure to signal an explicit need for action was explained by the platform being taken for granted: he described the platform as barely noticeable due to its inactivity and because it "had always been there" (personal communication Rijkswaterstaat employee 2, June 17, 2022). For the Rijkswaterstaat employee who had warned the NAM environmental manager, the reason for not signaling "code red" to the NAM or the Amelanders was that there was no risk in terms of flooding for the island – which was Rijkswaterstaat's sole responsibility. This shows that Rijkswaterstaat narrowly defined the dunes and the platform as leaky in terms of flooding, for which it needed to be accounted for, but not as chemically leaky, which was beyond Rijkswaterstaat's duties. This rendered the disruption and subsequent leakiness of the platform as unforeseen, and therefore unaccounted for.

After the warning, the NAM had expressed their intention to remediate the site on short notice, but they postponed this planned remediation multiple times based on the assumption that the dunes sufficiently protected the site against the sea. It was

only in 2018, when the sea fully eroded a dune northeast of the platform, that the responsible ecological manager of the NAM realized that swift intervention was needed. After this realization, he started a process to initiate the remediation. However, this process was delayed multiple times for different reasons, including other priorities within the larger NAM organization and stringent environmental regulation that prohibited large machines in the dunes. Another main source for the delay was that the NAM initially intended to remediate several polluted areas at once, for which it sought cooperation with Rijkswaterstaat who was formally responsible for three other polluted sites. While these sites were not directly at risk for coastal erosion, an integrated remediation process was initially preferred by the NAM because it would be more efficient and cost-effective than several separate remediation processes. However, this combined operation increased the bureaucratic complexity, and therefore the NAM eventually decided to focus solely on the platform. Ultimately, the remediation activities started before the sea reached the platform (and before an environmental permit was given), but the NAM was too late to prevent that part of the remaining chemicals flowed into the sea (personal communication former NAM environmental manager, June 13, 2022).

Similar delays in remediation in the extractive industries have been linked to the creation of material and emotional distance between the sites where decisions are made and those where the impacts are felt (Appel, 2012; Orihuela et al., 2021). Such distancing has been described as particularly notorious for remediation processes, because remediation activities tend to drag on for several decades and are associated with informational chaos (Kramarz, 2022; Lawrence, 2022; Shriver et al., 2020). In our case, centralized and technocratic management had detached NAM and Rijkswaterstaat employees from the lived material reality in the dunes due to their organizational fragmentation and physically distant locations. The legal division of responsibilities between the NAM and Rijkswaterstaat also enacted separated understandings of who carried the burden of risks. To Rijkswaterstaat, potential pollution was first and foremost a risk for the NAM. In turn, NAM rendered *risk* a matter of liability, and neglected the material implications for the dunes, for the Ameland communities and for the marine environment more broadly. This brings into question whether the entanglements under helm grass management would have enabled different assessments of risks and different response-abilities. Based on our analysis, we infer that a former regime would have signaled the need for intervention earlier and more forcefully to the NAM, partly because the entanglements under the helm grass management showed a situated, place-based and material understanding of risks.

4. Shifting response-abilities

Our analysis demonstrates that different coastal management approaches enact different amphibious response-abilities. Although helm grass management focuses on creating barriers to keep the sea out, it also has amphibious qualities as it produces close-knit human-coast entanglements. However, its ability to respond to increasing erosion processes in the Wadden Sea turned out to be limited. In contrast, dynamic coastal management provides an infrastructure to enact more amphibious land-sea interactions, enabling sand and sea water to flow and run their course. This approach is promoted for its ability to respond more effectively to the anticipated effects of rising sea levels and increased frequency and intensity of storms. Moreover, it promises to encourage the dynamics of the intertidal Wadden Sea. However, the partial erosion of the gas exploration platform also showed that the capacity of dynamic management to respond to events that were not anticipated, or that were outside the scope of what is considered a natural process, was limited. Thus, the shift in management approaches conversed a set of amphibious human-sea-land entanglements that was able to respond well to visible, short-term and situated changes effecting coastal stability, into a set of differently amphibious entanglements that was able to respond to long term, unprecedented changes in the coastal dynamics but that lacked ability to respond to disruption outside of Rijkswaterstaat's understanding of coastal safety.

A focus on amphibious response-ability brings to the fore that different sets of relations enact different entities that are equipped with different abilities to act and be acted upon. In our case, this was most explicit for the gas exploration platform. In the entanglements of the coast and the Amelanders, the place-based practices of the community of Amelanders prevented the platform from becoming invisible and ensured that it was actively re-membered as a part of the community. This shows that these locally situated practices do more than just greening dunes, entertain dogs, or clean up beaches; they enact entanglements in which industrial ruins can be seen and placed within a context of coastal management (Awâsis, 2020; Edensor, 2005; Morrill, 2017; Whitney, 2019). In contrast, the obsolete platform had become an industrial ruin that fell outside some of the classifications of amphibious dynamics, with consequences for management and responsibilities. That is, although the coastal managers monitored and communicated about the erosion, this ultimately did not activate the necessary responses to prevent pollution. Over time, the re-arrangement of materials – the sea that made the platform leak toxic chemicals into the sea –

eventually enforced an understanding of the site as one that required intervention by those in charge.

The calamity with the platform demonstrates that even when coastal management regimes are amphibious because they deliberately shape dynamic water-land relations, they are neither neutral nor natural (Floor, 2018). Some amphibious encounters may be unexpected and destructive for entities that rely on stable ground (cf. Asplen, 2008; Carse, 2012; Jensen & Markussen, 2001). While some trade-offs may be inevitable (cf. Ginn et al., 2014; Giraud, 2019), they become problematic when they are depoliticized. When trade-offs are naturalized, certain processes are rendered as inevitable, and certain activities are rendered as structurally invisible, impossible or undesirable. In other words, when a management regime only fosters relations that can respond to a restricted set of coastal changes, this generates blind spots for the risks that fall outside of its scope. In the set of relations enacted in the dynamic management approach, a mixed land-water interface was realized, but other more-than-human bodies were not equally allowed to flow and interpermeate, and the undesired flow of the chemicals could not be responded to. Our analysis shows that the risk that the platform would be eroded was a matter that was unactionable by design, partly due to institutional separations between land and sea in the management regime. Moreover, it is important to note that mining contexts such as gas exploration sites are notorious for enacting situations of slow violence and disrupting integrated response-abilities (Kramarz, 2022; Nixon, 2011). This indicates that contexts of resource extraction require extra scrutiny for which entanglements are enacted, how they facilitate and disable flows, and how this distributes response-abilities and risks.

Our analysis makes explicit how amphibiousness is political, because not all flows are equally desired and allowed. Scholarship on amphibiousness has demonstrated that the boundaries between and relations among coastal bodies (including land and sea, but also humans, sand, grass, waves and responsibility regulations) come into being through more-than-human practices (Jensen and Morita 2015; Empson 2017; Pauwelussen 2021; Hill 2020). At Ameland, the different entanglements involving Rijkswaterstaat, the NAM, and Amelanders produced different coastal entanglements that allowed for some flows and disabled others. As our analysis demonstrates, when coastal management focuses on amphibiousness only as unleashing and building on natural processes, while maintaining or erupting separations between other bodies, it limits the possibilities for mixed approaches to respond to harmful leaks such as chemical spills. The limitations of each of the coastal entanglements in responding to environmental calamities marks the

importance of making political what kind of dynamics are foregrounded, taken for granted, or rendered invisible in shifting coastal management regimes. All these aspects together shift who can act, who is at risk, and who is allowed to be porous and leaky (Beck, 1992; Bridel, 2021; Choi, 2015; Kramarz, 2022).

To be clear, our analysis is not an assessment of the superiority of one coastal management regime over another; we are not suggesting that helm grass management would have been able to prevent the pollution. Instead, our concern is that with the exclusion of place-based relations for amphibious coastal management, particular response-abilities were also excluded. Considering increases in frequencies and intensities of extreme weather events and rising sea levels and the uncertainties and risks associated with this, the question is how to enable multiple, flexible and diverse amphibious response-abilities. Appropriately dealing with calamities requires resisting the tendency to depoliticize amphibiousness and equate it with taken for granted natural processes. Although response-abilities are forward looking, in practice, these actions are as much conditioned by predictions of the future as by the formation of entanglements in the past and depend on the sea-land-human relations enacted by coastal management schemes (Choi, 2015). What is needed are amphibious coastal management practices that recognize the unpredictability of land-sea entanglements, the inevitable leakiness of more-than-human bodies, and the politics and exclusions in the enactment of water bodies, coastal relations and response-abilities. Such a management approach can foster more politically informed, pluralist, flexible, and situated abilities to prevent environmental calamities (Moore, 2016). We end this article by articulating suggestions for how Dutch coastal management can enhance amphibiousness in management practices, in particular within understandings of and activities related to safety and risks within management regimes.

5. Conclusion

As we have seen, the shift in Dutch coastal management was motivated by the judgment that dynamic management generates better abilities to respond to sea level rise and ensure dry feet for human coastal residents. Indeed, the entanglements enacted by dynamic management enable amphibiousness in the sense of dynamic land-sea relations, which proved to be effective for reducing the risk of flooding for Ameland. At the same time, dynamic management decreased amphibiousness in how humans are entangled in these relations. The shift towards dynamic management fell short in recognizing what kind of amphibious entanglements were

enabled and disabled, and with what consequences for abilities to respond. While dynamic management has enhanced abilities to respond to some risks – sea level rise and extreme weather events being the most prominent ones – it has not been able to address other risks that equally demanded a response. We therefore conclude that amphibious coastal regimes need to attend to the diverse amphibious bodies and flows, and the associated possibilities to act, that can be brought into being.

We described a case of globally renowned coastal management that explicitly creates space for amphibious resilience. While this management approach on the surface of it seems to align well with suggestions and recommendations derived from STS research (Morita, 2016), our analysis provides reason to further up the ante. To become more response-able to environmental risks, an integrated understanding of the politics of amphibiousness is important. Our emphasis on politics is motivated by the same reasons that propelled dynamic management into existence in the first place: to need to cope with increasingly unpredictable extreme weather events that are associated with climate catastrophes and crumbling coasts. It is also motivated by the observation that a transition from one coastal management regime to another is always situated in a particular history and context, including place-based more-than-human relations as well as industrial artefacts. Such situatedness tends to get overlooked in crisis situations, which risk authoritarian and depoliticizing interventions, often rendering centralized technical relations as the only legitimate ones to respond to urgent threats (Aykut et al., 2019; Choi, 2015; Gagné, 2019). Centralization and technicalization redistributes risks and vulnerabilities in particular ways, in our case from the risk for flooding to the risk for pollution. To respond to possible future risks, management approaches are required that comprise of a multitude of entanglements that can see and democratically take care of the dynamic, risky unpredictability of future coasts across times, scales and safety risks (Nelson et al., 2020).

Therefore, we end with a suggestion for dynamic management to be more ambitious in its amphibiousness. For this, we find inspiration in both historical Dutch water governance and contemporary experiments with the co-production of expertise. The co-dependence between the Dutch and water has historically resulted in innovative engineering *and* innovative governance, leading to a participatory and decentralized organization of human-water relations (Bijker, 2007; Brouwer, 2006; Kaijser, 2002). To connect such long-standing ideas of decentralized water responsibilities to more contemporary democratic innovations, we suggest that amphibious response-ability can be better achieved through collaborations between scientific, executive and local experts in the form of a local knowledge and management alliance (Landström et al.,

2011; Lane et al., 2011; Waterton, 2017; Whatmore, 2013). Our suggestion does not include a formulation for what amphibiousness in this locality should entail precisely, as it is for the knowledge alliance to collectively and situated determine what events require response-ability. Instead, this is an invitation to shape this alliance as an amphibious and more-than-human partnership. For this partnership to be amphibious, it requires embracing and even encouraging ambiguity and politics in the process, to allow for human, water and other bodies and matters to be permeable (Latour, 1993; Waterton, 2017). It would be a key task of this alliance to collectively determine what knowledge is salient and missing for the diverse response-abilities that might support that locality (Liboiron, 2021). To achieve this, participants should be willing to bring their personal histories, relations and knowledge to the table, open up every phase of knowledge production for contestation, including scientific work that usually does not allow local and non-local experts to be involved. Ultimately, what is at stake is the ability of the alliance to generate caring and capable entanglements between and across people and nonhumans – entanglements that include different forms of scientific and local forms of knowledge, that connect centralized policies and place-based practices, and that involve not just management, but also living, walking and playing at and with the coast (i.e. Landström et al., 2011; Lane et al., 2011; Waterton, 2017; Whatmore, 2013). In this way, such a collective can spur inclusive political decisions about which matters become matters that require a response.

4

Remove sand | Re-move, sand!
An arts-based inquiry into affective human-sand relations

1. Introduction

This chapter is about the relations between sand and humans. What sand is depends on its relations, including those with humans (Kothari, 2021; Kothari & Arnall, 2020). This point is illustrated by architect Zumthor's (2006) description of the different possibilities of a single material:

> Take a stone: you can saw it, grind it, drill into it, or polish it – it will be a different thing each time. Then take tiny amounts of the same stone, or huge amounts, and it will turn into something else again. Then hold it up to the light – different again. There are a thousand different possibilities in one material alone.

(Zumthor, 2006, p. 25)

This excerpt shows that materials have different qualities depending on their relations. When sand is entangled with many other sand grains it becomes almost fluid, being able to creep into tiny holes. When sand is surrounded by water, the body of sand grains disperses, which makes it easier to be carried by waves and tidal forces. Entangled with human skins, sand scrubs, enters wounds and evokes moods. These examples show that properties of sand are not fixed; these properties – what sand is - emerge only in relation to something else (Barad, 2007a; Ingold, 2013).

This chapter tells about sand that is entangled with humans through an arts-based research project named *Remove sand / Re-move, sand!* (henceforth, '*Remove sand*'). I co-created this project together with artistic researcher Sammy Hemerik [1].

Remove sand consists of an installation, two workshops, a poem (in written form and recorded), and a video. Sammy and I initiated this project to encourage reflection on human-sand relations and to experiment with what these relations can look like. It is important to note from the beginning that this chapter refers to *artistic* experimentation, not experimentation in a representationalist sense. Our

[1] Sammy Hemerik is an independent multidisciplinary designer, based in the Netherlands. With a background in graphic design and design research, she balances visual communication with graphic sensibility to create thoughtfully executed solutions. Her work has a social-cultural approach and through visual research she strives for critical thinking in major social issues and this is where her work meets other disciplines. For more information, go to www.sammyhemerik.nl.

experimentation is not about finding generalizable truths about human-sand relations; our experimentation is meant to provoke and intervene in the relations we engaged with. Thus, when I refer to 'experimentation', this is not a matter of controlled discovery, but a matter of creating different human-sand relations.

The chapter tells the stories of three different sand-human entanglements: sand in relation to me and Sammy when we created *Remove sand*, sand in relation to humans who participated in workshops, and sand in relation to you, the reader. This latter story will occasionally address you actively; the text will invite you directly to reflect on your relation with sand and how this relation is influenced by the text you are reading right now. This chapter is therefore simultaneously a personal record, a description of intervention-oriented research, and a performance in itself and these three goals are reflected in the colours of this text:

Red text: Presents a personal reflection on my/Sammy's relation with sand and how it changed in the course of the project.

Blue text: Operates on the relation between sand and you, the reader, in order to generate a more affective relation between you and sand

Green text: Presents other activities within *Remove sand* that aimed to influence affective relations between sand and human participants in the project.

Our three stories start at the Wadden Sea area, between barrier island Ameland and the Dutch mainland. In this area, sand continually shapes what islands, gullies and mud flats look like. On the seabed, sand holds tight to sludge to find the lowest point of the intertidal area. The sand-sludge fills up the gullies and blocks the ferries that transport people and goods to and from the island. Sand is generally quite successful in finding the low-laying gullies, and this motivates people to dredge the seabed on a daily basis to ensure that the ferry can cross the Wadden Sea. The sand-sludge is dredged, after which it is dumped a few hundred meters westward. Every day, dredgers clear out the gullies, and every day, the tidal streams return part of the sand (Arcadis, 2016; Rijkswaterstaat, n.d., 2019).

Sand movements determine which activities can take place in the Wadden Sea and on the islands. Some sand movements enable humans to cross the sea and travel to the island. Other sand movements threaten these activities, such as the tide that returns some of the dredged sand. These sand movements (both the dredging and the backflow) are the result of historical human interventions in the tidal system, in particular the construction of the Afsluitdijk, which closed off the Zuiderzee (Lotze et al., 2005; Reise, 2005). The Afsluitdijk is a prestigious work of engineering that, as a side effect, has caused an influx of sandy sludge into the Wadden Sea (Reise, 2005; Rijkswaterstaat,

2019). Counterproductively, contemporary dredging activities enlarge this influx, because such activities result in wider gullies. Wider gullies decrease the speed of water flows, which allows sand to sink to the seabed. Therefore, these adjustments in the seabed increase the frequency of dredging. Currently, dredgers remove almost two million cubic meters of sandy sludge annually, disturbing seabed critters with penetrating lights, sounds, and moving objects in the water of the Wadden Sea (Hoving, 2021; Rijkswaterstaat, 2019). Therefore, the current dredging activities will soon reach financial, technical, and environmental limits set by national budgets and EU regulations on nature protection (Gemeente Ameland et al., 2019).

In response to such limitations, the Dutch government is looking for alternatives to guarantee access to Ameland. As part of the exploration, governmental actors, scientists, and local publics are analyzing different scenarios to this end. This formal participation procedure focuses on economic, technological, and managerial human-sand relations. It does not consider personal relations and stories about sand and associated sand qualities that shape what sand is. This may be a problem because sand is not just a resource or a hindrance. But also part of various more-than-human affective relations. Especially in the case of islands, human-sand relations are strongly connected to cultural heritage, sense of place and possibilities for future liveabilities, sometimes vis-a-vis bleak climate futures (Empson, 2017; Kothari & Arnall, 2020). Therefore, human-sand relations are important aspects for the participatory process to take into account (Whatmore, 2002, 2013).

In the spring of 2021 and winter of 2022, I studied changes in the landscape of Ameland. On the windy island, sand was never far away. Grains painfully blew against my legs when somebody showed me around in the green dunes, they forced me to close my eyes when I cycled against the wind, and they crept into my socks and my phone case. While many interviews and discussions centered on sand, I never considered these bodily sensorial experiences with sand as being related to my research. Even when sand was literally blown into my eyes, I never viewed my own embodied relation with sand as a site to learn about the landscape, sand, and myself. Instead, what I learned about sand was what I heard from other humans.

While I always looked for ways to be close to the non-human materials that I studied, not all activities that I was interested in provided access to close encounters with sand. This was partly because the activities that I studied did not foster bodily relations between humans and sand at all, for example because sand-human relations were mediated by dredging machinery. Moreover, I unconsciously prioritized human over non-human informants for my research, because it was more comfortable.

Relying on other people's expertise – whether it was informed by science or by place-based experiences – provided an entry point to learn about sand that was familiar to me. I noticed that I lacked the necessary observation skills to notice much in the sandy landscape. My eyes were not trained to notice irregularities or temporal changes in the landscapes, because I had never attentively and systematically observed dunes. In contrast, my interviewees had been (formally or through their daily lives) trained for years to notice the bumps and gullies that slipped my eye. All in all, the technology-based activities that I studied, my lack of training, and my discomfort prevented me from engaging in a type of research practice in which I focused on sand more directly. To foster a relation in which this would be possible, I decided to create a setting that could enable sand-human encounters.

