

Regulating water, ordering society

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Practices and politics of water governance

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door

Margreet Zwarteveen

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Water engineers: heroes of modernity and progress

In the not so distant past, choosing a career as a water expert was among the obvious choices when one had the aspiration to become a hero. Water engineering education granted its bearer – provided he was white and male, but that went without saying – with the scientific credentials as well as the moral superiority to re-shape large areas of land, and alter the courses of rivers, in the name of progress and modernity. The efforts of water engineers working in developing countries epitomized ‘the white man’s burden’, the poem Rudyard Kipling wrote in 1899. In it, he put forward the suggestion that white men had a moral obligation to rule over, and encourage the development of, people from other ethnic and cultural backgrounds until they could take their place in the world by fully adopting western ways.

Referring to Dutch engineers working in Indonesia, Ravesteijn maintains that they “... were involved in a heroic struggle to conquer challenging tropical water streams. They did this far away from home, in a deadly climate, and in circumstances that were also extremely harsh otherwise. Especially the pioneers among the builders of monuments were true heroes in the eyes of later generations of engineers.” (Ravesteijn, 1997: 7). Men like “Willcocks (Willcocks, 1935) and Cotton (Hope, 1900) in India and Egypt, de Bruyn in Indonesia (Ravesteijn and Kop, 2008), van der Heide in Siam (ten Brummelhuis, 2007), Godard in Tonkin (Vésin, 1992), and Bélime in French Sudan (Mali) (Schreyger, 1984)” (Molle et al., 2009: 329) likewise maintain a glorious existence in the memories of today’s water engineers: in statues raised in their honour at the intakes of the irrigation systems they originally designed, as well as in historical accounts of their marvellous accomplishments.

Also in the Netherlands, many would agree that water engineers – men like Cornelis Lely and Johan van Veen – have “laid the foundations” (Woud van der, 2007) for the country’s current modernity and prosperity.¹ Some would even argue that a small group of water engineers, together with Thorbecke, made the Netherlands what it is today by initiating a number of large infrastructural works that would once and for all change the the country (Woud, van der, 2006). In the words of Auke van der Woud: “These men were not desk-experts, but real field workers who studied water and the rivers in a scientific way. They understood the rivers. What they achieved is without precedent.” (Interview in *De Volkskrant*, 20-10-2007, translation mzz). As van der Woud shows, the construction and management of these new and huge infrastructural works demanded and went accompanied with parallel transformations in law and governance, thus laying the basis for the entire

organisation of the Dutch state – and some would say forming the essence of Dutch identity and culture in the process.²

The continued appeal of such stories lies in how they combine ideas about the malleability of society – ideas that it is possible to control, design and re-shape landscapes, water flows as well as societies – with comforting beliefs in the existence of visionary, courageous and intelligent leaders – men to whom ‘we’ can delegate the responsibility to look after ‘our’ waters, men in short who will look after us. Actively cherishing these stories is of course also commercially attractive: that the Dutch understand water and know how to control it, for instance, is part of a carefully nurtured marketing tale that helps the 3000 Dutch companies dealing with water technology stay in business.³

Today’s water problems are not less challenging than those of the past. The oft-repeated reminders that increases in rates of use and extraction are by far exceeding levels of population growth; declarations of water crises as the top threat of the next decade (at the recent World Economic Forum); estimates of the billions of people who in the not-so-far future will live in areas plagued by water scarcity; accounts of how climate change is endangering the water- and food security of many of the world’s poorest people; the proliferation of water-related conflicts; reports about droughts in Sao Paulo or the San Joaquin Valley in California – and I could go on and on – all make water into one of the more prominent topics on contemporary political agendas.

