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## **Mud: deltas dealing with uncertainties**

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2016

### ***document version***

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### ***citation for published version (APA)***

Zegwaard, A. (2016). *Mud: deltas dealing with uncertainties*.

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## SUMMARY

Deltas are dynamic environments to live in. They provide favourable conditions for the production of food through their fertile soils and the transportation of goods over the rivers and to the sea. Quite paradoxically these favourable conditions at the same time house severe threats for life in these regions: rivers tend to flood, sea levels rise and lands tend to subside. The productive yet cruel nature of deltas has gained renewed consideration through the international attention for the effects of climate change. It are these circumstances under which Dutch delta planners have been particularly active, resulting in the formulation of delta plans not only for their own Dutch Rhine-Meuse-Scheldt Delta, but also others around the globe including the Mekong Delta in Vietnam and the Ganges-Brahmaputra-Meghna Delta in Bangladesh. Though deltas are iconic and stereotypical victims of climate change, there are no pre-set boundaries as to where they begin and end. In this setting it is the objective of this PhD thesis to explore how different (versions of) deltas are understood by looking at practices that bring deltas into being as policy objects and through this analysis conceptualizing the differences and similarities between these (versions of) deltas.

Looking at the interactions between deltas as objects of policy intervention on the one hand and the ways in which these deltas are understood on the other, this thesis sets out to treat the conceptual and the empirical on the same level. Drawing upon a post-Actor Network Theory analytical vocabulary, in particular the works of John Law and Annemarie Mol, this study examines the enactment of deltas through multiple ontologies. Understanding deltas as performative, enacted entities, the study explores how deltas emerge as objects of policy intervention, how this emergence is related to particular ideas of expertise and authority, and in what terms deltas are defined and understood. The overall research question of this dissertation is: How to understand current day practices of dealing with deltas as politics of ontology? In order to come to an answer four subsequent chapters have been devised to explore the topic from four different perspective, consequently with four different audiences. These audiences are broadly: interdisciplinary climate change scholars; water studies scholars; scholar with an interest in science and technology studies; and environmental planning scholars.

The first chapter is titled 'climate change and ontological politics in the Dutch delta'. This chapter describes how complexity, uncertainty and ignorance are being dealt with in the Netherlands, looking at how knowledges are produced and incorporated in decision-making on uncertain climate change. On the basis of work done in the Netherlands, this chapter shows two things in particular. First, it illustrates how decision making responses historically have been subject to change under influence of floods and how the emergence of climate change has significantly altered these floods. Second, based on the analysis of processes of dealing with a blue green algae problem in a lake, it shows that climate change not only influenced decision making responses, but also impacted the very reality that is being enacted. Consequently, this brings an ethical dimension to the fore, related to the intrinsic tension between the growing awareness that "all is interconnected" on the one hand and the realization not everything can be taken into account on the other.

After this exploration, the knowledge-policy interfaces are examined more in detail in the chapter 'inside matters of facts: reopening dams and debates in the Netherlands'. Both civil engineering and environmentalism strongly influenced the development of water governance in the Netherlands in the 20th century. Most research on the topic has focused on these aspects separately. This chapter maps the interaction between governance, technology and ecological systems in the Netherlands, to provide insights into how these are interacting. The analysis is based on a combination of a literature study and an empirical case study on the debates concerning the reopening of the Philipsdam, in the Southwest Delta of the Netherlands. It shows how the negotiations that took place enacted a particular Philipsdam reality, which both increased the complexity of decision-making concerning the dam itself and radiated outwards to affect other parts of the Dutch water system. It concludes that the process of constructing facts and the way these are framed once they have been established as facts are both intrinsically political and reflect the multiplicity of views of how the lake works and what the problem is, and how these views are incompatible at times. As such, ontological complexity is ingrained in what is represented as facts and severely complicates an apparently matter of fact decision to reopen a dam.

Following this the chapter 'delta formations: delta planning, the future and ontological multiplicity', will start branching out to non-Dutch deltas. In

instances of high uncertainty scientific experts occupy the difficult intermediary position between having to provide clean cut answers to policy makers' questions on the one hand while dealing with fluid, unclear and uncertain knowledge of problems on the other hand. Many researches have studied ways to optimize the process of knowledge production at the science-policy interface, predominantly focusing on ways in which uncertainties are or should be dealt with. This chapter looks at the other side of the same coin, it looks at the construction of a consistent object, exploring what happens when in this case a delta is formed as an object, looking at how futures are produced to give body to this object. It describes how the formation of the delta as an object takes place along two lines: partiality and enactment. The production of futures has functioned as a powerful tool in defining the specifics of the deltas.

The last building block that will enable this thesis to formulate an answer to its main research question is presented in a chapter titled 'the delta diagnosis: on the sociomaterial enactment of the Dutch, Bangladesh and Mekong Deltas'. This chapter applies a fractality approach to the same deltas as discussed in previous chapters. Unlike the other chapters it does not directly look into delta planning processes. Instead it looks in a more environmental historical way at how these deltas have been dealt with. It looks at processes of separation: the separation of waters and lands, good water and bad water. Furthermore, it looks at the (geo)political economies that are shaping and get shaped by these separations. Finally, it discusses what this means for regarding deltas as fractals, by discussion how the similarities that can be observed in these various attempts to make distinctions in these deltas.

Returning to its main research question on how to understand current day practices of dealing with deltas as politics of ontology, this thesis concludes by opting to think about deltas as multiple nor singular, but as fractal. Fractal not in the mathematical sense of the word, but as environments that simultaneously have strong resemblances and differences. Similarities and differences not only over time and space, but temporal and spatial properties of deltas understood as enacted. The thesis concludes that Deltas are to be understood as muddy. Muddy not just in the sense of physically being composed of a mixture of land and water, but also as mouldable policy objects, as moving targets.