2. As sand touches others

Sand and human bodies are attuned to each other (Hultman & Taguchi, 2010; Somerville & Powell, 2019). Sensory experiences that involve humans and sand can be peaceful and playful, but also annoying and sometimes scary. Sand affords humans the ability to build castles, make glass, and grow vegetables. Humans also influence sand, when they dredge, extract and transform sand into other materials. This means that sand and humans affect each other. Affect is the ability to move and be moved, to be changed (in one's abilities) by one another, and to change another body (in their abilities; Barad, 2007; Haraway, 2012; Whatmore, 2013).

The notion of affect can be found across disciplines, but much affect scholarship is indebted to the work of Deleuze and Guattari, and Spinoza. This lineage of work conceptualizes affect as the pre-personal, unconscious, constitutive forces that circulate and resonate between bodies and worlds. Emotions can be part of affective relations, but affective encounters do more than only evoke feelings. Affective encounters impact a body's (human or non-human) ability to act in its encounters with other bodies (Gallagher et al., 2017; Massey et al., 2008). In this reading, affect is explicitly not a human-oriented concept and the bodies mentioned here are not human bodies only. All bodies are permeable and leaky and continuously change because of the affective relations they are in.

Affective relations are not a given. For a body to affect and be affected, activity and openness are required (Ahmed, 2004; Massumi, 2002). These elements can be stimulated or obstructed by the atmospheric settings in which they are located (B. Anderson, 2009). The notion of

affective atmospheres highlights that affect is part of a wider setting. Settings, and the moods they radiate, are therefore not passive backdrops for relations to play out, instead, they are a forceful element in the enactment of affective possibilities (B. Anderson, 2009; B. Anderson & Ash, 2015). Atmospheres can be peaceful, homely, murky, or desolate, and relate to settings and landscapes. Such atmospheres steer what activities and more-than-human relations can occur and which would be impossible or out of place (B. Anderson, 2009; Hajer & Pelzer, 2018; Michels & Steyaert, 2017; Zee, 2017). In other words, atmospheres simultaneously emanate from a gathering of relations, and actively shape activities and relations because they envelop and encircle them; they are both milieu and bodies (B. Anderson & Ash, 2015; Ash, 2013; Neimanis, 2017). The immersive and material experiences within such atmospheres can spark affective transformations and new alliances into being, potentially even catalyzing societal transitions (Hajer & Pelzer, 2018).

2.1 Arts-based research

Atmospheres can be intentionally steered to generate more affective relations. Through aesthetic factors such as architectural designs or well-chosen words, it is possible to create an intimate setting that can strengthen the potency to affect (Anderson, 2009; Anderson & Ash, 2015) Such affective possibilities are explored and developed in the field of arts-based research. Arts-based research produces knowledge by drawing upon techniques that are developed in a variety of artistic disciplines such as photography, dance, and installation art (Gergen & Gergen, 2018). Arts-based research tends to be interventionist in the sense that research activities involve creating or stimulating affective atmospheres by enabling sensory and embodied experiences (Coemans & Hannes, 2017).

Touching, smelling and listening are research practices that can enhance possibilities for noticing other-than-humans, and that can increase affective possibilities by directing attention to the porosity of bodies (Merewether et al., 2022; Neimanis, 2017; Paterson, 2006; Puig de la Bellacasa, 2009). These practices bring to the fore that bodies change when they connect: when bodies smell and taste, other bodies leave their marks, which changes both involved bodies. Therefore, sensing other bodies disrupts the idea of a contained self and a discrete other. Experimenting with sensory connections, then, can provide resources for thinking and making more affective more-than-human relations (St. Pierre, 2019; Puig de la Bellacasa, 2009; Skiveren, 2022; Westerlaken, 2020).

I want to illustrate these points about the affective power of sensory relations by describing two arts-based research projects that were developed in the context of the

Dutch marine environment. First, Lo and Chen (2020) explored how they could better understand the eels who cross the North Sea to move into the Amsterdam canals to reproduce. The artists explore the hurdles that the eels face in their attempts to reach fresh water. Their interactive, multisensory installation entitled F/EEL enabled visitors to experience what it is to navigate a world that is not designed for them, through an obstacle run that was not designed for humans (Sheng-Wen Lo, n.d.). Through this obstacle run, the artists and participants can make sense of eel experiences in the Amsterdam canals beyond what usually comes to the fore in research and policy related to eels or Amsterdam mobility.

F/EEL. Interactive installation by Lo and Chen. The image shows part of the obstacle run through which visitors can get an embodied understanding of the routes eels travel to reach fresh water.

Second, in her project *Verduinen* ("to become a dune"), Ameland-born visual artist Maria Stuut artistically explores the possibility to become part of the Amelander dunes. To understand sand movements and the formation of dunes, she wrapped herself in protective clothing, then laid down flat on the beach, and waited to be fully covered by sand. In trying to become a dune, Stuut learned that

> sand moved very differently from what I had expected, it created some kind of gully around me and it felt as if I very slowly submerged in quicksand, except for the sand at my legs, there it felt as a heavy blanket.

(personal communication, 16 November 2022, my translation)

In this project, Stuut uses the kinesthetics of her own body as the primary instrument-technique to understand sand within dunes. She learned how sand moved alongside her body, how it covered her and how she covered sand, and how she became part of the dunes for the duration of the experiment. While the embodied knowledge generated through this experiment may not fall within the scope of what is valuable or legitimate knowledge in all social science research, it presents a potent way to imagine bodies that stretch beyond the human skin and to cultivate awareness of more-than-human bodily relations (Leavy, 2009).

Stuut lying at a beach at Ameland to become a dune. Courtesy of the artist.

While cultivating more-than-human affect is an accepted goal in non-western research contexts(Liboiron, 2021; Tallbear, 2014; Tuck & McKenzie, 2014), this goal is less accepted for western research projects. Projects engaging with the more-than-human have been dismissed for being anthropomorphic, overly speculative, or outright naïve (Büscher, 2021; Zizek, 2014). One argument is that these projects rely too heavily on analogies of their own experienced realities, arguably reinforcing practices that put human needs, values, and experiences center stage, and leaving little space for other-than-human creatures to give shape to the world. However, it is not possible nor desirable to eliminate our human-ness that inevitably shapes the relations we have with more-than-human others. Instead, to critically examine such relations, embodied research can scrutinize the *in-between* where bodies can mutually affect each other. Dismissing such endeavors as naive anthropomorphism, then, risks placing them in overly divisive categories of the human and the non-human, ultimately robbing both of them of the possibility to generate affective relations between them (Skiveren, 2022).

Ingold (2013) offers a useful metaphor to focus on relationality in more-than-human encounters. He describes how such encounters can be seen as riddles that present openings for a more-than-human conversation:

> To describe any material is to pose a riddle, whose answer can be discovered only through observation and engagement with what is there. The riddle gives the material a voice and allows it to tell its own story: it is up to us, then, to listen, and from the clues it offers, to discover what is speaking.
>
> Ingold, 2013, p. 31

The voice described by Ingold refers to the possibilities for correspondences between beings, where each impresses on the other and leaves their mark (cf. Ahmed, 2004; Barad, 2011). Coming to an understanding of the riddle of other bodies requires researchers or participants to be willing to partake in heterogeneous correspond-dences, to do the work of trying to understand and to reconfigure the clues of the riddle to learn about other beings in

their relations with us (Gergen & Gergen, 2018; Kara, 2015; Law, 2004).

By creating an affective atmosphere through the arts, *Remove sand* provides a trope to generate affective encounters. To do so, the project draws on arts-based techniques to generate enchantment, flow, and skill (Krzywoszynska, 2016a, 2016b). Enchantment refers to a state of wonder about the entanglements one engages in. This state is characterized by heightened sensibility and exhilarated, focused attention (Krzywoszynska, 2016b; Somerville & Powell, 2019). Flow is a state in which one gets completely immersed in an activity and forgets about time and space, solely concentrating on the task at hand (Krzywoszynska, 2016b). To be skilled is to have intimate relationships with more-than-human others (Ingold, 2018; Krzywoszynska, 2016b). Skill is developed through repetitive engagements that sensitize sensory registers, and enable one to respond to subtle signals of the other. These three elements guide our project for generating a setting in which humans and sand can enter into more porous relations.

3. Learning with sand

Sand is easy to pick up, write in, and throw around. These qualities encouraged Hemerik and me to explore the possibilities to an affective atmosphere in which humans and sand could become more attuned.

After experimenting with arts-based practices from various artistic disciplines, Sammy and I decided to create an interactive installation supported by an audio experience to envelop people in an affective atmosphere with sand. We held two workshops to explore the effects of the interactive installation. We also created a video to enable some of the ideas and experiences to travel to other settings. The various elements of the project are discussed separately in this section.

3.1 Making an installation

Makers: Sammy Hemerik, Marieke Meesters and Johan van der Veer
Materials: beach sand, wood, metal, white stain, rope, mirror foil, paint suits, headphones, pulleys, white buckets and shovels

Installation art has been described as a dynamic form of contemporary art that consists of "any arrangement of objects in all kinds of spaces" (Armonas, 2022, p. 5). Because the audience is part of the arrangement, installations have unique abilities to create a heightened awareness of the relations between the elements of the installation, including the public's bodies (Armonas, 2022; Caldarola, 2020). In our design of the installation, we made decisions about energy input, materials, and overall coherence. To bring the

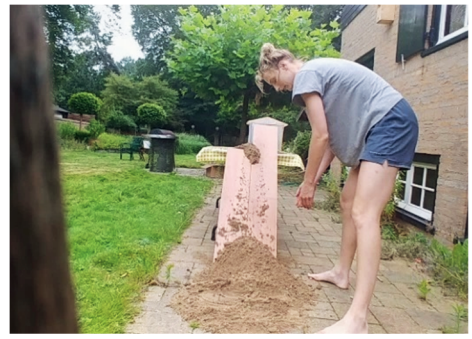
The playground that inspired us to use gravity for movement. Photo by Sammy Hemerik.

repetitiveness of sand movements into the design, we decided that the installation would move sand in two directions, back and forth. To realize this, we needed two sources of energy to move sand. Our first energy source was human power – a person would manually move sand or use simple tools to do so. For the second source, we considered using electrically powered conveyer belts or human force. However, the industrial character of the conveyer belts did not match our ideas about the natural setting and the low-tech character of the installation. We also wanted to incorporate the more-than-human involvement of sand movements that I had encountered in the Wadden Sea, and therefore we excluded the option of sand movements solely stimulated by human force. Eventually, we found inspiration in a children's playground that used gravity to move water and sand and we decided to use the playground as an example and to draw on gravitational forces.

After having decided on the energy sources, we needed to choose the materials

to construct the installation with. We tested how sand was pulled down by gravity using diverse materials, such as cardboard, wood, and glass, and under what angle that happened. We opted for wood as the backbone of the installation because it was relatively light, adjustable, and affordable. It can be attached and detached from other pieces of wood using screws, so the installation can travel. Wood can easily be painted in different colors and it can be made water-resistant. Wood is also unbendable and robust, which was required in this installation as it had to carry the heavy weight of wet sand. We used a wooden board to create a slide, which we painted white and partly covered with mirror foil. This silvery foil further smoothened the surface of the slide, and somewhat reflected the sky and the participants when they were near the slide. The foil also simply looked beautiful.

The wooden frame of the installation is 2.3 meters high, 1.8 meters wide, and 3 meters long. These dimensions enabled sand to slide down. We opted for a large installation to create some distance between the point where sand would enter and leave the installation. The height of the installation provided new challenges for moving sand because the top of the slide is above the carrying height for most people.



Testing how sand slide of various materials, including cardboard, wood and glass. During these experiments, I discovered that sand make sounds that made my head tingle. Photo by author.

Hence, this height complicated lifting sand to the maximum height of the installation by human force alone. To help people lift the sand on the high side of the slide, we introduced rope and pulleys. The rope hangs from the top of the slide and because of its roughness, it provides grip for human hands. The pulleys reduce how much human power is required to lift the sand. We also looked for a design that would make the bucket tilt at the top of the frame, but this proved technically unfeasible. Therefore, we integrated stairs into the installation, so people could step onto the frame and manually tilt the bucket to release the sand on the slide.

We included buckets and shovels in the installation to allow participants to effectively move sand onto the top of the slide. We painted them white to visually connect them to the frame. We also

included white suits for human participants to wear. These polypropylene painting suits were inspired by European climate activism in which I participated. In these actions, the suits protected the activists' clothes against dirt when occupying industrial sites. For me, it also enacted a sense of alienation from the site and therefore space to break away from the etiquette of the scene (which would be to stay away from the sites that we tried to occupy). These qualities were appropriate for our experiment too; the suits invited the participants to diverge from their normal behavior with sand and linked them to the rest of the installation.

The construction of the installation was a negotiation between humans, gravity, wood, sand, metal, and rope, informed by the specificities of the materials and some key desires of ours. Our plans and desires also changed throughout the making process because we discovered that the construction did not always work out as planned. For example, tilting the bucket at the top of the installation was possible in our initial designs, but in practice, there were forces or characteristics of the materials that prevented such tilting. By working through such moments of limitation, we got subtly more skilled and better attuned to the materials. While we consciously designed the installation in a particular way, the resulting slide is an outcome of our skills and our ideas as well as the characteristics of sand, wood, and metal that emerged in the context of the installation (see next page for images of the different stages of the design process).

Various phases of the design process. The bottom left illustration shows a design of the installation for a festival in Amsterdam. Bottom right shows climate activists obstructing a coal transfer site in the port of Amsterdam (Van de Wiel, 2017)..

3.2 Writing and recording

Makers: Marieke Meesters (concept, writing and recording), Janneke Aronson (recording), Sammy Hemerik (concept)

The second element of *Remove sand* consists of a poem and a recording of it. We created the poem during the process of making the installation. The poem initially served to guide participants in the installation, and eventually became an element in itself. As we already had experimented with the installation, we could integrate the lessons we learned in making it. For example, we needed to make the text compatible with the progress of the installation and with the setting, because it had to be instructive to listeners who were engaging with the installation. We also drew on the feedback of proofreaders to see if the narrative, tone, and rhythm were effective in stimulating an affective atmosphere.

In the text, someone introduces themselves as the sand from the Wadden Sea, describing some practices in which the sand is involved in that area. The text also instructs the listener on how to interact with the installation; initially by filling the bucket with sand, attaching it to a pulley, lifting the bucket, and then tipping it over so the sand is released at the top of the slide and falls. Similar instructions are repeated three times with slight variances, which aimed to let participants enter into a state of flow while engaging with the installation. The text encourages the listener to divert from the initial instructions and to start using their other senses – smell, touch, even taste – and to use their sight differently to stimulate them to enter into a state of enchantment. The text ends with a segment that wonders about sand's intentionality, and, to explore this intentionality, suggests studying sand's movements, the way it responds to other bodies, and reconsidering where the human body and the sand body begin and end. Within the text, a slow shift in agentic capacities of participants and sand takes place, slowly placing sand as an animated figure that has desires and needs for itself in its relation to humans.

Writing the text forced me to imagine sand as an animated figure and to consider how text can enable an experience that makes the reader almost touch or hear the sand. While this may not be successful for all listeners and readers, this exercise powerfully opened up some riddles about understanding sand in the Wadden Sea for me as a writer.

We collaborated with a professional voice artist/podcast maker for good audio quality and a soft, pleasant voice to guide participants through the installation. It was intended to generate an affective atmosphere for the listener that was flowing (through repetition) and enchanting (through a soft voice and encouragement to explore sand by using all of the human senses). While we initially used the recording only to complement the

installation, it also functioned in combination with other elements of the project and as a stand-alone work to generate an affective atmosphere, as I will describe shortly.

3.3 Making a video

Makers: John Ozgun (videography), Veerle Boekestijn (videography), Sammy Hemerik (directing), Marieke Meesters (directing & editing)
Materials & software: Drone camera, two different film cameras, Adobe Premiere Pro
Location: Beach of Wassenaar, the Netherlands & Wageningen Campus, the Netherlands.

The opening shot of the video shows the waves of the North Sea. The shot follows the waves, and the installation comes into view. The video then shows the different components of the installation, the buckets, the ropes, and the slide. Then, a person in a white suit walks around the installation, and looks up at it, perhaps wondering what it is or how to engage with it. More people become visible, all hesitant to start the interaction with the installation and with sand. After some time, they start filling white buckets with sand.

The humans carry the buckets to the installation's highest point, where they pour the sand into a bucket that is attached to a rope. They climb the stairs, pull the rope down so the bucket lifts, and manually tilt the bucket so gravity gets a grip on the sand grains. Seen from different angles, the sand slides down. Then, the humans engage in activities through which they can relate to sand differently; some take a moment before lifting the bucket or

Still from video. Shot by drone, operated by John Ozgun.

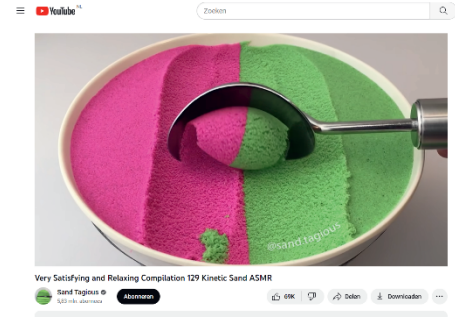
seem to hesitate to fill the buckets again. The video ends with several alternative, more intimate interactions between sand and humans: people look at sand up close, they touch and sniff the sand, and they do not fill the buckets up again to continue the routine activities. These shots are close-ups.

The video is recorded with natural lighting on a cloudy day. The recurrence of the white in the suits and the installation contrasts with the grey, yellow, and green colors of the beach and dunes, making it recognizable as an artistic installation. Besides white, there are no bright or outspoken colors in the video. Most shots in the video were recorded in the context of the workshop that I will discuss shortly. The close-ups of people interacting with sand were recorded afterward, based on the feedback of proof-viewers and our judgments that images depicting bodily intimacy between humans and sand were crucial. The sand of the close-ups was the sand of a beach volleyball field on the Wageningen campus. Two professional filmmakers helped us in recording the workshop and the scenes at the volleyball field. The ordering of the shots visually supports the increasing intimacy between sand and humans, with overview shots at the beginning of the video and close-ups at the end.

We designed the soundscape of the video based on the feedback that we received at various moments during the project. In particular, we incorporated the feedback that people felt easily overwhelmed by the different elements of *Remove sand*, which broke the flow and enchantment. Therefore, we decided on a clean and simple soundscape. This meant that we excluded elements such as music or a monotone beat. The soundscape of the video consists of sounds of the waves and wind and the sounds that highlight interactions between people and sand. The sound of footsteps on the beach, of scooping sand with a shovel, of a rope that is pulled up, and of sand that is dropped in a bucket form the audio landscape of the video, feeding into a sensory experience for the viewer.

Our focus on auditive experiences with sand was a result of our trials with sand slides. In these trials, we discovered that the sounds of sand moving over smooth, sturdy surfaces were pleasant to the ear. After this realization, we explored ASMR videos in which sand was used as a basis for relaxing videos. ASMR is short for Autonomous Sensory Meridian Response, and refers to a pleasant tingling sensation people can experience when they watch or hear particular triggers, such as whispers, or tapping on microphones with fingernails. Specific images and sounds can trigger deeply relaxing experiences or feelings of general well-being for individuals. ASMR videos have become a popular genre on YouTube, and videos that make use of sand a popular subgenre. In these videos, ASMR artists use kinetic

sand, which is an oily, moldable, brightly-colored substance that resembles sticky, wet sand. The videos usually show hands that mold, stamp, or cut sand. Combined with audio of high quality, these images are appealing to many viewers in a sensory, physical way (Kim et al., 2019; McGeoch & Rouw, 2020) We played with these insights from ASMR videos to make the video pleasing in a sensory and unconscious mode to enchant the viewer/listener and looked for prefabricated sounds that had these effects, at least on us, including the sound of sand that are dropped in the bucket, of a shovel that is put in sand and of sand that slides down the installation.