Some argue that because of their urgency, solving water problems requires new water wizards⁴ and heroes:⁵ new courageous visionaries who speak and act on behalf of both nature and society. I am much less sure that new water heroes are possible and desirable. Disappointments about the lack of hospitality of the water profession to women (for of course I would have wanted to be one of those heroes), and feminist misgivings of father-figures may partly explain this. But my reservations about the desirability of new water heroes are also linked to the realization that the meanings of the terms ‘water’ and ‘knowledge’ have radically changed over the past thirty to forty years, in the process also altering the terms of existence for water heroes.

Changes are importantly fuelled by the social and ecological disasters provoked by large infrastructural projects – the Sardar Sarovar Dam in India has become an iconic example (see Mehta, 2007; Roy, 1999) – which (among the many other debates they provoked) have called into question the contents and cultures of engineering water knowledge. Changes also stem from more fundamental doubts about the possibility to combine economic growth with efficiency and environmental conservation.⁶ Linked to critical insights into how development in some places was and is achieved at the cost of mal- and underdevelopment elsewhere, insights into how wealth and poverty are con-

nected by unequal terms of trade that are maintained through economic, political and military powers, such changes further call into question whether yesterday's wisdoms can help solve the water problems of today and the future. Together, they have seriously shaken up the belief that science and engineering will lead to ever increasing levels of progress and modernity⁷ – a belief that provided an important justification and sense of mission to colonial engineers. It probably never was that straightforward or easy, but it is less possible now than it ever was to simply posit and assume positive linkages and synergies between 'water', 'knowledge' (or engineering) and 'development' (or improvement).

I would like to use my lecture today for a reflection on the implications of the changes in the terms of the water debate for ways of knowing and intervening in water, for ways of thinking and doing water governance. My effort here can perhaps be likened to the making of a rough sketch of the contours and coordinates of today's water governance questions, a sketch that forms the starting point for producing a map – or more likely a set of maps, each with their own legends, colours and scales – to demarcate the areas and domains in which today's water experts and professionals navigate and operate. I have two important starting points and motivations for this exercise: the first is concern about the equity and sustainability of prevailing water (and water rights, incomes, risks) distributions, and the second is the recognition that the distributional questions that form the heart of water governance are always contested and disputed. I use my lecture, in other words, to explore ways of engaging with water governance questions that acknowledge (rather than conceal) that these questions are always deeply political.

Changes in water as an object of knowledge and intervention

Let me first say something about how the meanings of water – as an object of knowledge and intervention – have changed over the last decades. There are at least three sets of changes. First, different from the golden era of the hydraulic mission (Molle et al. 2009), today's dealings with water no longer just are about the development and construction of new projects.⁸ Instead, they are about how to save and conserve water and allocate it among competing uses and users. Where water used to be considered as something that could and should be usefully captured and made available to people, today's main challenge is how to make best use of available sources without compromising future availability and the functioning of ecosystems. This shift is associated

with the closure of river basins – meaning that all available water is allocated and no single drop flows out of the basin (see for an example Molden et al. (2001) and Molle (2003)) – and with the so-called ‘green turn’ (Disco 2002): a radical re-appraisal of the importance of the environment (nature), both for its own sake, as well as for ‘the services and values’ it provides to society (see for instance Costanza et al. 1997; de Groot et al. 2002; Goldman 2002) – a re-appraisal epitomized in phrases like: building with nature and room for the river. Concerns about the water-related consequences of climate change (floods, droughts, extreme weather events) are introducing further changes in the meanings of water, with terms like fear, risk and uncertainty becoming an ever more familiar part of water vocabularies.