4. Involving other humans

We made the installation and audio recording to create an affective atmosphere in which human-sand relations could become more affective. To explore whether the installation and audio recording indeed provided an atmosphere that stimulated affective relations through flow, enchantment, and skill, we organized two try-out workshops, one on the beach (with the installation and audio recording) and one in a meeting room (with only the audio recording and a bowl of sand).

4.1 Workshop 1

A bleak beach. People in white paint suits scoop up sand and put it in white buckets. A small audience watches and speaks in whispers. The white suited figures pick up the buckets, heavy now that they are filled with sand, and waddle with the bucket in their hands towards a large, white wooden installation in the shape of a slide. The Dutch clouds are mirrored in the slide's shiny silver-coloured surface. For a moment, the white suits fumble with the buckets, a rope and a pulley. The next moment, they lift the bucket effortlessly into the sky, discharging its load when it has reached the top of the installation. The sand covers the clouds for a moment as they slide down. Then the next bucket is

filled, moved and released, moving from
sand to sand, growing heaps of confusion.

Installation at the beach in Wassenaar.

Installation at the beach in Wassenaar.

On 13 November 2021, a collective that consisted of sand, the installation, and thirteen humans assembled on the beach of Wassenaar, a town on the Dutch North Sea coast. This collective was there to engage in sand movements, provoked by the artistic character of the installation and event. In the vignette with which I started this section, I pointed to the atmosphere that evolved during the interactions at the beach. Perhaps we could describe it as an atmosphere of respectful and solemn excitement, or an atmosphere of expectation and curiosity, slowly turning into one of confusion and engulfment. Perhaps all of these descriptions, and none of them, help to hint at and re-enact some of the affective possibilities that were explored on the beach.

The thirteen participants were friends, family, and colleagues of both Sammy and me, consisting of people from different age categories (between 25-50 years), with different professions. Most of the participants did not know each other before the workshop. We started the workshop with a short welcome, a brief introduction to the installation, and an outline of the workshop and asked for their informed consent to observe them and write about these observations. The introduction was deliberately kept vague, to enable participants to generate their own experimentation.

Sammy and I instructed participants in three ways how to engage with the installation and sand. First, they watched how Sammy interacted with the installation. Meanwhile, participants queued up beside the installation, put on the white painting suits and their headphones. Second, through the headphones, participants listened to the second set of instructions for sand movements on their own devices. Third, a set of instructions was attached to the installation in the form of visual clues. For example, arrows and lines on the installation demonstrated how the rope could be attached to the installation and that the bucket could be lifted by using the pulleys.

Participants were given a white paint suit to wear, as to protect their clothes, to get out of their routines, and to stimulate a feeling of connection with the installation. The white-colored suits connected the participants, shovels, and buckets. When participants put on the white paint suits, it was clear to them that they became part of the installation, even when they were not near the wooden frame or did not touch any sand.

In the workshop, we experimented with different numbers of people engaging with the installation at the same time, with a maximum of four people. Because the workshop was at a public beach, several people who were not part of the initial collective approached the installation out of curiosity, forming a spontaneous audience.

After everybody had engaged with the installation, we collected feedback in two ways. Directly after they had taken part in the exercise, participants were asked to record a voice message through WhatsApp to give feedback individually, and later to take part in a plenary debriefing. These methods of reflection are decentered forms of field notes, in which researchers and participants co-produced reflections on the interactions with the installation (Hamilton & Taylor, 2017). This method of collecting feedback established a dialogue between researchers and participants and distributed the options to contribute to the analysis and co-produce knowledge.

In their feedback, most participants indicated that in their engagement with the installation they primarily focused either on the other participants or the – to them - unknown goal of the experiment. Most mentioned that they looked at the other participants to find out what to do, more than listening to the instructions in the audio recording or looking at the installation itself. Most participants experienced the exercise as a social experiment, more than an experiment in sand-human relations. This seemed to indicate that there was a mutual exclusivity between focusing on human-sand relations or focusing on human-human relations, as participants either engaged with each other or with sand.

In their engagement with the installation, participants showed that they were inclined to take action, to do something. Only one or two participants took the time to watch, listen, feel, smell, and taste. Participants indicated that the tendency to act was partly generated by a feeling of being watched by an audience (other participants waiting and the general public at the beach), and partly because participants felt overwhelmed by all the stimuli that were part of the exercise (people, sand, things that needed to be done in a certain order, and an audio recording to listen to). Most participants felt overwhelmed by the presence of multi-sensorial stimuli, and they could not simultaneously focus on their visual, auditory, or other senses. This distracted people and prevented them from getting into a state of flow. These factors prevented them from focusing on their senses, even though this was part of the instructions of the audio recording. While we instructed the participants in several ways on what to do, we neither informed them beforehand about the goal of nor the inspiration for our project. Multiple participants expressed that they would have liked more information beforehand to make better sense of the installation while engaging with it. For others, the absence of information enabled a more intuitive approach to making sense of the installation and their relation with it. Although the slide created associations with a playground, participants experienced the exercise as a serious occasion. One person suggested that

children might experience it very differently.

Participants give feedback at the beach.

4.2 Workshop 2

A big yellow shopping bag, filled with sand and a dozen of dinner bowls, stands in the middle of a conference table. About ten people take place at the table, staring at the bag in expectation. One participant states that he is "only here to watch and listen, not to participate", but he soon finds out that that is impossible. They quietly watch a video of people on a beach, who wear white suits and headphones, and who scoop up sand and carry it to a slide. Then the people in the room respectfully pick up a bowl, fill it with sand and carry it to a silent place where they put on some headphones. Wiggling fingers move sand around, fingers unconsciously set in motion when they are confronted with sand grains and hear about rotating sand in the Wadden Sea. While the sand-fingers move, the people listen, otherwise motionless, peaceful, at ease, forgetting about the hushed background chatter as well as about the idea that sand is indifferent.

I organized a second workshop to integrate the feedback and experiment further with ways to generate an affective human-sand atmosphere. On 17 November 2022, 12 social scientists specialized in environmental governance gathered to watch the video, listen to the spoken word audio, and physically get in touch with sand. The workshop took place at my university, with my colleagues, in a professional-looking, somewhat sterile meeting room. The vignette describes an atmosphere that can be indicated as calm and quiet, perhaps expectantly or a bit awkward, or perhaps all.

This workshop served to see how a different combination of elements of *Remove sand* would evoke an affective atmosphere and stimulate affect between humans and sand. In particular, it built on the feedback of feeling overwhelmed by multiple simultaneous stimuli. This time, I limited the input of stimuli, cutting out the installation altogether. Moreover, I only presented the audio and video one at a time to foster a state of flow.

The workshop was structured into three phases. First, I informed the audience about the inspiration for the project, the Wadden Sea dredging, and the formal participation procedure. I clarified that the human-sand relations were hitherto not an explicit part of the formal participatory process and that this *Remove sand* partly intended to contribute to that process. Participants were asked for their informed consent for observations made during the workshop to be used in this chapter and/or for an artistic exposition. Then, I handed out a small bowl of sand to each of the participants and started the video, for the participants to touch and play with the sand while watching the video. The sand that was used in the workshop came from my garden. It was a mixture of course sand grains, small rocks, and roots of plants and therefore did not resemble beach sand. However, this did not seem to bother the participants, as they did not mention it in the twenty-minute plenary debriefing session after watching the video. In the session, the participants shared experiences and insights, reflecting on questions about what the participants had seen in the video, what the people in the white suits were doing, and how that related to practices in the Wadden Sea. We also reflected on how the workshop participants interacted with the sand while watching the video. Some participants had moved the sand, others had not touched it. The third phase stimulated the participants to engage in a more exclusive, intimate setting with the bowl of sand. Through headphones, participants listened to the audio recording of the poem. Participants were encouraged to find a private place and ignore other people, and focus on the text and the bowl of sand. I informed them that the text would not apply directly to the indoor setting they were in, so the participants would not be confused about incompatible aspects in the audio

recording and so their flow would not be broken. Participants were asked to take a picture of the bowl when the audio file had finished, and send me a voice message via WhatsApp in which they reflected individually on what they had just experienced. The questions asked in this second debriefing were about their experiences while listening, about new insights, the emotions they had experienced, the atmospheres created by the audio and the sand, and a reflection on their relation with the sand in front of them.

Subsequently, we collectively discussed the workshop more generally. Concerning the video, participants described that they watched people who engaged seriously and respectfully with sand in a repetitive exercise. Some associated it with the Greek myth of Sisyphus and with the Dutch proverb *water naar de zee dragen* ("carrying water to the sea"). One person who was more familiar with the Wadden Sea case described a discrepancy between the exercise of *Remove sand* and the dredging in the Wadden Sea. The purpose of the first activity was unclear, whereas the purpose of the dredging activities was to accommodate the crossing of the ferry. Another participant reflected that the exercise made her realize that the crossing of the ferry may not be logical for everybody and could require scrutiny as well. Some interpreted the video as showing human figures who felt lost and puzzled, others interpreted their activities as mindful and meditative. In this workshop too, participants raised the idea that children would probably not have felt lost when they were offered the chance to engage with the installation, but would immediately start playing. Participants felt awkward and uncomfortable while watching the video, but the soothing sounds made them feel more relaxed. Some participants expressed that the white suits felt sterile and out of place. One conclusion was that if the participants of Workshop 2 had worn the same suits as the figures in the video, the participants of Workshop 2 would have better identified with the people in the video because they would all have been "sandpeople" (Personal communication, participant in Workshop 2, 17 November 2022).

In their reflections on the second half of the workshop, participants described distinct experiences. For some participants, listening to the audio recording while having a bowl filled with sand on their lap created a soothing peaceful atmosphere, particularly because of the pleasant voice, which facilitated a feeling of connectedness with sand. Other participants considered the listening exercise provocative. During the exercise, some participants grew unsure if they could still touch the sand in whatever way they pleased. This evoked associations with contemporary emancipatory movements, in particular the #MeToo movement that addresses sexual harassment. While listening, most participants wriggled their fingers through

the sand, shoved it to one side of the bowl, or drew figures in it, and this touch became increasingly awkward for some when the association with non-consensual touch was evoked. Some participants felt irritated because they considered affective human-sand relations redundant or elitist, or because they considered the exercise to be anthropomorphic and therefore invalid.

Bowls with sand after being touched by participants.

5. *Remove sand* as affective atmosphere

All of the elements of *Remove sand* (the installation, the poem, the audio recording, the video, two workshops, and the chapter you are currently reading) do something individually; they set the stage for different atmospheres, embodied relations, insights, and points of action separately and in conversation. The arts-based research approach of *Remove sand* generated decentered, embodied, and associative experiences. We approached this project intuitively, building on waves of energy that came and went during the project, and on associations and insights that we generated along the way in our engagements with human and non-human others. We learned how steep a slide had to be to enable sand movements, how a color scheme could create a sense of coherence for the audience, and how tilting a bucket can be a tedious endeavor. Writing a poem about sand, based on sand movements in the Wadden Sea and transformed into sand movements in the installation, turned out to be a powerful exercise in itself to speculate on possible understandings of sand. The video heightened our awareness of the enjoyable sounds that sand grains make when they bounce, trickle, or rub on other materials. The activity of writing this chapter created an atmosphere in itself, which created a new sense of wonder for how to use words to describe moods. These elements of *Remove sand* constituted affective atmospheres that fostered our curiosity, frustration, and relaxation.

Sand, wood, paint, and other materials were a fundamental part of our research collective because they co-shaped the possibilities of our collaboration. This meant that the installation, video, and workshops evolved throughout the project. For instance, during the initial experiments with materials we became aware of the auditive qualities of sand in relation to some materials and to the human ear. This example shows that

during the making process, Sammy and I became more attuned to the abilities of all bodies involved in our constellation, what they were and were not able to do, and how we could move them.

The ingredients described by Krzywoszynska (2016; enchantment, flow, skill) guided my analysis in deciphering how affective atmospheres can influence relations between us and sand. Getting to know the circulations of sand at Ameland and in the Wadden Sea enchanted us. In making the installation, we learned about sand's willingness to slide over some surfaces and reluctance to move over others. By writing the poem as if we were sand, we were confronted with a riddle from/about sand, and with the opportunity to speculate on the relations we have with sand. In doing so, we were also invited to imagine other ways to interact with sand in settings beyond writing the text. This process of opening up possible human-sand relations was reinforced while we were editing the video and sand turned out to produce sounds that were relaxing to our bodies. All of these events set the stage for affective atmospheres that opened up our imaginations and heightened our sensibilities to the various possibilities of sensory relations between humans and sand. With regards to flow, the creating phases of *Remove sand* largely enabled full submersion in the process of creation, losing track of time and of a sense of self. In this state, we received real-time feedback from the materials we worked with, immediately acting upon the possibilities that we encountered in engaging with the materials of *Remove sand.* We also developed various skills in building the installation, writing the text, creating the video, and hosting the workshops. However, while we noticed that we learned about various modes of engagement with sand, we were also limited in our skill development, because we undertook most of the practices of *Remove sand* only once, creating something new every time. We made one installation, one poem, one video held two different workshops, and wrote one academic chapter. Perhaps we would have become more skillful if we had made multiple videos or multiple installations, and some of these would potentially be more effective in generating a human-sand affective atmosphere. Nevertheless, not repeating the same practices was also productive; it stimulated creation and joy in making something new, which arguably stimulated Sammy and my flow states and feelings of enchantment with sand.

Based on this observation, our analysis suggests that a fourth element can be added to the three posed by Krzywoszynska (2016). Besides enchantment, skill, and flow, we learned that a mode of creation mattered for attunement to non-human others. The purpose of creation was important to bring together the materials (including our human bodies) in a constellation that was

not there before the project started (cf. Ingold, 2013; Somerville & Powell, 2019). This also meant that when the creations were finished, the force that held the collaboration together gradually disappeared. The installation lies in pieces in my attic, the video is online but largely unwatched and the sand lies on the beach and in my garden, continuously entering into new entanglements. This suggests that it takes perseverance to keep a particular affective atmosphere and the bodies created in it alive.

The experiments described in this chapter were exploratory and artistic, meaning that the conclusion about the workshops should not be seen as generalizable or representative findings. Moreover, it is impossible to describe the effectiveness of the workshops in causal terms. The workshops took place in a larger context that is full of continuously evolving more-than-human affects. Recognizing these difficulties, we distilled two key insights about *Remove Sand*'s ability to create affective atmospheres.

First, our arts-based intervention provided a space to experiment with unusual relations in a way that most scientific settings would not have been able to. It opened up space to physically interact with sand to imagine sand as agentic or animated. As it turned out, this experimental space stretched beyond the installation, audio, video, and workshops. For example, my sister, who proofread the poem, declared that afterward, she often wondered "what sand would have wanted" in sandy places such as construction pits or beaches.

Second, affective atmospheres do not steer affects evenly across all (types of) bodies, and the entities that demand the least attention require explicit organization to help people notice and attend to them in a moral sense (Ginn et al., 2014; Giraud, 2019; Weiss, 1999). Even when interventions are designed to center around sand, sand can still move to the background. Sand demands little conscious attention from our participants. The workshops showed that an atmosphere in which human-sand relations could take a central position required to suspend other relations that might overshadow this relation. This suggests that many other entities need to be backgrounded to carve out space for sand. We noticed that more exclusive, sober situations provided better settings for being affected by sand. Therefore, exclusion is a fifth element to encourage affective relations, besides enchantment, flow, skill, and creation. Such exclusion is a skill in itself that requires training.

This chapter ends with an open-ended proposal for another workshop. Let's call it Workshop X.

5.1 Workshop X

A person reads a text about human-sand relations. They read about affective atmospheres, arts-based research, installations, white suits and bowls with sand in conference rooms. While they read, some things happen to the reader. Perhaps they reflect on their personal relation with sand now this relation is placed center stage. Perhaps they notice how their ideas about sand slightly shift. Perhaps they get distracted, and never make it to the section where they are addressed more directly. Perhaps they get frustrated because they are unconvinced that sand deserves this kind of attention, while other beings suffer in more relatable ways. Perhaps something altogether different happens when a person reads this text.

This workshop takes place now, in the moment that you read this text. I realize that this intervention breaks the flow of reading this chapter, but it is important that you can see for yourself whether watching the video and reading or listening to the text can indeed generate an atmosphere that affects you and lets you experience your own answer to the riddle. In approaching a work of art, one engages with the work's materiality and artistic techniques, and not so much with the intentions of the maker (Foucault, 1994, via Soussloff, 2011).

Below, you will find a link to the video and to the audio recording, which you can watch and listen to. You will also find the text in written form, which you can read for yourself, in your head or out loud. To experience *Remove sand* in a multi-sensorial way, consider adjusting some elements around you to create an atmosphere that you find appropriate. I can recommend collecting sand before you start reading/listening. See what happens to your body when you listen or read with sand at your fingertips.

You can watch the video here.

You can listen to the audio recording here.

The poem starts on the next page.

Hi there
I'm sand
I'm the sand that is dredged in the Wadden Sea. There are more of me entering the Wadden Sea every tide because you changed the natural streams of the sea. And now, you don't want me to stay there – I hinder the ferry and I hinder the tourists. You dredge me every day and dump me a couple of kilometers further on. But the high tide brings me back to the gully. Over millions of years, my grains have been rounded by such transports.
I've been moved by rivers, by winds, and by seas
And now, I'm being moved by you

So, I'm here to be wherever you want me to be
You scoop me up with your hands
You collect me
You put many of me together
You use the bucket to move me

When I'm in the center,
I'm in the wrong place
So, you take me away
From your routes
You take the bucket and lift me up
Until you make me tumble and I fall down

I've been moved by rivers, by winds, and by seas
And now, I'm being moved by you

I'm here to be wherever you want me to be
You scoop me up with your hands
Collect me
You put many of me together
Use the bucket to move me

When I'm in the center,
I'm in the wrong place
So, you take me away
from your routes
You take the bucket and lift me up
Until the bucket touches the slide
Until you make me tumble and I fall down

I'm here to be wherever you want me to be
You scoop me up with your hands
Collect me
Feel how you touch me and how I touch your hands
Can you feel that I am round, without corners,
I won't stick easily
When you put many of me together
See how I relate to all of me in my full, grainy multiplicity

Sense my temperature
Sense my smell
Taste my age
Use the bucket
Move me

When I'm in the center,

I'm in the wrong place
So, you take me away
from your routes
You take the bucket
and lift me up
Until the bucket touches the slide
Have you noticed my weight?
Then you make me tumble and I fall
down

I'm just here to be wherever you want
me to be
You're still scooping me up with your
hands
Collecting me
Putting many of me together

By now I begin to wonder
Am I here to be with you?
Why are you continuously
scooping me up?
Take a moment to look at the
movements
Who are they for?
Why is this being done?
And why am *I* the only one *being*
moved all the time?
Is this what *I* crave?

Do an extra round of scooping
Scoop me up with your hands
Use the bucket to collect me
Lift me up – I will fall down anyway

You scoop me up with your hands
Collect me
Where do our bodies meet?