A second important change is that where water development and management used to be the exclusive realm of state agencies, water is now ‘governed’ by a multitude of actors and parties.⁹ Alongside a shift in managerial attention from the infrastructure to the resource, and increasingly from the resource to the ecosystem, there is a paradoxical decentralisation of responsibilities to private companies and civil society organizations. There is also a multiplication of experts – including economists and restoration ecologists – who are involved in water regulation and decision making. Instead of (or in addition to) government forms of regulation, free markets (or market mechanisms) are now increasingly relied upon for effectively and efficiently allocating water among competing uses and users, while private sector actors are expected both to mobilize the funds needed for constructing new water infrastructures, as well as to manage (or operate) water resources and systems and provide water-related services in an efficient manner (Ahlers 2010, Bauer 1997; Zwarteveen 2006; Bakker 2009; Budds 2009). The meanings of water citizenship are changing in the process: instead of participation in the public realm, consumption in the private realm becomes its defining feature.¹⁰

The greater reliance on private actors and market mechanisms goes accompanied with the use of market metaphors in the languages used for steering, understanding and justifying the modes of operation of water managers and decision makers at different scales, even if these are public agencies, civil society organizations or informal water providers (Ahlers et al. 2014; Bakker 2009; Boelens and Zwarteveen, 2005; Ahlers and Zwarteveen 2009). In the process, water management and governance procedures become redefined and restructured, blurring the very distinctions between private and public or between formal and informal (Ahlers et al. 2014, Bridge and Perreault 2009). Some refer to such changes with words like integration or adaptation, and others denote them as shifts to *polycentricity* (Andersson and Ostrom, 2008;

Lankford and Hepworth, 2010) or characterize them as a Habermasian turn to deliberation (Neef, 2009).

A third and related change is that water concerns seem to increasingly cross administrative and national boundaries. This happens in at least two ways. First, although actual water distributions happen at local and basin levels, they are ever more subject to the dynamics of the global economy (Vos and Boelens, 2014). The 4,800 litres that it takes to produce a hamburger is just one example. That I can go to my supermarket and buy grapes that were cultivated in the desert of Maharashtra (Larrington-Spencer, 2014) or mangos on the desert coast of Peru¹¹ is another. The financing of large dams for the production of hydropower in the Eastern Himalayas under the Clean Development Financing Facility, as part of mechanisms to off-set Northern carbon dioxide emissions is yet another (Erlewein and Nüsser, 2011). The existence of such global linkages prompts troubling questions about how benefits and burdens of accessing water are distributed, and about how to democratically control water decision making. How fair or wise is it that water from the deserts in Maharashtra or Peru is used so that I can eat grapes or mangos in the Netherlands? Does the production of these cash crops increase incomes of producers and labourers enough help improve their food security, and how are such incomes distributed?¹²

A second way in which water governance ‘jumps scales’ is that water problems are increasingly seen as being global in nature. A new “global water regime... prescriptive rules and standards of appropriate behaviour meant to govern water-related actions on a global scale” (Conca 2006: 1-2) seems to be emerging, a regime that through the use of specific conceptual languages and forms of expertise (mostly modelling and economics (Vos and Boelens 2014)), links the treatment of water as a scarce and ‘therefore’ economic good to forms of representation and calculation that make its meanings and values commensurable across places and times. In the process, knowledge gets detached from meanings, from embedded experiences (Jasanoff 2010).

These three sets of changes set the scene for how current water-related questions are perceived and addressed, and for how solutions are proposed or contested. Although competition for water is increasing, the question of who is responsible for making allocation priorities or steering distributions is becoming ever less clear, while precise information about the nature and direction of water flows is often lacking. Through the combined effects of multiple new (in particular, private sector) actors; ‘invisible’ and globalising market-based allocation mechanisms; and global policy institutes and directives,

questions of how to democratically control water decisions, and of whom to hold responsible for them, are becoming ever less transparent and more complex.

Changes in knowing water

Alongside – and linked to – these changes in the meanings of water, ideas about what it means ‘to know’ water have also undergone changes. In the past, engineers and scientists were seen as talking value-free truths to power. Indeed, the authority and legitimacy of water scientists and engineers importantly rested on a perceived division of labour between academia, markets and politics. Now, the idea of science and technology as distinguishable or even in opposition to power, markets or politics is making place for new ones which acknowledge how knowledge, power, markets and politics are mixed in ways that are difficult to disentangle.