I am sure it is not only in your hands
Tell me, can you see how *I* tend to
move?
How I tend to act
Where do you think I would like to
go?
And what am I doing to you?
How do *I* make *you* move?
How does my body change yours?
How do my routes change your
routes?
How do *our* routes change *us?*

5

The Social License to Operate and the legitimacy of resource extraction

Abstract

The Social License to Operate (SLO) has emerged as a leading concept to assess the legitimacy of extractive operations. This article examines recent SLO literature to discuss how the SLO is conceptualized and enacted. Our discussion focuses on three main themes: (1) who are considered to be relevant stakeholders; (2) the ways in which these stakeholders are engaged; and (3) how social and environmental impacts of extractive operations are considered. Our analysis points to a tendency in literature to focus on local stakeholders and a failure to consider wider sustainability implications. On the basis of these findings we argue that the evaluation of extractive operations must be based on a comprehensive concept of legitimacy that not only seeks the approval of local stakeholders but also recognizes the importance of open-ended political deliberation that addresses global norms of social and environmental sustainability and includes diverse values, needs and interests.

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1. Introduction

Two decades after Jim Cooney coined the term Social License to Operate (SLO) to describe local risk management, the SLO has become a prominent concept used in corporate as well as academic discourse (Boutilier, 2014; Boutilier & Thomson, 2011; Jijelava & Vanclay, 2018; Prno & Slocombe, 2012). The SLO concept reflects the increasing recognition of the importance of societal support for extractive operations. Failing to secure a SLO is considered a major corporate risk for many natural resource-based sectors and can lead to protests and litigation (Hanna et al., 2016; Mitchell, 2019).

Over the last decade, SLO scholarship has focused on assessing how corporations have managed community relations and expectations to generate support (Prno & Slocombe, 2012; Voyer & Van Leeuwen, 2019). A recurring topic in this literature is to analyse to what extent extractive corporations meet specified criteria that are considered important. Authors have identified different criteria for the SLO, including legitimacy, credibility, and trust (Boutilier, 2014; Jijelava & Vanclay, 2018; Vanclay, 2017). Discussion of what the key components of an SLO are, has led some authors to problematize the conceptual ambiguity of the SLO and its potential to establish legitimacy (e.g. De Jong & Humphreys, 2016; Harvey & Bice, 2014; Owen & Kemp, 2013). This also raises the question how the concept is enacted in practice and with what implications (Demuijnck & Fasterling, 2016).

Building on this critical literature, we have identified three main themes. The first main theme is who the relevant stakeholders are; that is, who has to consider extractive operations to be legitimate, credible, and trust- worthy? Practices of stakeholder engagement show a tendency to limit the stakeholder concept to communities who live nearby the operation (Harvey & Bice, 2014; Moffat et al., 2016) and to vocal and organized groups, while non-residents or opponents are excluded or even criminalized (Hanna et al., 2016; Lansbury Hall & Jeanneret, 2015; Owen, 2016). Second, the way in which engagement is done has been criticized. For example, scholars have noted a lack of inclusiveness (Moffat et al., 2016; Owen & Kemp, 2013), because engagement is often limited to and focused on the purpose of continuing extractive operations without disruptions or substantial alterations (De Jong & Humphreys, 2016; Parsons et al., 2014). Third, scholars have pointed to a limited scope of the SLO, that is, the SLO focuses mostly on local and social impacts, discarding global and environmental considerations (Gehman et al., 2017; Pedro et al., 2017).

Thus, while the SLO concept has become a prominent term in literature and practice, it also continues to be debated. Not only in terms of how the SLO is and should be

conceptualized and defined, but also in terms of the effects it is producing as extractive corporations attempt to secure it. This article discusses recent SLO literature, published between 2018 and 2020 and indexed in either Web of Science or Scopus (see Annex 1 for an explanation of the selection strategy) to explore new directions and trends in the SLO's conceptualisation as well as its enactment in practice. We focus our discussion on the three main themes identified above: stakeholders, engagement, and impact. We use this discussion to reflect on how and to what extent the SLO concept contributes to the legitimacy of extractive operations. Based on our findings, we argue that scholarly literature on extractive operations and the SLO needs to broaden its conception of legitimacy beyond local stakeholders' acceptance (Beetham, 1991; Parkinson, 2003). Legitimacy should also include the justifiability of operations, that is, the extent to which extractive operations and their social and environmental impacts are seen to be in accordance with formal and informal rules, as well as societal norms and beliefs (De Jong & Humphreys, 2016; McCullough, 2015). Using this broader notion of legitimacy is urgently needed to support a fuller evaluation of and critical reflection on the legitimacy of extractive operations.

2. Stakeholders

Securing an SLO involves the attempt to gain support from stakeholders and communities (Boutilier & Thomson, 2011; Moffat & Zhang, 2014). Scholars have shown that corporations tend to prioritize residential or local, vocal, and well-organized citizens and social groups, at the expense of historically marginalized communities and individuals for whom no clearly visible or fair representational structure exist (Bowles et al., 2019; Filer & Gabriel, 2018; Nyembo & Lees, 2020; Ofori & Ofori, 2019; Owen & Kemp, 2013; Parsons et al., 2014). In addition, non-local stakeholders that are affected by and have an interest in extractive operations, including those related to global sustainability crises, are generally not considered (Baines & Edwards, 2018; Brueckner & Eabrasu, 2018; Mercer-Mapstone et al., 2019; Moffat & Zhang, 2014; Voyer & Van Leeuwen, 2019). This means that the heterogeneity of stakeholders relevant for a SLO is overlooked (Matebesi & Marais, 2018; Owen & Kemp, 2013; Szablowski, 2019; Vanclay et al., 2019; Voyer & Van Leeuwen, 2019). What this suggests is that the SLO literature is based upon a limited conception of who is a relevant stakeholder, what communities are, and whether and how they can be equal negotiation partners (Luke & Emmanouil, 2019; Lytle & Hitch, 2019; Matebesi & Marais, 2018; Mercer-Mapstone et al., 2019).

In response to these limitations, literature stresses the importance of civil society actors to organize themselves and to strategically employ the SLO for establishing a political space (Filer & Gabriel, 2018; Gunster & Neubauer, 2019; Matebesi & Marais, 2018; Ofori & Ofori, 2019). SLO scholars note how such self-organized bottom up processes may help counter dominant understandings of stakeholders, facilitate open discussion about which stakeholders are relevant to include, and offer a platform for deliberating diverse values, including those that deviate from dominant development norms (Filer & Gabriel, 2018; Gunster & Neubauer, 2019; Kelly et al., 2018; Mather & Fanning, 2019; Ofori & Ofori, 2019; Voyer & Van Leeuwen, 2019).

3. Engagement

Studies have criticized companies for having a top-down approach to engagement rather than promoting meaningful two-way conversations with an active, emancipating role for stakeholders (Luke & Emmanouil, 2019; Voyer & Van Leeuwen, 2019). Such top-down approaches are often enabled by the infrastructural and institutional dependencies of local communities on extractive corporations, but they affect the quality and outcomes of engagement, and risk (re)producing uneven power relations and inequalities within and between stakeholder groups (Mercer-Mapstone et al., 2019).

To address these limitations and power inequalities, recent SLO literature emphasizes alternative conceptualisations of engagement that foreground continuous and equal deliberation and reflection. Social licenses differ from formal legal or political licenses because they are not granted with a clear mandate and time-period (Moffat et al., 2016). Instead, securing an SLO involves open-ended, context-specific and dynamic processes that require long-term engagement strategies (Bowles et al., 2019; Leena et al., 2019; Luke & Emmanouil, 2019; Moffat et al., 2016). Such processes aid the recognition of diversity in values and sources of knowledge, post- operational impacts, and allow non-corporate and non- governmental actors to co-design the engagement process (Bowles et al., 2019; Gunster & Neubauer, 2019; Luke & Emmanouil, 2019; Lytle & Hitch, 2019; Szablowski, 2019; Van De Biezenbos, 2019; Voyer & Van Leeuwen, 2019; Walsh & Haggerty, 2020).

Governments play a crucial role in enabling deliberative spaces and in preventing corporations from exclusively determining the scope and design of engagement (Poncian, 2019; Szablowski, 2019; Taarup-Esbensen, 2019). While it has been noted that powerful government-corporation collusions can constrain and deter opposition (Bowles et al., 2019), it is important to consider such opposition and protest not just as a problem to be

prevented or ignored, but as an expression of public values and a sign of important and ignored underlying issues (Vanclay et al., 2019). The assessment of the legitimacy of extractive operations should focus on the extent to which the SLO involves open-ended engagement approaches that include a more balanced set of values and worldviews.

4. Impact

Extractive operations are often associated with negative social, environmental, cultural, political and economic impacts (Demajorovic et al., 2019; Saenz, 2018; Voyer & Van Leeuwen, 2019). Yet, empirical research into SLO rarely includes technical details, analyses, or reports. This absence of the actual material dimensions of extractive operations in SLO research is an important insight, since the operational design, qualities, and impacts of projects are often the locus of passionate public disputes (Demajorovic et al., 2019; Saenz, 2018; Voyer & Van Leeuwen, 2019). From the few studies in our corpus that include this material dimension, only two explicitly relate the SLO to the expected severity and probability of social, economic and environmental impacts at different scales (Brueckner & Eabrasu, 2018; Mather & Fanning, 2019). Another suggests that this omission serves to distract actors from considering these impacts (Van De Biezenbos, 2019). Thus, while the SLO literature analyses operations' efforts to reduce unrest through engagement, it – paradoxically – largely fails to address the actual social and environmental impacts that fuel this unrest in the first place (Demajorovic et al., 2019; Voyer & Van Leeuwen, 2019).

A way to engage more explicitly with the material impacts of extractive operations is by means of information. There is often an implicit and problematic assumption that stakeholders have the capacity to acquire such information themselves, distil potential impacts from this information, and organize themselves to voice their concerns (Mercer-Mapstone et al., 2019; Owen & Kemp, 2013). In response, scholars have argued that companies should take an active approach by enabling transparent, easily accessible, and reliable information about a wide range of (potential) impacts as a basis for engagement (Demajorovic et al., 2019; Zhang et al., 2018). Moreover, this knowledge base needs to be sufficiently diverse to align with the diverse worldviews and perspectives of stakeholders (Hampton & Teh-White, 2019; Kelly et al., 2019; Zhang et al., 2018). A co-production strategy that considers a broad range of stakeholders as active contributors to and co-producers of credible and relevant knowledge for assessing risks and importantly, for co-designing operations, is seen as promising for a fair and informed assessment of the legitimacy of extractive operations (Fraser et al., 2019; Parkinson, 2003). A second way to

increase engagement with material impacts of operations is by connecting the SLO to discussions around the demand and desirability for extracted resources on local, regional, or global scales. This implies connecting the SLO with broadly supported international sustainability targets, such as the Sustainable Development Goals (SDGs; Panda & Sangle, 2019; Pedro et al., 2017).

5. Conclusion

The findings we have presented show that the way in which the SLO is enacted is characterized by a limited conception of stakeholder engagement and by insufficient attention towards the local, regional and global, social and environmental impacts of extractive operations. Multiple biases in the conceptualization and enactment of the SLO hinder meaningful engagement of stakeholders and prevent actual changes in extractive operations (Brueckner & Eabrasu, 2018). Specifically, we have seen: (1) a tendency to privilege well organized and local communities and groups over marginalized, "dissident" or non-local stakeholders; (2) a concept of engagement that restricts opportunities for two-way dialogue and long-term, equal and meaningful deliberation; and (3) a failure to represent the actual nature and impacts of the operations at stake.

Drawing on the more critical literature that recognizes and reflects on these biases, we suggest to widen the scope of the SLO concept by: (1) including a diversity of local and non-local stakeholders; (2) improving the ability of these stakeholders to actively engage by creating long-term spaces for active and meaningful deliberation and co-production; and (3) enabling the coproduction of knowledge about impacts and risks of extractive operations, and incorporating international sustainability targets. What this comes down to is the creation of spaces for meaningful political deliberation across local-international scales that include diverse stakeholders and involve the co-production of knowledge about the diverse impacts and implications for extractive operations. This requires that extractive sites are connected to wider sustainability issues including pollution and emissions, patterns of production and consumption, and (global) inequality (Hitchcock Auciello, 2019; International Resource Panel, 2019).

Taken together, these suggestions imply a broader conception of legitimacy that includes not only the acceptance of relevant stakeholders but also the wider justifiability of extractive operations which foregrounds the importance of including diverse values, arguments and knowledge claims in SLO deliberations. This broader concept of legitimacy will require SLO scholarship to go beyond problematic approaches to

engagement that primarily focus on acceptance by local stakeholders. These approaches have been criticized in studies of participation beyond the SLO (Mbeche, 2017; Pelletier et al., 2018; Skutsch & Turnhout, 2018), including studies that focus on the exclusion of indigenous and traditional communities (Ruckstuhl et al., 2014). Although they remain common in research and practice, they are limited in their scope. Specifically, they prevent the explicit consideration of the wider political economic context in which extractive operations are situated and how this limits the inclusion of the diverse values and interests that are at stake, enables the perpetuation of power inequalities, and prevents the establishment of political spaces for equal and open deliberation about the desirability of extractive operations (Gaventa, 2006; Parkinson, 2003).

To conclude, it is important that the SLO literature adopts a broader concept of legitimacy in its assessment and evaluation of extractive operations (Beetham, 1991; De Jong & Humphreys, 2016; Parkinson, 2003) and that it engages with other scholarship on participation and engagement, and on the political economy of extractivism. This will contribute to a fuller understanding of how and under what conditions extractive operations may meet local and global requirements for subsistence and human and ecological well-being and it will strengthen the conceptualization, evaluation and enactment of legitimacy in the SLO.

6

Making ends meet

Extractivism flattens complex and pluriform more-than-human relations to extract, exploit and create maximum revenues. In resource management, this form of oppression tends to be reinforced by scientific knowledge practices and responded to by laboratory forms of participation. These forms of participation fail to address the harm produced by extractivist practices because they tend to structure participatory procedures so they become instrumental for extractivism, and because they select participants on the basis of humanist categorizations through which only (some) humans are granted the status of participants, while others are seen as the background against which participation plays out. This presents a sacrifice logic that makes some bodies valuable and others disposable (Braidotti, 2022, p. 56). To equip the notion of participation with more abilities to resist extractivism, this dissertation has presented a notion of participation that takes both participation and participants to be an effect of relations and that recognizes that current understandings of participants are based on problematic humanist assumptions. I explored whether this posthumanist participatory approach could help resist extractivism by scrutinizing how bodies are made sacrificable in resource management and research thereof by mapping where and how boundaries between bodies were constituted and the processes that enacted and re-enacted these boundaries, as well as through articulating alternative bodies. In the four research chapters of this dissertation, I explored how the concept of posthumanist participation aids in understanding how entities in the Dutch Wadden Sea area are made and how they become more affective. This dissertation has also investigated how posthumanist participation relates to current academic conceptualizations of participation in resource management by examining the SLO.

This concluding chapter is structured as follows. In the next section, I briefly summarize the previous chapters. Then, I map the journeying of this PhD research, to account for the performativity of my research choices and to emphasize the situated partiality of the knowledge produced in this dissertation. Only after shedding light on the ethical and conceptual considerations that shaped the insights of this dissertation can I answer the research questions. Subsequently, I reflect on the potential of a posthumanist participatory approach to resist extractivism both in resource management and the study thereof. This dissertation concludes by turning to a current development in the Wadden Sea region, which may present an opportunity for resisting extractivism.

1. A summary

In the context of salt mining, **Chapter 2** describes how impact measurements have material consequences, not only because they steer decisions, but also because they change the materiality that they ostensibly only measure. As Barad (2007a) notes, actions are constitutive of bodies, which makes it impossible to measure entities without changing them. I documented how several subsurfaces were enacted through distinct sets of scientific measurements which were incommensurable with each other and of which only one was considered to represent reality. This generated an impasse of pitting disparate pieces of evidence against each other, which ultimately allowed powerful actors to maintain their position as decisive arbiters of what is real. This shows that determining which subsurface exists is a political process and not a techno-scientific one.

Chapter 3 demonstrates that coastal relations at the barrier island Ameland were not able to respond to a looming chemical spill. The chapter explains that this inability to respond adequately is a result of the particular way coastal relations have been shaped by the dynamic coastal management regime. Dynamic coastal management generates a mixed land-sea interface, which effectively increases the resilience of the island vis-à-vis sea level rise, but also produces static and distanced coastal relations between humans and the coast. In 2019, these sets of coastal relations were unable to respond to coastal erosion that threatened to dissolve a 60-year-old nascent polluted gas platform owned by the NAM. Our analysis shows that the understanding of amphibiousness in coastal management was limited to unleashing natural processes and was unable to include humans or industrial artifacts in their sets of coastal changes to respond to. For coastal management to be more response-able for preventing environmental calamities, it needs to recognize the unpredictability of land-sea entanglements, the inevitable leakiness of more-than-human bodies, and the politics and exclusions in coastal management.

Chapter 4 shows that arts-based experiments can generate atmospheres that stimulate sand and humans to develop affective relations. Affective relations are relations in which entities are reciprocally influenced by the other, which changes what both entities are, as well as what they can do. The arts-based experiment enabled affective relations between humans and sand when humans became enchanted by and skilled in their engagements with sand. Building enchantment and skill required an exclusive focus on the human-sand relation. The chapter shows that arts-based activities can enact human-sand bodies that are more porous to each other. To mobilize the interventional character of academic research, the chapter also probes the reader to consider the chapter itself as an affective atmosphere for altering their (the reader's) relation with sand.

Chapter 5 takes stock of contemporary understandings of participation in natural resource management by reviewing the literature on the Social License to Operate. SLO practices generally include laboratory forms of participation to enhance corporations' societal legitimacy. Reviewing the SLO literature with a posthumanist perspective in mind showed that the literature dominantly conceptualizes participants as bound individuals that participate via predetermined procedures. More-than-human relations are barely mentioned in relation to participatory procedures. The humanist categorizations and the lack of material participation imply that SLO-related participation tends to reproduce existing inequities and power relations.

Together, Chapters 2, 3, and 4 present three elements of a posthumanist approach to participation in the context of resource management practices: they attend to how bodies are made, the response-abilities that result from the enactment of these bodies, and the role of affective atmospheres and scientific research in facilitating these atmospheres to facilitate alternative enactments. Chapter 5 explores whether this notion of posthumanist participation can be brought into productive conversation with SLO literature, as the SLO is a popular term that structures academic and sector debates about participation in resource management. However, the chapter suggests that the academic discourse on SLO may be limited for further developing a posthumanist participatory sensitivity in participation processes.

Each of these four chapters engages with different epistemic traditions, which also reflect the conceptual and epistemic journey I undertook in the course of the research project. In their diversity, the chapters may appeal to readers who are trained in various epistemic traditions and may be less familiar with the posthumanist approach that is dominant in this dissertation. Those educated in Euro-American assumptions may face difficulties in departing from the premise of a static and singular reality and embracing one that is plural, performative, and emergent and what this implies for research (Law, 2004; St. Pierre, 2021). To remain attentive to the lingering influence of singular thinking by clarifying which relations and ethical considerations were constitutive of the realities described in this dissertation, I will once more turn to the performativity of my research and explicitly describe the conceptual choices of this dissertation[1].

[1] Separating the journey of this research from the answers to the research questions risks presenting the journey and conceptual choices as existing outside of the answers to the research questions. Nevertheless, I present these sections separately because this separation has helped me to understand

2. Concepts as interventions

Concepts are part of the relations that generate various researched realities. Concepts are brought into being by particular set of relations, and through intra-acting with other elements in research encounters they play an important role in generating new realities (Barad, 2013; Fox & Alldred, 2021; St. Pierre, 2021; Wu et al., 2018). This means that in a posthumanist approach concepts are 'thought with', or invited, as part of a research collective that constitutes a new reality through their entanglements (Law & Mol, 2020; Puig de la Bellacasa, 2012). Concepts engender particular ontological selections and restrict which bodies can be enacted. This implies that the selection of concepts has political consequences for what is brought into being(Morrill et al., 2016). This point is articulated by Strathern (1992) when she states that "it matters what ideas we use to think other ideas" (p. 10), and by Haraway (2016) who elaborates: "[i]t matters what thoughts think thoughts, it matters what knowledges know knowledges, it matters what relations relate relations, it matters what worlds world worlds" (p. 35). Strathern and Haraway both point to the political power of ideas, thoughts, and knowledge because they condition what knowledge can be produced (Blaser & De la Cadena, 2018). Concepts, then, present political interventions in the partial realities that they co-constitute (Lather & St. Pierre, 2013). This section maps the performativity of my conceptual choices within this PhD research and reflects on how the concepts I used influenced the relations and bodies enacted through my research.

My PhD trajectory started with writing Chapter 5 to investigate contemporary understandings of participation in resource management. The main concept that structured this article on the SLO was Beetham's conception of legitimacy, which, unlike the other concepts I used, is grounded in political theory and not in feminist posthumanism. Beetham's multifaceted notion of legitimacy emerged during the process of reviewing the SLO literature and proved useful in connecting SLO-related participation to larger debates about environmental sustainability and democracy—which were marginal concerns in the SLO literature—and for problematizing the limited understandings of participants, issues, and procedures in the SLO literature —which were more central points of critique. It was productive in critiquing contemporary

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and engage with the challenging implications of posthumanist research, and I believe it may help readers who would otherwise get blocked or excluded because they are not fluent in the language of posthumanist research (cf. Greene, 2013).

understandings of participation in resource management, but less so for deconstructing the humanist categorizations that characterized SLO-related participation or for resisting extractivism in natural resource governance.

To explore knowledge participation in the mining context in Friesland, I used the notion of the 'sociology of translation', as proposed by Actor-Network Theory (ANT) scholar Callon. Callon (1986) describes a sociology of translation that highlights how networks can expand and become legitimized. These networks are considered to be composed of humans and non-humans, which allowed for a less human-oriented exploration in Friesland than the literature had engendered. With this conceptual repertoire, I set out to study changes in relations between people and landscapes in the Frisian mining context and their negotiations about mining impacts (Chapter 2). During the empirical research and the writing process that followed the research encounters, the chosen concepts were not productive to foreground the (what appeared to me as the) most pressing issue of the case, namely the way causality was established in discussions about salt mining and its effects on what existed. ANT's sociology of translation and treason (Callon, 1986; Galis & Lee, 2014) enabled me to explore the obstacles that prevented the homeowners' network from expanding and becoming more legitimate and the negotiations between different networks, but it produced fewer explanatory possibilities for thinking how the homeowners' network was established in the first place. Without mapping how bodies were constituted within the diverse networks, I felt that my research would not be able to convincingly present the various enactments as multiple realities rather than as multiple perspectives on reality. A sociology of translation, despite its nuanced conceptualization of processes through which knowledges become dominant, did not provide enough analytical ammunition to understand how beings and knowledge were enacted.

To better understand the multiple realities that conflicted in this controversy, I needed to engage with how these realities were made. This required analyzing the content of the homeowners' knowledge claims, which required far more interdisciplinary engagement with the subsurface and notions of causality than a focus on human negotiation processes would have required. I am not trained as a geologist, which had its advantages in not automatically affirming what was considered normal to geologists (cf. Smith & Smith, 2018). But it also had disadvantages. For a long time, I thought that I did not understand how the geological models worked and how causality was determined. Interdisciplinary STS work is arduous and paralyzed me at times when my self-doubts were kindled. Eventually, reading more recent ANT work, as well as feminist posthumanist literature, lifted the paralysis evoked by my insecurities (St. Pierre, 2021), in particular Barad's (2007)

conceptualization of intra-active causality, recommended by a friend[2] after I told her about my struggles in understanding causality. Barad's conceptualization of intra-active causality unsettled my unconscious trust in the geologists' claims of truth and therefore proved to be analytically valuable and emotionally liberating at the same time. In seeing causal relations as the demarcations between different bodies, intra-active causality offered a conceptual assurance: it was so different than the causality of geologists that it presented a radical re-orientation in what causality was and could be. With intra-action as a conceptual companion, I dared to engage in relationships with the entities of the subsurface without having to adhere to soil scientists' definitions of these entities. With intra-action, I could think through the constitutive role of measurements in more-than-human mining dynamics.

With the concept of intra-active causality, the information generated by homeowners produced one reality, and the activities of the applied scientists produced another. The concept helped to identify moments where measurements were mobilized for presenting a singular reality and to scrutinize which other realities were cast as illegitimate or excluded. It is important to point out that scientists were not necessarily convinced that their measurements were singular truths – they allowed for uncertainties and often considered their measurements as approximations. Yet, different measurements were always handled in such a way that they had to be brought back to a singular holistic truth. The resulting singular reality collaterally excluded other enacted subsurfaces and allowed them to pretend as if this exclusion was not political, but technical (Li, 2011). My aim was not to sketch these scientists as irresponsible individuals, but rather to demonstrate how the practices that reduced multiplicity to singularity enable forms of extractivism. Rather than blaming liberal individuals, we are looking at the points at which unproductive reductions to singularity happen and, thus, where politics are flattened in order to focus on considering response-able forms of risk and impact assessments.

After getting more acquainted with feminist posthumanism through working with the notion of intra-active causality, I found that engaging with the coastal management at Ameland evoked other feminist posthumanist concepts. Initially, I was intrigued by the term 'Building with Nature', which signals a hegemonic mode of managing coastal areas, including at Ameland. Whereas earlier management focused on keeping the sea at bay, the building with nature approach inverted previously popular notions of coastlines as

[2] Thank you, Veerle Boekestijn!

static and separated to understand coasts as fluid. The relational fluidity of bodies and agency in coastal contexts was foregrounded by the term 'amphibiousness'. In this body of amphibious literature, the idea of *responding* to coastal changes popped up multiple times, particularly in critiques of "terrestrial responses" to amphibious or watery sites when management aims to create and defend dry land (Morita, 2016; Zwarteveen, 2015). This notion of responses to coastal dynamics then translated into response-ability, and through *amphibious response-ability* came a possibility to see coastal erosion as an ongoing dialogue of relations that is shaped by coastal management.

Response-ability moves away from the dominant idea that responsibility can be located in individual people or organizations. It focuses, instead, on fostering good relations as the basis of responsible practices since agentic capabilities derive from relations. This last point can be articulated with multiple terms that circulate in posthumanist literature. For instance, a Puig de la Bellacasian/Mollian understanding of care would make a similar appeal to good relations because it also calls for embodied collectives that together sustain and build interdependent worlds that can flourish (Mol et al., 2010; Puig de la Bellacasa, 2012, 2015). Yet, in a context of coastal environmental calamity, like the one at Ameland, the term response-ability more forcefully drew attention to the implications of those bodies and relations that were lacking and that consequently could not take responsibility. Response-ability emphasizes that relations are required for actions to take place, and I argue that this take on responsibility enacts an ethics of practical tinkering towards better relations. It requires pro-activeness and creativeness because relations constantly produce and reproduce bodies and response-abilities. To be held responsible, in more individualized terms, happens in retrospect, while to be able to respond is about making good relations in the present. As such, response-ability circumvents normative anchoring points that more forcefully direct what is good or right. The strength of this circumvention is that it enables us to move beyond the idea that only humans can negotiate and assess ethical relations since thinking with response-ability does not limit agentic capabilities to the humanist human. Instead, it recognizes that participating bodies are fluid effects of intra-actions, which means that all materials are part of participating bodies because they engage in negotiations about what exists now and what will exist next. Understanding material change as a more-than-human political negotiation brings to the fore that all materiality is inherently political. Using the notion of response-ability, then, allows situated assessments of what is right and wrong because morality depends on the enacted

bodies and their response-able vis-à-vis each other. If bodies and relations change, what is right or wrong also changes[3].

Two case studies later, I developed a sense of the intra-actions and response-abilities in measurement practices in Friesland and coastal management at Ameland. While this enabled me to think more porously about humans in relation to subsurfaces and coastal entities, I was left with an appetite for other types of interventions than my research and concepts hitherto made possible, in particular intervening for affective relations. To facilitate affective interventions, I engaged with the arts, primarily by collaborating with Hemerik and engaging with her associative and intuitive methods for doing research and for determining 'what works'. The arts, as a domain that is centered around making, and whose practitioners are perhaps less burdened by legacies of distant observation[4], is a field that offered me a breath of fresh air for what PhD research could look like. Under Hemerik's guidance I became more acquainted with the potency of associative knowledge for research and with the possibilities of researching through creation. Through this process, it became clear that if research implies doing, then you might as well do something and present it as research[5]. This, of course, requires different forms of quality assessments, a point to which I will return later. While an understanding of research as doing casts each component of *Remove sand* as an academic output, in the context of my PhD, it was only with a textual description that *Remove sand* counted as a legitimate component of my dissertation. By textually engaging with the various components, a new phenomenon emerged: a text that relates to the other creations, becoming a part of the arts-based project. Through writing, the other elements of the project became repeatedly available, long after these elements were completed as research activities (Winthereik & Verran, 2012).

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[3] Barad (2007a) refers to the intertwining of ethics, ontology and epistemology with the compound word 'ethico-onto-epistemology'. With this term, Barad points to how the ongoing constitution of reality inherently interweaves with theory and knowledge, as well as with an "ethics of entanglement" (Barad, 2011, p. 150) and an "ethics of exclusion" (Giraud, 2019, p. 171). It is important to note that Indigenous epistemologies have equally rejected a separation between ethics, being and knowing: see Wildcat (2001) for a comparison between conventional Euro-American and American Indigenous metaphysics.

[4] However, artistic disciplines have their own problematic legacies of observation, see e.g., Hughes (1985) and Shaw and Sullivan (Shaw & Sullivan, 2011). Thank you, Veerle Boekestijn, for pointing this out.

[5] Esther Turnhout, thank you for bringing this point to my attention. See Borgdorff (2006, 2011) for a more extensive overview of the debate on researching with the arts in the Netherlands.

Chapters 2 and 3 provide the conditions for the intentional intervention of Chapter 4, because the notion of affective atmospheres builds on both intra-action and response-abilities. The term *affect* — similar to intra-action — destabilizes the binary logic of two discrete bodies, and the term *affective atmospheres* — similar to response-ability — acts on the idea that agentic abilities result from relations. Yet, *affect* and *affective atmospheres* were performative in their own way. The Deleuze-Guattarian notion of affect (Deleuze & Guattari, 1987) makes visible that one's abilities to act augments or diminishes when relations change. With the term affective atmosphere (Anderson, 2009; Anderson & Ash, 2015), the possibility arose to intervene with a particular affective intention in mind, in this case, to increase affect in human-sand relations. In this chapter, the concept of affect directed intra-actions so they could open up stabilized relations (between humans and sand) and create more affective bodies, and allowed them to be changed by each other. As a result, the possibility emerged to see the pages of this dissertation as an atmospheric setting in itself and to invite the reader to influence and be influenced by sand (see Chapter 4). Throughout the experiment, it became clear that other, more affective relations with sand were possible for many who had engaged in one or more of the components of the project. *Remove sand* showed that enacting alternative human-sand relations is possible and perhaps not that difficult as long as affective atmospheres are created and some willingness for porosity exists. Those who have read the chapter can judge for themselves whether this dissertation indeed provided an affective atmosphere and whether it has opened up their relations with sand.

In mapping the conceptual journey of this PhD research, a recurring ambition appears: to destabilize hegemonic paradigms. In the SLO review, the multifaceted notion of legitimacy disarranged the distinction between participation and materiality. In Harlingen and Wijnaldum, intra-active causality destabilized the idea of a singular subsurface that could solely be known by specific scientific measurements. At Ameland, response-ability unsettled what it meant to hold people or organizations responsible when remediation failed, and it pointed to sets of coastal relations that required work and not individualized agents. *Remove sand* explored different possibilities of what legitimate academic research practice is and does[6]. Destabilizing conventional understandings of

[6] While much work in STS, anthropology and artistic research has challenged what research is and does, within the contexts of my (technical) university, I found no predecessor in the social sciences and humanities that could serve as a point of reference for art that qualifies as PhD research within my institutional context.

laboratory participation, causality, responsibility, and research helped to reveal how sedimented understandings can become part of extractivist practices, since they engage in ontological politics (Barad, 2007a; Giraud, 2019; Haraway, 2003; Yates et al., 2017).

A final word about the performativity of concepts and the enactments of this PhD research before I give some answers to the research questions posed in Chapter 1. The processes I became entangled with and my understandings of them are incomplete and continuously evolving. The journeying described here is therefore something other than an autobiography: it is an embracement of the particular relational figurations that constituted the insights of this dissertation. The answers formulated below should be read as grounded in this partial and situated constitution. This means that the text below does not present final answers, and many additional answers could be given. What I address below are responses that I believe could help amplify and re-enact some of the insights of this PhD research beyond the pages of this dissertation.

3. A return to the research questions

3.1 Making bodies in the Wadden Sea

To explore empirically which bodies exist and can participate, the first research question set out to study *how participants were enacted and excluded in the Wadden Sea's resource management (research question 1)*. This research shows that various practices related to resource management (impact measurements, coastal management and remediation practices, and arts-based research practices) enacted bodies that were multiple. In Chapter 2, measurement practices enacted multiple subsurfaces in the towns and fields close to salt mining. The longitudinal measurements that were practiced by homeowners in Wijnaldum enacted a subsurface that consisted of one entity. The first set of measurement practices led to the argument that the decades-old houses had a solid foundation (evidenced in the years without damage), and that, therefore, the cracks in the walls should be attributed to the mining and its impacts on soil subsidence. In contrast, the governmental authority cross-sectionally measured water streams, housing constructions and foundations, and historic changes in water levels to determine subsurface relations, resulting in a complex subsurface that consisted of various entities (including water streams and ditches). The second, more complex, measurements complicated assigning causality to the salt mining practices, as the governmental authorities considered it more likely that the cracks in the walls were caused by other subsurface processes. Thus, the

diverse sets of measurements resulted in two different subsurfaces (a subsurface-as-a-whole and a complex subsurface), of which the more complex causal claim was decisive in discussions about compensation for damage. While the subsurface-as-a-whole had a limited ability to travel in the negotiations about compensation for the homeowners in Wijnaldum, it shaped the measurements for enacting the subsurface in Harlingen, where the subsurface-as-a-whole became a more widely accepted reality. As a result, a shift occurred in the process to establish what the subsurface looked like and what causality could be.

In Chapter 3, various coastal constellations enacted various coasts, of which only some included the human Amelanders and the drilling platform as participants. When coastal erosion threatened to dissolve a polluted gas drilling platform, these various enactments led to different assessments about how urgent remediation of the platform was. For over fifty years, in the constellation that included the gas company NAM, the gas exploration platform had not been enacted as a participant that could shape the coast. This was partly based on the idea that the pollution was immobile, which enabled the strategy to abandon the platform until changed circumstances would make exploitation of the site profitable. This led to a particular exclusion of the platform and a slow response by the NAM, who had been formally assigned to remediate the site. Both governmental authorities and Amelanders were entangled in relations that performed the threat and the necessity of intervention into being because of their situated relations, but that lacked abilities to make this assessment travel to the coastal relations of the NAM. Our analysis suggests that preventative action was unactionable by design, which was partly due to institutional separations between land and sea in the management regime: binary divisions of land and sea organized risk assessments, which disabled Rijkswaterstaat to intervene more forcefully. We also linked the lack of actionability to the separations between more-than-human bodies that erupted as a result of dynamic coastal management; the switch to coastal management based on helm grass planting to one based on sand suppletions, resolved coastal relations that involved the historically situated practice of helm grass planting. Because these relations were no longer practices, the bodies and abilities enacted through them were also dissolved and reduced.

Both cases suggest that the existence of bodies (subsurfaces, risk assessments) alone does not guarantee the ability to shape material negotiations about the unfolding of the world and that it sometimes does so in unexpected ways. The accounts of Wijnaldum and Ameland show that even when bodies are enacted, they do not automatically become influential in negotiating how the world unfolds. While each body participates in the relations through which they were enacted, not all bodies extend into the sets of relations

that have the most influence in shaping the world. This depended on which bodies were enacted, as I just described, but also on which person or organization was considered credible for such enactment. For example, in Wijnaldum, the governmental authority did not take the homeowners' co-enactment of the subsurface seriously, and relied solely on their own measurements for the constitution of the subsurface. For me, too, it was difficult to engage with the measurements of the homeowners, and it required much conceptual intervention to do so. This shows that it is difficult for other-than-usual measurements to be considered credible and therefore to travel beyond their initial relations. Such traveling depends on the relations that already exist. For instance, neither the NAM, Rijkswaterstaat, or Amelanders were embedded in relations that could prevent environmental harm. These observations confirm some of the insights of the literature review on participation in natural resource governance to acquire an SLO. Not all humans are considered to be participants, which means that not all humans can engage in shaping resource environments, and more-than-human relations are often not considered relevant for participation at all.

Moreover, participants that do not get re-enacted cease to be able to participate. The cases suggest that bodies need to be made and remade for them to continue to exist (Barad, 2007a). The importance of re-enacting bodies for them to exist over time was also apparent in the context of *Remove sand.* Bodies were constituted by action as well as inaction, as bodies resulted out of *not* establishing baseline measurements, *not* cleaning up a polluted site in time, and no longer engaging with helm grass or with an art installation. This shows that in a posthumanist participatory approach, there is no distinction between intervention and inertia of humans in the form of bounded individuals because both equally shape reality. This inseparability between action and inaction problematizes the notion of a human individual that can choose whether they participate in how the world takes shape. Because humans are entangled in the constitutive processes that inscribe into the flesh of the world, there is no escape from participation (Barad, 2007a, 2010).

Thus, we can discern multiple types of enactments and exclusions. First, bodies get enacted or excluded through (in)actions. These bodies are situated and partial because they are only enacted within a particular set of relations. The different subsurfaces and gas platforms are examples of these enactments. Second, the re-enactment of bodies in other relations, what I call traveling, is just as important in being able to shape the world. Traveling is about traversing into other sets of relations in a recognizable form, which occurs either when bodies are re-enacted through similar practices in similar constellations, or when they are re-enacted in other constellations. To be precise, these bodies are different than those earlier constituted (no body is made twice), but they gain

force when they are recognizable and stabilized beyond their initial relations. The two levels of enactment have been recognized in political landscapes in which indigenous peoples have to navigate between worlds. De la Cadena (2010) describes how in Ecuador, indigenous politicians switch between participating in constitutive activities with other-than-human entities and in activities for NGO or union work. Such politicians, who can switch between enactment and traveling, are helpful in these contexts because they enable diverse enactments of bodies to travel, and in so doing they bring doubt about the meaning of beings that are otherwise treated as if they are unambiguous (De La Cadena, 2010, p. 352). The monument owners in Harlingen can be seen as fulfilling a similar position in the case of salt mining; they were partially successful in invoking a destabilized notion of the subsurface by advocating for the protection of the monuments. Without people who can bring doubt about what exists, disputes about bodies are vulnerable to being reduced to different interpretations that are rendered as driven by distinct cultures or, in the case of Wijnaldum, by distinct interests in compensation. When entities are reduced to a matter of interpretation, not of existence, it is easy to dismiss the one that is considered to be driven by a selfish desire for financial compensation.