Attempts to theorize and think through the implications of these entanglements are producing new definitions of water and water problems, new ontologies, as well as proposals for new ways of organising processes of knowledge production. As for the first, many of the newly proposed ontological definitions aspire to capture the idea that nature and society are not two distinct phenomena or domains but instead are always already implied in each other. Hence, rather than explaining the behaviour of water by referring to some natural watery essence – a hydrological core¹³ – and explaining the behaviour of people by referring to some humanist essence, emerging theorizations propose considering water and people in their mutual interactions, positing that they exist and indeed ‘are’ because of and through each other. This interdependence is mediated by technologies, institutions and labour as well as by words, languages and discourses (laws, norms, beliefs, cosmologies).¹⁴ One of the useful but also puzzling effects of such definitions is that they shift questions from the indisputable domains of nature, biology or technology (domains only accessible by an exclusive group of experts) to the contingent domain of society and politics. This opens them up for debate, widens definitions of expertise and multiplies the number of knowers.

Water scholars for instance propose terms like ‘waterscapes’ (Swyngedouw 1999; Baviskar 2007) ‘hydrosocial networks’ (Bakker 2010) or ‘hydrosocial cycles’ (Boelens 2014; Linton and Budds 2014) to express that the growing pressures on water resources, as well as the resulting scarcities, are not natural processes but the outcome of specific histories and practices of water re-

sources exploitation or ‘development’.¹⁵ By questioning the nature-culture (or technology-society) divide, these ontologies also question the very foundations of scientific knowledge production. Most importantly, they call into question the possibility to see and know from an unidentified position, something Haraway calls the god-trick: “the false vision promising transcendence of all limits and responsibility” (Haraway 1991).

A different type of new approaches for defining and knowing water stem from ideas that many problems in water are *complex*, or some would say *wicked*, problems. Wicked problems are clusters of interrelated problems, characterized by high levels of uncertainty, a diversity of competing values and decision stakes and a multitude of interest groups who may have different world views and different interpretative frames. The solution to wicked problems depends on how the problem is framed and vice versa: the problem definition depends on the envisaged solution. The implication is that scientific or engineering knowledge always is part of the problem, and not independent from it (Norgaard et al. 2008). Solving wicked problems is an open-ended process full of surprises and unknowns. ‘Normal’ scientific knowledge, which proceeds as if causes and effects are known or knowable is of little use for solving wicked problems, or for dealing with complexity. Complexity thus needs to be attended to differently.¹⁶

New definitions of water and of water problems go accompanied with new ways of expressing what scientists do. Where scientists were seen to ‘discover’ realities and the laws of nature or societies, new ways of speaking about science say that scientists ‘construct’, or even ‘perform’ them, and that knowing is intervening in and direct material engagement with the world (Barad 2007).¹⁷ Or, rather than representing the world ‘as it is’, emerging ways of indicating what knowledge is for instance talk about performance or enactment (Law 2004, Mol 2002).¹⁸ Such terms express that knowledge is always based on prior identifications, assumptions and specific boundary conditions, and linked to specific histories, cultures and socio-material projects. Particular ontological constructions and conceptual choices, just as particular technologies and policy options, stem from, are related to, favour and help bring about certain ways of ordering the world – and of distributing wealth and risks – and not others. This does not mean that anything goes, or that it becomes impossible to judge less from more accurate knowledges, but it does mean that developing awareness of, and becoming accountable for, the choices inherent in cherished ways of knowing and intervening becomes itself an important feature of good science: which possibilities (for being and relating) do specific orderings (categorisations, taxonomies, abstractions) create

and for whom, and which ones do they foreclose? Are alternative modes of ordering possible (Law, 2004)?