3.2 Response-ability

To find relational, posthumanist alternatives for the notion of responsibility, which is connected to assumptions of agentic individual humans, this dissertation investigated *what responsibility looks like in the context of posthumanist participation (research question 2)*. In this dissertation, I have conceptualized responsibility in posthumanist participation as 'response-ability': the possibility to respond to ongoing changes. This term translates a striving for individual ethical behavior into the possibility of continuously transforming ways of living in more-than-human webs of relations (Westerlaken, 2020). When relations are response-able, the boundaries between sets of relations are permeable, meaning that they can reciprocally influence each other to enable maintaining and repairing worlds (Puig de la Bellacasa, 2017). This dissertation presents some occasions in which response-abilities were lacking and other occasions in which sets of relations were response-able to each other.

In Chapters 2 and 3, I describe various instances in which response-abilities are lacking. When response-abilities are lacking, bodies can't travel from initial enactments to other sets of relations. In Chapter 2, the selection of measurements and instruments and their abilities to constitute reliable evidence was at the heart of the controversy, yet this point was not open for deliberation. This suggests that the governmental authorities were not response-able to the subsurface-as-a-whole, which meant that they enacted a different one

by using another set of measurements. Non-response-ability, in this case, was problematic because it depoliticized the processes through which some bodies were rendered nonexistent and therefore excluded from participation. This presented a situation where the governmental authorities treated the homeowners, arguably, with respect (and as participatory) by investigating the possibility of mining damage to their houses, but where this engagement remained unproductive in dissolving the conflict because the bodies enacted with the measurements of the homeowners were dismissed as non-existent. This resembles situations in which Euro-American people dismiss the realities of Aboriginal or other indigenous peoples as beliefs (De La Cadena, 2010; Law, 2015). Rendering realities as beliefs also presents the possibility to search for the real, and this search is often dominated by the idea that reality can ultimately be revealed through dominant Western scientific methods. Thus, reducing non-scientific or other-than-dominant-scientific relations to mere beliefs is an oppressive form of establishing impacts that dismisses the non-hegemonic reality before measurement processes have even started.

Non-response-ability is also problematic when it has far-traveling consequences. In Chapter 3, this was the case when none of the sets of relations were answerable to an impending environmental calamity. As a result, the pollution became entangled with seawater, which made it impossible to remediate since the chemicals dissolved and spread out. This shows that where non-response-ability occurs, other bodies can step in to respond, sometimes with detrimental environmental effects (Harding, 2011). Inabilities to respond in resource management thus require attention because negative impacts can be far-reaching.

This dissertation also documented response-able connections. In Chapter 2, the monument owners of Harlingen were responsive to the subsurface-as-a-whole produced by the Wijnaldum homeowners. In mobilizing the tilt monitor, a measuring instrument that was considered able to measure causation, the subsurface-as-a-whole could travel to the reality of the governmental authorities and become an important actor in negotiations about extractive futures for Harlingen. This suggests that response-abilities are not static, but change over time when relations continue to be on the move. To stimulate response-abilities between bodies, Chapter 4 showed that it is possible to intentionally create settings that can open up relations between bodies. *Remove sand* created affective atmospheres in which response-abilities were willingly crafted. In the experiments, people attended to their senses, which is the main mode in which human bodies' can relate to sand, and this attention provided better abilities to respond to sand. While the possibilities for affective exchanges were small and may have only reached a handful, they

demonstrate that response-abilities are malleable and that affective settings matter for this malleability.

Even though response-abilities can be steered, it is impossible to be response-able to everything, and which response-abilities are enacted is a matter of selection (Giraud, 2019). Focus and exclusion played key roles in determining which response-abilities emerged. In the arts-based experiments with sand, I explicitly aimed for changing human-resource relations to destabilize the idea that the resource, in this case, sand, was only a resource. Facilitating other relations by inviting affective elements that steered the mood and, thus, the possible relations, the experiments enacted bodies that contributed to disrupting univocal relations in which matter was *only* a resource. This, following Blaser and De la Cadena (2018), is perhaps a key priority for determining what response-ability should look like: how materials become more than resources.

Creative activities present forceful affective atmospheres. Through tinkering and crafting, sites that are rendered empty become instantly filled with entities (Jungnickel, 2017). Crafting generates "psychological, material and social attachment[s]" to the sites with which crafters engage (Haraway, 2016, p. 79), which constitutes realities beyond the extractivist singularity. This dissertation has shown that even with materialities that are perhaps alien to many people and difficult to empathize with, such as sand, response-abilities can still be crafted. The emerging entanglements with sand, wood, and paint made visible that making something is a way to resist essentializing identities and fortifying relations. The act of creation, through mundane, funny, crafty, or even industrial processes (Rolston, 2013), can enact states of enchantment with resource materialities that change what these materialities are and how they can relate to human bodies (Ingold, 2013, 2018).

Enchanting situations not only emerged through processes of creation, but also by enabling submersion at the moment through color choices and explicitly stimulating foci. Another mechanism that can enact submersion and enchantment is play. While not addressed in this dissertation, other literature on more-than-human affective relations shows that play is a mode of relating that can turn sedimented hierarchies upside down through a collective search for affective, joyous, and creative engagements (Driessen et al., 2014; Westerlaken, 2020). Playful instances are reported to change the dynamics of unilateral domination into more reciprocal and affective ways of being in human-penguin, human-dog, human-ants (Driessen et al., 2014; Westerlaken, 2020), and human-pig relations (Driessen et al., 2014). Sicart (2017) defines play as an attempt to balance order and chaos in a new and surprising way, which means that "like literature, art, song, and dance; like politics and love and math, play is a way of engaging and expressing our being

in the world" (Sicart, 2017, p. 5). Because play can fracture hierarchical relations, playful intentions generate powerful atmospheres that stimulate response-able relations (Van der Meulen, 2021; Westerlaken, 2020). To stimulate play, players usually need to be given cues that playful ways of relating are allowed. This explains why *Remove sand* was not experienced as playful, despite the project's main element being a huge slide: while we designed rules for engaging with the installation, these were not meant to invoke play, nor did we make explicit that these rules were up for negotiation. Incorporating signals for play in *Remove sand* may further augment affective relations and response-abilities between people and sand.

3.3 Research as participation

This PhD research is one of the participatory processes that steered what resource management in the Wadden Sea area looks like. This section describes how I participated in resource management in the Wadden Sea and how this enhanced my understanding of posthumanist participation (research question 3).

Research intervenes materially, which blurs the distinction between studying and doing posthumanist participation. This study of the Wadden Sea participated in two ways. First, the PhD research produced possibilities for some bodies to travel by creating texts and disseminating them. By documenting the subsurface-as-a-whole and the various enactments of the coast, I re-enacted these bodies in a different but recognizable form and enabled them to flow beyond their initial enactments and get re-enacted within the contours of this dissertation. That means that in describing posthumanist participation in the Wadden Sea region, I was also part of and interfered in relations – not only in my head or on this paper. Description and creation are always entwined because the research activities facilitated intra-actions that led to new sets of relationships. As a result of the research encounters, this dissertation co-enacted new, situated sites of resource management that re-enact some bodies of the Wadden Sea by making them recognizable but also change them by putting them in relation to other phenomena, for example by connecting them with the SLO-related participatory practices. The descriptions of this dissertation enacted particular realities which you have witnessed and became part of while reading this dissertation.

Second, this PhD research participated in world-making activities through non-textual activities. With Remove sand, this PhD project encouraged new forms of relating to sand, and these relations can influence human-sand relations elsewhere. Besides crafting affective sand-human relations, this PhD research enacted various other affective flows.

In my research encounters in Wijnaldum, Harlingen, at Ameland, and for Remove sand, I was in contact with many people and other beings. These encounters, I argue, were outcomes of the research activities as much as the articles and chapters I wrote were. Studying something is, after all, a way of making and doing, and research encounters enact new realities. Some people made clear that they enjoyed showing me their home environments. For others, the research led to a renewed appreciation of their own situated relations. And some people felt encouraged to further their struggle for environmental justice. One person experienced our encounter as a process of healing, and a governmental official felt inclined to check whether the procedures for participation were safeguarded in the policies and practice after repeated encounters. This shows that posthumanist research that works through case studies can be, and often is, something other than generating insights alone; something that "is not therapy but rather something else, akin to a kind of sociological sociability that allows people to be heard" (Back, 2012, p. 28). This suggests that concepts can be liberating not only for those who ask the questions, as hooks (1991) suggested, but also for those with whom the questions reverberate or those who answer them.

The act of doing research at Harlingen, Wijnaldum, and Ameland changed the affective relations in which I was entangled and with whom I could connect. It turns out that there are many Ameland-lovers, both Amelanders themselves and tourists from the mainland. Being affected through my study of Ameland was a fruitful way to also connect to these people, for example with Stuut and her artistic practices, which I described in Chapter 4. In general, doing research was a way to meet people face to face, people whom I would have never met otherwise, and who changed who I am and who, perhaps, were changed because of our encounters. I believe that many researchers recognize that research is a way of enacting affective relations in real-time (Back & Puwar, 2012) and would subscribe to my argument that the act of researching enacts affective atmospheres. However, recognizing these relations as valuable outcomes of research in themselves is perhaps more challenging than the relations that were generated at arts-based sites; the installation, video, and poem were tangible results of the research that, in itself, presented an academic expression. Nevertheless, affective social relations that forge connections between different groups and epistemic traditions are equally tangible results.

Considering the affective flows established by research has implications for research ethics and valuing research and researchers. When research implies creation, it requires a research ethics that acknowledges and builds on the constitutive forces of academic engagement. In some cases, the affective relations created in doing the research will travel further than the articles produced because sometimes the strongest contributions of

scientific research remain unspoken and undescribed (Back, 2012). When researching is participating, it means that every action matters for how the world unfolds and for what research signifies, whether they are part of the formal research contexts or not (Liboiron, 2021). This means that there are no moral holidays, no shortcuts, and no possibilities to compensate because a new reality has already unfolded. It also means that the networks produced, the affective relations encouraged and the oppressions challenged because of research practices deserve an explicit place in the assessments of researchers.

In my writing process, I experienced tension in my abilities to respond to calls for citational and epistemic justice as articulated in postcolonial scholarship. Especially when it comes to ontological politics (Todd, 2016), postcolonial literature has urged scholars in general, and posthumanist scholars specifically, to assess if and how our citational practices and references to indigenous ontologies counter or reinforce epistemic acts of violence (Hunt, 2014; Todd, 2016; Watts, 2013). During the writing of the articles for this PhD research, I responded to those calls by citing scholars from the Global South and scholars who state that they belong to various indigenous groups. While I attempted to respond, my responsiveness was inherently limited, as I needed to balance different and competing interests and needs. My limited possibilities to respond to the calls of postcolonial and indigenous scholars seduced me at times to think of my practices in terms of responsibility; to think of blame and individual notions of agency for solving the inequalities and injustices that proliferate in academia. In this case, thinking with response-ability again situated my abilities to respond to this call within the set of relations that shape my research abilities. Thinking of response-ability, then, helped me to move forward by thinking about what can be invited to the research constellation to enable better responses.

Thus, participation in resource management through research enhances an understanding of posthumanist participation because it brings home the difficulties, the sometimes-deadly trade-offs, and the necessary exclusions that resource environments are thick with. For me, it brought to life the latent assumptions and ethical repertoires that guided my thinking, as it showed that every inclusion/exclusion had consequences for which realities unfolded and how. It also enabled an ethics that was not known in advance but tinkered its way into being in the ongoing intra-actions. As the example about citational justice shows, the notion of response-ability complicated individualized notions of responsibility. Doing empirical research required answers to questions like "Who do I ask for consent when I plan to study the dunes by wandering on the trails?" or "Should I spend the coming two weeks finding articles and books from scholars from the Global South to replace some of the privileged western scholars I usually cite?" or "Am I acting in an

extractivist way when I only scan an article to check if it can serve as a reference for this statement?" (The answer is yes, according to Liboiron [2021]). In responding to dilemmas like these, I looked for response-able actions, although this was sometimes difficult to uphold or assess, as the answers to these questions are not straightforward. It is, for example, unclear whose consent is needed when studying landscapes and public spaces in the Netherlands, and sometimes asking for consent is counterproductive to resisting hegemonic extractivist relations, for example when streets are reclaimed for the benefit of more-than-human livability. Answers to questions about response-abilities are not straightforward, either in research or in other forms of posthumanist participation in resource management, which more intimately made me realize how response-abilities will inevitably be limited. Rather than seeking a definitive answer, we need to "stay with the trouble" (Haraway, 2016) to find the tensions in diverse responses and to see which steps can be taken.

Posthumanist participation fundamentally raises the question not just of what research is, but also what research is for, and how its effects can be evaluated. Those who have engaged with posthumanist or adjacent literatures may think the blurring of boundaries between research and other practices is much needed to resist extractivist research practices and to enrich and transform reality. For others, this type of research is either not research or bad research because it ostensibly does not meet their standards of good research, including norms such as systematicity and objectivity (Fox & Alldred, 2021; Greene, 2013). This latter point is illustrated well by a commentary on a special issue on performative modes of inquiry. Greene (2013) asserts that, after reading the articles, she is concerned "about a loss of the systematic character of social inquiry, where the systems (guidelines, rules, precepts, assumptions) are open and available to all. I worry that inquiry then becomes less distinguishable from other important human endeavors and less uniquely consequential" (p. 753). These combined worries present a paradox, which I believe cuts to the core of many critiques of posthumanist research. The concerns voiced by Greene involve simultaneously an ambition of inclusivity, expressed through stating that knowledge production should be open to all, and a fear of losing the privileged societal legitimacy that traditional science claims enjoy and that makes them consequential. These worries, therefore, seem to be less about the quality and valence of posthumanist research, and more about its disruptive implications for the authority of particular forms of science (Lahsen & Turnhout, 2021; Stengers, 2010).

The reluctance of scientists in giving up their privileges and power has implications far beyond assessments of posthumanist research and has been described as one of the reasons why purposeful environmental and climate policies are repeatedly stalled (Lahsen

& Turnhout, 2021). While Lahsen and Turnhout (2021) discuss the attempts of natural scientists to retain scientific authority, my point in describing the same mechanism in the social sciences and humanities is that this defense mechanism is perhaps not a matter of discipline, and can be perhaps be better explained by the temporal orientation of research. When knowledge production is backward-looking (i.e., when it intends to represent a past reality), it neglects the performative and transformative aspects of scholarly practices that can "constitute new subjects in the present who can participate in the creation of a transformed future" (Rosiek, 2013, p. 2013). This implies that incorporating the future into the very foundations of our inquiries is crucial for reconfiguring realities in the present that are response-able to the future (Lather & St. Pierre, 2013; Martin & Kamberelis, 2013; Rosiek, 2013).

4. Extractivism in the Wadden Sea area

This research set out to explore how posthumanist participation can avoid reinforcing humanist exclusions and thereby resist extractivism. The answers to the research questions show that bodies are continuously constituted through actions that are not usually considered to be participatory, such as impact measurements, coastal management, and remediation practices. Nevertheless, these activities importantly shape resource management because they get re-enacted in other constellations in recognizable ways – a process I have called traveling. The answers listed above show that the enactment of bodies is limited in two ways. First, bodily constitutions are inherently exclusive: when some bodies get enacted, other bodies don't. When realities unfold, there are always bodies that will not materialize. In current resource management, including the Wadden Sea area, exclusions tend to be at the expense of bodies that are more difficult to mold into the requirements of extractivism, that is, more complex and pluriform bodies. Second, not all bodies travel. Which bodies can travel to other constellations depends on the relations that are sedimented and stabilized through repetition and institutionalization. In the Wadden Sea, this process of sedimentation and institutionalization has unfolded over hundreds of years, making the area susceptible to extractivist exploitation (Lotze et al., 2005).

Although the cases studied point to many relatively explicit and visible extractivist patterns, for example, when they involve the literal extraction of materials for revenue or when they result in coastal pollution at the expense of coastal and marine communities, extractivism can also be reinforced in more subtle ways. This occurs when particular intra-actions enact realities that subordinate realities incommensurable with extractivism. In the

context of this dissertation, this happened in at least three ways. First, when governmental authorities dismissed enacted realities, they rendered non-extractivist sets of relations non-existent. In the dismissal of the Wijnaldum subsurface, governmental procedures to establish causality between mining practices and damage did not empower citizens in their appeals to mining companies about damage. Contrary to what these procedures promised to do, they smoothened out differences between incommensurable realities by erasing one of them. This demonstrates that governance instruments that claim to leverage power imbalances can, in practice, reinforce them when they follow dominant habits of knowing that make the worlds they know (Blaser & De la Cadena, 2018; De la Cadena, 2021; Law et al., 2014). This shows that impact assessments that attempt to resolve conflicts through dismissal limit dissent, and they do so in violent ways when they make conclusive claims about what exists and what does not.

Second, ontological politics were patterned in an extractivist way by preventing that conflicts between dissenting realities manifest. In Harlingen, one reality got nested in another because agreement on what exists was established before the issue became politicized and before actual impacts had become manifest. The Wijnaldum subsurface got integrated into the reality of the extractivist subsurface: the non-extractivist reality was made compatible with extractivism by including compensation clauses and by embracing new monitoring instruments (Law, 2015; Law et al., 2014). While this process of ontological politics might appear as less adversarial than the outright dismissal of one reality, it ended up silencing and domesticating non-extractivist sets of relations to further extractivist ways of relating, which makes it equally unequipped to resist extractivism (Law et al., 2014). Regardless of the type of ontological politics at play and whether it dismissed or co-opted one reality, it is clear that these procedures are unable to resist extractivism and in practice end up strengthening extractivist destruction in the Wadden Sea area.

Third, when multiple realities exist separately, they can co-exist until separation no longer holds. At Ameland, the co-existence of two noncoherent enactments of the coast went on for more than 60 years and only became incommensurable when they were both threatened by coastal erosion. Two enactments of the platform co-existed in the years before the coastal destruction: one in which the platform was invisible, impersonal, and a site that could be neglected, and another in which it was an important landmark for recreation, tourism, and sustenance uses enacted by place-based relations. The invisible NAM platform can be seen as a prolongated version of *terra nullius,* empty land, waiting to be found, cultivated, and exploited – not a place that required care (Blaser & De la Cadena, 2018; Law, 2015). In the face of coastal erosion, the platform became a site that

did require urgent care, but initially only within the place-based set of relations. This shows that separated co-existence can be peaceful, but when realities are separated for very long, or in sedimented ways, the possibility for bridging between two realities, which may be needed in times of danger, is eroded.

The erosive logic of extractivism sometimes interacts and intertwines with a logic of care, and non-coherence between realities can be generated through distinct forms of care (Law et al., 2014). In taking measurements, or by trying to prevent coastal pollution, individuals engaged in local caring practices. This implies that caring in resource management can enact multiple realities in which what counts as good, bad, and good enough management is determined through messy, complex, and ambivalent negotiations that are entangled with extractivist modes of production (Mol et al., 2010). What is the right action for one situation may not be right in a slightly different situation, and what seems right can even contribute to destruction (Law et al., 2014; Mol et al., 2010). When care and extractivism are entwined, using the term *extractivism* can productively point out those practices and realities that leave little space for others to exist. Excluding these practices is critical to foreground other realities (Ginn, 2014; Ginn et al., 2014; Giraud, 2019). A point to note is that studying extractivism also risks reinforcing extractivism partly because research itself tends to reproduce dominant realities and silence marginalized ones that threaten extractivism (Law, 2015).

The extractivist practices of singularization in the Wadden Sea illustrate and reinforce historical uneven and unequal patterns of extractivist destruction where some parts of the Netherlands (particularly northern and eastern provinces) have been more at risk than other parts. Specifically, it demonstrates a pattern of extractivism in the Dutch periphery for the enrichment of the political and economic centers in the west of the Netherlands. This geographical selectivity has been experienced by Dutch people in the north and east as internal colonization: the subordination of a population to the dominant state (Pinderhughes, 2011), which generally manifests through experiences of marginalization and power inequalities (Das & Chilvers, 2009; Hechter, 2017; Pinderhughes, 2011). While colonialism is often understood on a global scale, various colonizing states are known to have engaged in colonizing practices within the state boundaries, besides overseas imperialism (Etkind, 2011; Stroh, 2017). The Dutch colonized many peoples, often explicitly for exploitation of these areas (the Dutch referred to their oversea colonies as areas to exploit, or *wingewesten).* Within the Netherlands, historical intrastate Dutch reclamation and extraction projects partly succeeded in rendering spaces empty by either creating new land or by classifying existing land as underdeveloped or expendable to justify the transformation of existing relations into extractivist ones (Van de Grift, 2013,

2015). Processes of inequal exchanges and geographically selective extraction continue in resource management in the Dutch northern and eastern provinces. Management practices continue there, often in subtle ways, to generate empty zones that can be sacrificed, which has most prominently occurred in Groningen due to a major reservoir of natural gas (Moolenaar, 2021). In the northern provinces, in which the research context of this dissertation is situated, processes of sacrifice have led some people to form an image of uncaring politicians and profit-seeking governmental and corporate individuals, despite increasing government efforts to alleviate feelings of neglect and marginalization (Moolenaar, 2021; Sievers, 2012).

This dissertation contributes to the discussion on extractivism and colonialism in the Netherlands in two ways. First, by documenting that governmental and corporate individuals are not uncaring; they care for the area and attempt to limit destruction, but fail to do so because of lacking response-abilities. Thinking about extractivist relations with the notion of response-ability clarifies why, despite caring practices, destruction in this area continues: when caring practices do not lead to enhanced response-abilities, they continue exploitation and marginalization, despite efforts to do otherwise. People in seemingly powerful relations can get stuck in non-response-able behaviors because the set of relations they are in makes them unable to respond and enact other realities. Solely focusing on their individualized responsibilities, then, does little to address these inabilities. Second, this dissertation contributes to the discussion on Dutch extractivism by showing that the Wadden Sea area is particular in that it is subjected to extractivism even though it is a widely treasured landscape. This twofold status of the Wadden Sea area, as both exploitable and as the country's favorite landscape (Rijkswaterstaat, 2017; Dirks, 2016), exemplifies that materials in the Wadden Sea are resources but not only that (De la Cadena, 2021). The multiplicity of relations and various enactments of the Wadden Sea's materiality provides a basis for stimulating non-extractivist resource management.

5. Finding allies for resisting extractivism

For resource materialities to be more than resources (Blaser & De la Cadena, 2018), the relations that make them into other bodies need to be done and repeated. In other words, materialities need to be *made* multiple (Mol, 2002). As we have seen, harmful processes of overt or more subtle extractivism make materials singular and extractable. When possible solutions are seduced by universalist objectivity, through which they force a singular reality, they will be unable to resist or remedy extractivist harms (Ehrnström-Fuentes & Bohm, 2022; Kroepsch & Clifford, 2021); at best, they may be able to replace one reality

with another one that might be preferable, but will still be singular. This implies that to prevent subtle reinforcement of extractivist singularization, the resistance to it has to be of a different caliber than extractivist practices themselves (Acuña, 2015; Viveiros De Castro, 2004). After all, as Lorde (1981)put it, the master's tools will never dismantle the master's house.

This dissertation has demonstrated the potential of a posthumanist participatory approach to study, rethink, and remake participatory processes by enacting different participatory realities. In this final section of my dissertation, I will connect some of my insights to an emerging movement that equally aspires to resist extractivism by enacting plural, response-able bodies, namely, the Rights of Nature movement (henceforth, 'RoN'). I do this to explore ways to mobilize the insights of this dissertation by bridging them with the cognate and popular project of RoN and to strengthen current legal and democratic innovations in the Netherlands that can aid in resisting extractivism.

The RoN movement aims to protect non-human entities, such as mountains and rivers, from extractivist practices by granting them legal rights (Putzer et al., 2022). RoN and posthumanist participation share an understanding of reality as an effect of patterned human-nature relations, and they share an interest in influencing these relations to make them more response-able (Ito, 2020; Magallanes & Sheehan, 2017). While within RoN distinct models have emerged that are based on different ideas about what nature is, who can defend it, and how rights of nature can be enforced, most RoN accounts mobilize Western governance instruments of legal rights to influence human-nature relations (Kauffman & Martin, 2021). The aspiration is that protecting natural entities also safeguards the complex webs of relations between humans and non-humans.

The use of a Western concept of legal rights is not without tensions and challenges. Historically, a rights-based framework has not served all groups equally and has failed to reduce distinctions between and oppressions of groups (Douzinas, 2000; Tanasescu, 2022). The notion has been particularly ineffective for those groups whose understandings of individuality radically differ from Euro-American understandings; indigenous relational ways of being are not well protected through a focus on rights for individuals, and legal rights have been used selectively, often at the expense of people with strong place-based connections (Tanasescu, 2022; Valladares & Boelens, 2017). The observation that a rights-based framework is limited in protecting relational ways of being is important within the context of this dissertation because it raises caution for considering RoN a fruitful project for stimulating processes of posthumanist participation. At the same time, advocating for rights-based protections is sometimes considered one of the few strategies with protectionary force, even if it molds relational ways of being into Euro-American

assumptions of individuality (Tanasescu, 2022). The theoretical ambiguity around the potential of RoN to protect relational ontologies also presents itself in practice. The protective force of RoN in practice is yet to be more conclusively confirmed; the few cases that have been taken to court so far failed to halt extractivist projects, and there has not been a state-filed court case that has lost. While a detailed and empirical exploration of the implications of the RoN movement is beyond the scope of this dissertation, a recurring point in the academic RoN literature is that the legal issue of granting rights of natural entities is of lesser importance for the possibility to resist extractivism than the political matter of who is entitled to speak on natural entities' behalf and how they are institutionally embedded (O'Donnell et al., 2020; Tanasescu, 2022; Valladares & Boelens, 2019). With this focus in mind, I will use the last few paragraphs to discuss a contemporary RoN initiative in the context of the Wadden Sea area and to argue that posthumanist participation can contribute to a more transformative approach to resisting and superseding extractivism that enables multiple relationalities and realities in the context of the Wadden Sea.

In the Netherlands in general, and the Wadden Sea region specifically, the RoN movement has gained in popularity as a way to protect natural beings, such as rivers, forests, wetlands, and seas (Bos dat van zichzelf is, n.d.; Den Outer, 2023a). In the past five years, RoN has spread throughout Dutch popular culture through commentaries in national newspapers, artistic projects, and research programs. In these contributions, the Wadden Sea has emerged as one of the most prominent candidates for being granted rights (Burgers, 2023; Den Outer, 2023b; Jan van de Venis et al., 2023; Noorderbreedte, 2023; NOS, 2022; Speerstra, 2023). The proposal to grant the Wadden Sea rights has led to an explorative investigation by the Ministry of Nature and Nitrogen into the possibility of changing the legal status of the Wadden Sea (Partij voor de Dieren, 2022). Although the minister recently decided against granting the Wadden Sea rights, proponents of RoN continue to call for a change in its legal status. One of the most visible researchers to further the campaign is legal scholar Tineke Lambooy who, together with other legal scholars, has presented the most detailed and elaborate outline, to date, of what a governance arrangement that recognizes the rights of the Wadden Sea could look like. In a 2019 article published in the journal Water International, Lambooy and colleagues refer to the Wadden Sea's biodiversity, to the popularity of the area amongst Dutch people and European tourists, and to the liveliness of the ecosystem to legitimize their selection of the Wadden Sea as deserving of rights.

Lambooy and colleagues propose a particular legal structure to represent the Wadden Sea in more conventional political domains. The scholars propose a "natureship" (*natuurschap*)

as an appropriate structure for embedding formal Wadden Sea representation in existing institutional arrangements. The "ship" (in Dutch *schap*) is a typical Dutch institutional form that provides a unique issue-specific governance arrangement (De Jong & Meijerink, 2006). The most well-known are the water boards[7] (*waterschappen)*, which are responsible for safeguarding water quality and quantity. Like water boards, natureships would be structured through a board with executive powers over the Wadden Sea area, but unlike the democratically elected water boards, the authors propose that seats in the natureship need to be reserved for relevant ministries, provinces, and NGOs to continue their current involvements, and, 'if deemed appropriate', more direct citizen involvement can also be part of the natureship (p. 799). To guarantee the natureship's independence from ministerial power, the authors propose a dual board structure similar to that of commercial enterprises, with a supervisory board and an executive board. Key tasks for the natureship would be to determine a policy framework to assess and limit economic activities in the Wadden Sea, to levy taxes, and to penalize infringements of policies.

My understanding of the proposal of Lambooy and colleagues is far from complete, and my sketch above highlights only some of the elaborate intellectual work that they and others have done. Yet, in the context of this dissertation, it is fitting to ask what a posthumanist participation approach could contribute to the RoN movement, by engaging with this particular proposal. What is promising is that the proposal was enthusiastically picked up by media platforms and by diverse green parties, which shows that non-conventional understandings of and protection for nonhuman entities may find relatively broad support in Dutch society. The popularity of the RoN movement and the serious consideration of its possibilities within current political processes suggest a paradigm shift that opens up novel ways to think about democratic more-than-human engagements. Another promising feature of the proposal is that it focuses on an embedded institutional actor rather than on a set of static legal provisions as an operationalization of RoN. This arguably generates a fluid and adaptive collective that can keep up with ongoingly changing realities; it prevents fixating either rights or nature in protecting situated more-than-human entanglements.

However, the natureship's current operationalization is also vulnerable to being hijacked by extractivist logic because it leaves open how the natureship can operate in moments of controversy and calamity. As the cases of this dissertation showed, knowledge

[7] See Lambooy et al. 2019 for their argumentation to propose *natureship*, and not a *natureboard*

controversies and calamities are important moments for ontological politics, in which bodies, risks, and response-abilities get shaped. Discussions about the Wadden Sea often involve scientific expertise in a prominent role (Floor, 2018; Turnhout et al., 2008). While it is important to include experts, their tendency to reinforce a singular reality that can only be legitimately known and represented by a singular scientific truth runs counter to the principles of posthumanist participation and will be unable to resist extractivism. If these dynamics were to repeat themselves in the natureship, this will be counterproductive. To enhance the chances that RoN in the Netherlands can prevent extractivist cooptation, and to ensure that the natureship presents effective legal innovation, this dissertation proposes an adaptation to Lambooy et al's (2019) proposal regarding the key task of the natureship.

The main potential of a natureship is to enforce procedures that generate participatory practices beyond the current focus on human participants and on scientific experts as those that can represent and speak for nature. The natureship can open up sites of participation to become multiplied and to be deliberately shaped by multiple human, nonhuman, and nonliving participants and multiple ways of knowing. As part of this proposal, I suggest focusing the attention on knowledge production sites and processes of remediation. These activities are often ignored in current participatory processes, and if they are included, it is with depoliticized terms such as *nature*, *expertise*, *truth*, or *rationality* which serve to domesticate potential resistance against extractivism (Barandiaran, 2020; Lahsen & Turnhout, 2021; Shriver et al., 2020; Tanasescu, 2022). Yet, they are politically powerful because they determine which worlds are given priority to unfold, and they should, therefore, also be treated as such. A natureship, then, can guide and enforce intentional processes of posthumanist participation that assess realities side by side without reducing one to the other and actively craft response-abilities by navigating between various realities (Landström et al., 2011; Lane et al., 2011; Law et al., 2014; Law & Singleton, 2013; Waterton, 2017; Whatmore, 2013). The key task of the natureship, then, would be to prevent dominant actors from singularizing reality, and to ensure that site- and issue-specific alliances collectively determine what knowledge and response-abilities are salient and missing, for which futures, and who benefits and who loses. Thus, the natureship could function as a key facilitator for establishing, opening up, and politicizing management and knowledge alliances that collectively determine what exists and how to determine it (Waterton, 2017).

When the main task of the natureship is to ensure politicized issue-specific alliances, Lambooy et al's (2019) proposal for appointed seats for conventional governance actors requires further scrutiny. It is important to point out that appointed seats are likely to

reduce natureships' chances for resisting extractivism because actors who represent predetermined agendas tend to close off processual, epistemic, and political openness and stimulate falling back on existing hierarchies (Lahsen & Turnhout, 2021; Waterton, 2017). While processual openness is perhaps less important when the natureship delegates decision-making tasks to site- and issue-specific collectives, appointed seats for institutional representation make the natureship vulnerable to the cooptation of dominant actors and of dominant extractivist ways of knowing and being. This point of hierarchy is particularly relevant because Lambooy and colleagues (2019) place natureships in the historical context of the democratic abilities of water boards. Although the water boards are often framed as the oldest democratic institutions of the Netherlands, the democratic valence of the water boards is not unambiguous and has been documented to be diminished shortly after the water board's establishments in the 12th century because the powerful nobility monopolized executive and legislative power for their enrichment (Kaijser, 2002). Contemporary water boards are also notorious for their lack of democratic legitimation, partially because they offer appointed seats to the contemporary powerful (landowners and industrial parties), although these are increasingly restricted for democratic reasons (Unie van Waterschappen, n.d.). This shows that the composition of the boards of natureships requires more critical examination, especially if my suggestion of the natureship as a facilitative institution rather than a regulatory one is adopted.

Rearticulating my proposals in the terminology of this dissertation, I suggest that a natureship can play a crucial role in resisting extractivist exploitation in the Wadden Sea if its institutional embedding can effectuate affective atmospheres that enact situated response-abilities and that can travel to other sites of participation. By delegating decision-making powers in structured ways, the natureship can play an important role in designing processes that stimulate such affective atmospheres. Importantly, every step in this process and every site of negotiation needs to be opened up to the multiplicity of realities and to explicitly resist universalist and extractivist practices – even when they seem to be used for the greater good of resisting extractivism. Acknowledging and acting on ideals of non-extractivism and plurality is required for RoN to not reproduce extractivist violence and harm. By incorporating the insights of this dissertation in the design of the natureship, RoN can gain transformative potential and prevent reproducing current patterns of domination. Without these adjustments, the responsible minister is right in her assessment that RoN does not have added value for protecting nature (*Beleidskader Natuur Waddenzee*, n.d.) because it will not be able to intervene in fundamentally extractivist patterns.

The popularity of RoN indicates a societal desire for new political imaginations, and posthumanist participation crucially feeds into the various efforts that actuate such re-imaginings. For democratic innovation to occur, actively dismantling extractivist re-enactments is as important as enacting non-extractivist entities and relations. This joint process of making and unmaking needs to take place in geographies of extraction, for which posthumanist participation and RoN could be helpful. Equally important for resisting extractivism is to intervene in relations in sites of consumption and political and economic centers, for which other movements, such as the degrowth movement and practices and theories aimed at regeneration, could be important allies. In combination, these movements provide exciting opportunities for democratic and legal innovation. A posthumanist participatory approach makes an important contribution to democratic politics by providing tools to open up and politicize relations and hierarchies in resource management.

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summary

samenvatting

Summary

In natural resource management, participatory procedures are increasingly called upon in institutional contexts to deliver just and democratic transitions towards sustainability. This results in top-down participatory processes that are organized by firms and governmental organizations, in which residents and other actors are – at best - invited to participate in decision making processes, but only in specific ways. Top-down participation, and its possibilities to stimulate democratic engagement, is based on specific assumptions about who can participate, which issues are relevant, and which achievements are desirable. This type of participation has been labeled as laboratory participation (Bogner, 2012), because it conforms to the standardized and hygienic conditions of laboratories in order to become credible. Laboratory participatory processes are critiqued in academic literature for failing to ensure the rights of marginalized or dissident communities and for failing to ensure democratic processes. Accordingly, many scholars studying participation advocate for more actively including (marginalized) groups in public engagement processes to enhance the democratic potential of laboratory participation in resource management.

However, even if laboratory participation would more comprehensively include marginalized groups, it would still fail to foster democratic resource management, because it is not designed to address the oppression that lies at the foundations of inequal and harmful resource management: extractivism. Extractivism signals a way of thinking that prioritizes extraction and commodification of materials into resources for maximum revenue. Laboratory participation is embedded in a democratic rhetoric that suggests an openness in decision-making processes, but in practice, these processes are restricted in their abilities to abort or prevent extractivist practices. This is partly because laboratory participation tends to conform to corporate interests and Euro-American understandings of democratic procedures, which excludes groups whose ways of life and modes of expression are incommensurable with the dominant procedures. Moreover, laboratory participation is based on a way of thinking that casts some beings as participants, and others as the background against which participatory processes play out. These latter beings are then rendered exploitable and sacrificable. Bringing out participation's democratic potential, then, requires addressing both the restrictions of predesigned processes as well as the 'sacrifice logic' (Braidotti, 2022) that organizes conceptions of participation.

For this reason, **Chapter 1** proposes an alternative conception of participation: posthumanist participation. In a posthumanist approach to participation, participation

encompasses all the processes that shape resource management instead of only those designed as such. This means that participation takes place through many ongoing processes, and that it is material and performative, which means that knowledge, issues, participants, and materials in resource management shape each other in an ongoing process. Importantly, these processes are situated in humanist legacies that problematically structure how participants should be understood, assessed, and regulated, and that privileges the human, white, male, able-bodied body. Starting from the premise that extractivist regimes and participation have evolved with humanism, and that they have thrived by exploiting those who continue to fall de facto outside of the domains of the humanist human, posthumanist participation addresses the sacrifice logic by deconstructing binary understandings of exploitable/non-exploitable bodies through tracing how these categories are made.

Therefore, the research objective of this dissertation is to explore how posthumanist participation in natural resource management takes place and whether and how it can resist extractivism. To this end, this dissertation draws on situations of ongoing resource management in the Dutch Wadden Sea, where gas, salt, and sand are extracted, relocated, and transformed. To trace posthumanist participation, and assess and enhance possibilities of participation to resist extractivism, the dissertation answers three questions: (1) How are participants enacted and excluded in the Wadden Sea's resource management?; (2) In a context of posthumanist participation, what does responsibility look like? And (3) How do I participate in resource management in my study of it, and how does this enhance understanding of posthumanist participation?

Chapter 2 gives an account of posthumanist participation in the context of impact assessments in salt mining by tracing how the subsurface becomes an active participant in resource management. The chapter describes how impact measurements have material consequences, not only because they steer decisions about mining, but also because they change the material reality they ostensibly only measure. As Barad (2007) notes, entities are constituted by actions, which makes it impossible to measure entities without changing them. I documented how in Friesland, a northern province in the Netherlands, several 'subsurfaces' were enacted through distinct sets of scientific measurements. The dominant assumption was that measurements measure a reality external to themselves, which resulted in the juxtaposing of several incommensurable subsurfaces, of which only one was considered to represent reality. In Friesland, this generated an impasse of pitting disparate pieces of evidence against each other, which ultimately allowed powerful actors to maintain their position as decisive arbiters of what

is real. This shows that determining which subsurface exists and can therefore participate in negotiations is a political process, and not (only) a techno-scientific one.

Chapter 3 traces how particular distinctions between humans, sea, and land create specific possibilities for responding to (the risks of) coastal change. The chapter describes how the coastal relations at barrier island Ameland enacted entities that were unable to respond adequately to a looming chemical spill. The chapter explains that this inability was partially a result of the coastal management activities produced by the coastal management regime, which focused on generating an amphibious, mixed land-sea interface. While dynamic management has enhanced abilities to respond to some risks – sea level rise and extreme weather events being the most prominent ones – it has not been able to address other risks that equally demanded a response. Most prominently, the resulting sets of coastal relations were unable to prevent the partial erosion of a polluted gas platform owned by the gas production company NAM. For almost sixty years, this polluted platform had waited to become profitable, but to no avail. Even when it became clear that this would not happen the NAM did not remediate the site, but instead made it invisible. While the platform and the risk for pollution were remembered and recognized by multiple Amelanders and coastal managers, the ways in which dynamic coastal management understood, structured, and distinguished humans, land, and sea prevented adequate intervention. Our analysis shows that to be able to respond to amphibious coastal dynamics, coastal relations need to be actively designed to enable diverse response-abilities, especially in times of climate catastrophes and crumbling coasts.

Chapter 4 investigates possibilities to design response-abilities by engaging through arts-based inquiry. Exploring the relation between humans and sand, the chapter shows that creative inquiry can generate atmospheres that stimulate sand and humans to develop affective relations. Affective relations refer to reciprocal exchanges between entities that change who they are and what they can do. In the experiment, affective relations arose when humans became enchanted by and skilled in their engagements with sand, and temporarily suspended their attention to other humans. The chapter shows that affective atmospheres can destabilize the boundaries between humans and sand by enabling new relations that bring more porous and more response-able bodies into being. The chapter also mobilizes the inherent interventional character of academic research, by probing the reader to consider the chapter itself as an affective atmosphere for altering their relations with sand.

Chapter 5 takes stock of contemporary understandings of participation in natural resource management by reviewing the literature on the Social License to Operate (SLO).

The SLO is a popular term in resource management and literature, and SLO-related practices and literature usually encourage participation to enhance corporations' societal legitimacy. Reviewing the SLO literature from a posthumanist perspective showed that SLO-related participation is limited to laboratory participation and that the literature dominantly conceptualizes participants as bound and static individuals that participate via predetermined procedures. Material dimensions of resource management are barely mentioned within the literature. Thus, SLO-related participation neither addresses the resource sectors' reliance on laboratory participation nor the sacrifice logic that perpetuates inequalities and power relations in resource management.

The **conclusion** describes that posthumanist participation is a useful concept to see participants as enacted and excluded through various world-shaping activities. This approach highlights that to be able to participate, participants need to be actively enacted, recognizably reproduced in other constellations to ensure their continued existence. To produce and reproduce participants, affective atmospheres are crucial. To account for the situatedness and inherent incompleteness of the knowledge produced in this dissertation, the conclusion also traces the relations that constituted the bodies and insights of the chapters. In doing so, the conclusion insists on considering the role of the organizing concepts and the conceptual journey of this PhD process, because it lays bare how academic research is often extractivist, and that resisting extractivism is ambiguous, messy, and situated.

This dissertation contributes to the discussion on extractivism, both within the Netherlands and more broadly, in two ways. First by documenting that one explanation for why governmental, techno-scientific, and corporate institutions fail to limit extractivist harm is because deeply embedded extractivist logics prevent the development of relevant response-abilities. Solely focusing on their individualized responsibilities, then, does little for addressing extractivist harm. Second, this dissertation contributes to the discussion on Dutch extractivism by showing that the Wadden Sea area has a bifold status, as it is both exploitable and the country's favorite landscape. This shows that the area harbors non-extractivist affective relations, which illustrates that the resources in the Wadden Sea are not only resources, which provides a basis for non-extractivist resource management. Resisting extractivism requires reproducing and emphasizing the multiple material realities of resources, preventing them from being reduced to a single entity or body.

To mobilize the insights of this dissertation in resisting extractivism, the chapter concludes by discussing the potential of the popular Rights of Nature movement (RoN). Relating the insights of this dissertation to a recent proposal to grant the Dutch Wadden

Sea rights shows that the proposal generates momentum and possibilities for resisting extractivist practices. However, the proposal is also vulnerable to being hijacked by extractivist logics, especially in cases of controversy and calamity.

Regardless of its vulnerabilities, the popularity of RON indicates a societal demand for new political and democratic imaginations. Embracing posthumanist participation in resource management can make established hierarchies beyond the human visible and can politicize them. For this innovation to occur, actively dismantling extractivist relations is as important as generating alternative non-extractivist ones.

Samenvatting

Participatieve procedures worden ingezet om te waarborgen dat natuurlijke hulpbronnen democratisch worden beheerd. Deze procedures worden meestal geïnitieerd door overheidsinstellingen of bedrijven, en zijn gebaseerd op specifieke assumpties over wie kunnen participeren, waarover de processen moeten gaan en tot welk doel zij dienen. Dit type participatie wordt ook wel laboratoriumparticipatie genoemd (Bogner, 2012), omdat het conformeert aan de gestandaardiseerde en hygiënische condities van laboratoria om geloofwaardig te worden bevonden. Kritische studies laten zien dat laboratoriumparticipatie niet kan waarborgen dat grondstoffenbeheer op een democratische manier plaatsvindt, omdat het weinig ruimte biedt voor (de belangen van) gemarginaliseerde of andersdenkende mensen. Deze studies bepleiten dat deze groepen actiever moeten worden betrokken in het grondstoffenbeheer om de democratische waarde van participatie verhogen.

Echter, zelfs als gemarginaliseerde groepen actiever betrokken worden en het beheer daarmee inclusiever wordt, dan nog is de democratische waarde van laboratoriumparticipatie beperkt. Dat komt doordat het niet ontworpen is om een bepaald type onderdrukking te adresseren, namelijk extractivisme. Extractivisme ligt aan de basis van ongelijkwaardige en schadelijk grondstoffenbeheer, en is een manier van denken die de onttrekking en commercialisering van materialen als belangrijkste doel heeft. Laboratoriumparticipatie is ingebed in een democratische retoriek die een openheid in besluitvorming suggereert, maar in de praktijk hebben participatieve processen beperkte mogelijkheden om extractivisme tegen te gaan. Dit komt deels doordat laboratoriumparticipatie zich vaak conformeert aan bedrijfsbelangen en Europees-Amerikaanse opvattingen over hoe democratische procedures er uit zien, met als gevolg dat groepen worden uitgesloten wier levenswijze en manier van communiceren niet verenigbaar zijn met de dominante procedures. Bovendien is laboratoriumparticipatie gebaseerd op een manier van denken waarbij sommige wezens als deelnemers worden beschouwd, en andere als achtergrond waartegen participatieprocessen zich afspelen. Deze tweede groep wordt daardoor exploiteerbaar en opofferbaar. Om de democratisch potentie van participatie te kunnen laten gelden, is het nodig om zowel de restricties binnen laboratoriumparticipatie als de 'opofferingslogica' (Braidotti, 2022) aan te pakken.

Daarom stel ik in **Hoofdstuk 1** een alternatieve opvatting van participatie voor: *posthumanistische participatie.* In een posthumanistische benadering van participatie omvat het begrip alle processen die grondstoffenbeheer vormgeven, en niet alleen de

processen die als zodanig zijn ontworpen. Dit betekent dat participatie plaatsvindt via vele doorlopende processen, en dat zij materieel en performatief is, wat betekent dat kennis, kwesties, participanten en materialiteit in grondstoffenbeheer elkaar in een voortdurend proces vormgeven. Een posthumanistische benadering erkent dat deze performatieve processen gesitueerd zijn in humanistisch gedachtegoed. Humanistische ideeën structureren op problematische wijze hoe participanten gedefinieerd, beoordeeld en gereguleerd worden: het bevoordeelt menselijke, witte, mannelijke en gezonde entiteiten en benadeelt allen die hier niet aan voldoen, inclusief de grondstoffen zelf. Posthumanistische participatie gaat uit van de premisse dat extractivistische regimes zich zij-aan-zij met humanisme hebben ontwikkeld en dat ze gedijen door diegenen uit te buiten die de facto buiten het domein van de humanistische mens vallen. Om deze opofferingslogica aan te pakken, helpt een posthumanistische participatieve benadering door middel van het deconstrueren van binaire opvattingen over exploiteerbare/niet-exploiteerbare entiteiten en door na te gaan hoe deze categorieën tot stand komen.

Dit proefschrift heeft als doel om te onderzoeken hoe posthumanistische participatie in grondstoffenbeheer plaatsvindt, en of en hoe zij weerstand kan bieden tegen extractivisme. Dit onderzoek is gebaseerd op actueel grondstoffenbeheer in en rondom de Nederlandse Waddenzee, waar gas, zout en zand worden gewonnen, verplaatst en getransformeerd. Dit proefschrift beantwoordt drie vragen: (1) hoe worden deelnemers in het grondstoffenbeheer van de Waddenzee bewerkstelligd en uitgesloten? (2) Hoe ziet verantwoordelijkheid eruit in een context van posthumanistische participatie? En (3) Hoe participeer ik in grondstoffenbeheer en hoe vergroot mijn participatie het begrip van posthumanistische participatie?

Hoofdstuk 2 geeft een beschrijving van posthumanistische participatie in de context van impact beoordelingen bij zoutwinning, door te onderzoeken hoe de ondergrond een actieve deelnemer wordt binnen grondstoffenbeheer. Het hoofdstuk beschrijft hoe impactmetingen materiele gevolgen hebben: niet alleen omdat de metingen beslissingen over zoutwinning sturen, maar ook omdat ze de materialiteit veranderen door haar te meten. Acties zijn constitutief voor entiteiten (Barad, 2007), wat betekent dat het onmogelijk is om entiteiten te meten zonder ze te veranderen. Ik heb gedocumenteerd hoe in Friesland verschillende 'ondergronden' tot stand kwamen door middel van verschillende sets aan wetenschappelijke metingen. De dominante aanname was dat metingen een werkelijkheid buiten zichzelf meten, wat ervoor zorgde dat verschillende onverenigbare ondergronden naast elkaar werden geplaatst, maar waarvan er slechts één werd beschouwd als representatief voor de werkelijkheid. In Friesland veroorzaakte dit een impasse waarin ongelijksoortige bewijsstukken tegen elkaar werden uitgespeeld,

waardoor uiteindelijk machtige actoren hun positie als scheidsrechter over wat echt is konden handhaven. Hieruit blijkt dat het een politieke zaak is om te bepalen welke ondergrond bestaat en kan deelnemen aan onderhandelingen, en niet alleen een technisch-wetenschappelijk zaak.

Hoofdstuk 3 onderzoekt hoe het maken van onderscheid tussen mens, zee en land implicaties heeft voor de mogelijke reacties op kustverandering. In de context van Waddeneiland Ameland beschrijft het hoofdstuk hoe de verschillende Amelandse kustrelaties niet in staat waren om adequaat te reageren op een dreigende verontreiniging. Dit onvermogen was deels het gevolg van kustrelaties die gevormd werden door kustbeheer. Dit kustbeheer was gericht op het genereren van een amfibisch, dynamisch grensvlak tussen land en zee. Hoewel dynamisch kustbeheer beter reactiemogelijkheden genereert voor de risico's van zeespiegelstijging en extreme weersomstandigheden, is het niet in staat gebleken om te anticiperen op andere risico's die evenzeer een reactie vereisten. Meer specifiek: de kustrelaties konden niet voorkomen dat een vervuild gasplatform van de NAM in 2019 deels verwoest raakte door kusterosie. Dit platform lag bijna zestig jaar tevergeefs te wachten op exploitatie. Ook nadat duidelijk werd dat exploitatie uitbleef, saneerde de NAM het terrein niet. In plaats daarvan maakte de NAM het platform op verschillende manieren onzichtbaar. Hoewel het risico op vervuiling door meerdere Amelanders en kustbeheerders werd herkend en erkend, werd een adequate interventie verhinderd door de manier waarop mens, land en zee werden gestructureerd binnen het kustbeheer. Uit de analyse blijkt dat kustrelaties actief moeten worden ontworpen om diverse reacties mogelijk te maken binnen de amfibische kustdynamiek, met name in tijden van klimaatrampen en afbrokkelende kusten.

Hoofdstuk 4 bestudeert hoe kunstzinnig onderzoek ingezet kan worden om reactie-mogelijkheden te beïnvloeden. Het hoofdstuk onderzoekt de relatie tussen mensen en zand en laat zien dat creatief onderzoek atmosferen kan generen die een affectieve relatie tussen zand en mensen stimuleert. Affectieve relaties zijn uitwisselingen tussen entiteiten die veranderen wie ze zijn en wat ze kunnen doen. In het creatieve experiment kwamen affectieve relaties tot stand toen mensen betoverd werden door en vaardig werden in hun omgang met zand, mits zij tijdelijk geen aandacht besteedden aan andere mensen. Het hoofdstuk laat zien dat affectieve atmosferen het onderscheid tussen mens en zand kunnen destabiliseren en nieuwe relaties mogelijk maken met meer responsiviteit. Het hoofdstuk mobiliseert ook het feit dat academisch onderzoek zelf een interventioneel karakter heeft door de lezer uit te nodigen om het hoofdstuk zelf te beschouwen als een affectieve atmosfeer die de lezers relatie met zand kan veranderen.

In **Hoofdstuk 5** wordt de balans opgemaakt van de hedendaagse opvattingen over participatie in grondstoffenbeheer door de literatuur over de Social License to Operate (SLO) te evalueren. De SLO is een populaire term in grondstoffenbeheer en de literatuur daarover, en SLO-gerelateerde praktijken moedigen participatie aan om de legitimiteit van bedrijven te vergroten. Door de SLO-literatuur vanuit een posthumanistisch perspectief te bestuderen blijkt dat SLO-gerelateerde participatie beperkt blijft tot laboratoriumparticipatie en dat de literatuur de participanten overwegend conceptualiseert als gebonden en statische individuen die deelnemen via vooraf bepaalde procedures. Meer-dan-menselijke relaties worden nauwelijks genoemd als belangrijk voor participatie. SLO-gerelateerde participatie heeft daardoor weinig mogelijkheden om weerstand te bieden aan extractivisme, omdat het vertrouwt op laboratoriumparticipatie en de opofferingslogica binnen grondstoffenbeheer niet aan de kaak stelt en het daardoor machtsrelaties binnen grondstoffenbeheer reproduceert.

De **conclusie** beschrijft dat posthumanistische participatie een nuttig concept is om deelnemers te zien als effecten van hun relaties die ontstaan door verschillende wereldvormende activiteiten. Deze benadering laat zien dat om te kunnen participeren, participanten actief moeten worden gemaakt, dat participanten op herkenbare wijze in andere constellaties moeten worden gereproduceerd om voort te bestaan, en dat voor het maken en reproduceren van entiteiten affectieve atmosferen van belang zijn. In de conclusie wordt ook erkend dat de kennis geproduceerd in dit proefschrift gesitueerd en inherent onvolkomen is. Door stil te staan bij de rol van concepten en de conceptuele reis van dit doctoraatsproces legt de conclusie bloot hoe academisch onderzoek vaak extractivistisch is, en dat weerstand bieden dubbelzinnig, rommelig en gesitueerd is.

Dit proefschrift draagt op twee manieren bij aan de discussie over extractivisme binnen en buiten Nederland. Ten eerste door te documenteren dat overheids-, techno-wetenschappelijke en bedrijfsmatige instellingen er niet in slagen om extractivistische schade tegen te gaan, en door dit te linken aan het diep ingebedde extractivistische gedachtegoed wat veel relaties in de Waddenzee vormgeeft. Een exclusieve focus op individuele verantwoordelijkheden draagt weinig bij tot het aanpakken van extractivistische schade omdat het niet meer responsiviteit produceert. Daarnaast laat dit proefschrift zien dat het Waddengebied een tweevoudige status heeft; het gebied wordt exploiteerbaar gemaakt, maar is tegelijkertijd Nederlands favoriete landschap. Dit toont aan dat het gebied niet-extractivistische affectieve relaties herbergt, wat duidelijk maakt dat de materialen in de Waddenzee weliswaar hulpbronnen zijn, maar niet alleen maar. Dit biedt een basis voor grondstoffenbeheer wat niet gebaseerd is op extractivisme. Om dit alternatieve grondstoffenbeheer te realiseren, is het noodzakelijk om de meervoudige

relaties van grondstoffen te reproduceren en te benadrukken, en om te voorkomen dat ze gereduceerd worden tot een enkelvoudige entiteit.

Het hoofdstuk sluit af met een bespreking van de potentie van posthumanistische participatie binnen de wereldwijd groeiende natuurrechtenbeweging. Er is een groeiende roep vanuit de Nederlandse samenleving om de Waddenzee rechten te verlenen, wat recentelijk uitmondde in een serieus en concreet politiek voorstel. Op basis van de inzichten uit dit proefschrift blijkt dat het voorstel in belangrijke mate maatschappelijk momentum en politieke mogelijkheden genereert voor verzet tegen extractivistische praktijken. Tegelijkertijd is het voorstel in haar huidige vorm ook kwetsbaar voor kaping door extractivistische ideeen en praktijken, vooral wanneer er in de praktijk controverse ontstaat of calamiteiten zich voordoen. Om ervoor te zorgen dat het geven van rechten aan de Waddenzee daadwerkelijk leidt tot bescherming van niet-extractivistische relaties is het nodig dat alle activiteiten die beslissen over wat bestaat of niet open staan voor de mogelijkheid dat er meerdere werkelijkheden naast elkaar bestaan; het reduceren van deze meervoudigheid tot een enkele werkelijkheid maakt grondstoffenbeheer kwetsbaar voor het reproduceren van extractivistische schade.

De populariteit van de natuurrechtenbeweging duidt op een groeiende maatschappelijke roep om nieuwe politieke en democratische denkbeelden. Door posthumanistische participatie te omarmen in grondstoffenbeheer ontstaat er een mogelijkheid om gevestigde meer-dan-menselijke hiërarchieën aan het licht te brengen en te politiseren. Hiervoor is het even noodzakelijk om extractivistische relaties actief te ontmantelen als om alternatieve, niet -extractivistische relaties te genereren.

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dankwoord

Acknowledgements | Dankwoord

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WASS certificate

Marieke Evelien Meesters
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
A1 Managing a research project			
WASS Introduction Course	WASS	2018	1
'Soil/water or soilwater: how different agential cuts muddle participation in salt extraction'	WASS PhD Day 2020, Wageningen	2020	0.5
'When the sea eats the drilling site: contested temporalities between coastal management and the natural gas industry'	WASS PhD Day 2021, Wageningen	2021	0.5
'Posthumanist participation in natural resource governance'	WASS PhD Day 2022, Wageningen	2022	0.5
'The frozen archives: the myth of knowledge aggregation in resisting mining'	cIDA, Univerrsity of Essex	2021	1
'What does social acceptance have to do with legitimacy?'	EU Raw Materials Week, satellite	2019	1
Scientific writing course	Wageningen in'to languages	2019	1.8
Review papers	Environmental Sciences and Policy	2021	1
A2 Integrating research in the corresponding discipline			
Interpretive Policy Analysis summer school: Conflict and sustainable futures	WASS	2018	3
Braidotti Summer School – Posthumanist knowledge(s)	UU	2019	2

Natural Resources and Conflict: Theorizing governance, resistance and violence	WASS	2018	3
Ethnographic Methods	AISSR	2019	4
Critical Perspectives on Social Theory	WASS	2018	4
B) General research related competences			
B1 Placing research in a broader scientific context			
Funds applications science-arts	Prins Bernhard Cultuurfonds	2021	3
Participation in international working group on SLO		2019	1
Visual methods course	WASS	2019	2
Project lead inclusivity (FNP + WCSG)	WUR	2021-2022	2
B2 Placing research in a societal context			
Ensuring SLO is adaptive and resilient	3rd SLO workshop MIREU	2019	0.5
C) Career related competences/personal development			
C1 Employing transferable skills in different domains/careers			
Competence assessment	WGS	2018	0.3
WASS PhD Council membership + WPC Council membership	WASS + WGS	2019	2
Total			**34.1**

*One credit according to ECTS is on average equivalent to 28 hours of study load

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