Where the defining features of scientific truth and objectivity used to be universality, detachment and transcendence, new norms of objectivity talk about engagement and 'situatedness' (Haraway, 1991), or pragmatically define truth as 'that what works'. Social studies of science and engineering have shown that the production of water 'facts' happens in specific places – that it is a located activity, rather than a universal or place-less one – by specific people, who have identities, bodies, cultures, and interests. To make scientific facts travel – or to help them become mobile, generic and universal – requires hard work of the involved actors.¹⁹ Part of this work is performative, and has to do with packaging them in languages, clothes, shapes and forms that are recognized and appreciated as carriers of truths (Liebrand 2014; Zwartveen 2008, 2011). A white male body may help, for instance, provided the person performing that body behaves according to specific historical and cultural gender scripts. So does wearing a professorial gown, for that matter.

Appreciation of the entanglements of science and society – the realization that scientific knowledge always already is part of this messy world – and of the concept-dependence and situatedness of truth claims, together with a much greater acceptance of the contingencies and complexities that characterize water situations, are leading to a thorough rethinking of how to produce good water science, and of how to distribute expertise. This is happening in at least three ways: the development of more inter- or transdisciplinary modes of analysis (Jansen 2009; Mollinga 2008); the recognition of – and proposals for – dealing with a plurality of many partial and finite knowledges (Gyawali and Dixit 2001); and ideas for organising and increasing public engagement (the participation of non-academic stakeholders) in science and science-based policy (Whatmore 2009, Jasanoff 2004). Possible names for new knowledge production proposals are mode-2, discursive (Norgaard et al. 2009) or post-normal knowledge (Petersen et al. 2011). These are associated with new integrative or adaptive ways of managing or governing, and have in common that they put much greater emphasis on the ability to adapt to uncertainties and on the organisation of dissent. In short, rather than making difficult political questions disappear from scientific debate by treating science and politics as different domains, these are proposals to explicitly acknowledge and deal with the entanglements between science and politics (or science and society).

Water governance as the organisation of distributions (1)

The changes in water as an object of knowledge, and in ways of knowing water that I just sketched form the background of the research agenda I would like to propose. Together, they are prompting re-consideration of what water problems are and according to whom, about how they can be known and solved, and about how processes of water decision making are (or should be) coordinated and organised. Motivated by concerns about the justice of contemporary solutions to water problems (see Schlosberg 2004, Joy et al. 2014, Zwarteveen and Boelens 2014), I like to read them as questions about water *distributions* and their organisation and coordination: distributions of water (and of water related rights, risks, responsibilities, benefits and incomes), as well as distributions of (scientific or political) voice, power and authority. Importantly, questions include those about the linkages between these different distributions: how do specific (policy or scientific) ways of ordering realities and producing knowledge relate to (inform, help produce and are informed by) specific ways of organizing distributions of water, and how do specific ways of organizing power and authority relate to (help produce or bring about) actual distributions of water?

Many existing studies of water assume or prescribe rather than question and investigate such distributions and their linkages. This is partly a reflection of the instrumental and engineering nature of much water knowledge, and is linked to the fact that water experts are trained and requested to diagnose problems in ways that match the kinds of solutions that fall within their repertoire. As my colleague Pieter van der Zaag always says: “We have the solutions. Now we just need to find the problems that match them”. Yet, thinking and analysing in terms of solutions performs water realities in distinct ways, something that Tania Li refers to as ‘rendering technical’. Rendering technical is a shorthand for a set of practices which display “the domain to be governed as an intelligible field with specifiable limits and particular characteristics ... defining boundaries, rendering that within them visible, assembling information about that which is to be included and devising techniques to mobilize the forces and entities thus revealed” (Rose, 1999: 33 quoted by Li, 2007: 7). Rendering technical simultaneously renders nonpolitical: it places questions of distributions and of the societal orders these presume and produce outside of what is debatable.²⁰

While sympathetic to the ‘will to improve’ (Li, 2007) that characterizes such solution-oriented analyses, I prefer not to start inquiries into distributions from ideas and assumptions about what and how they are or should be. Instead, I propose to make questions about the what, how and why of distri-

butions the very centre of the study of water governance. By doing this, I intend to open them up for dialog, as part of a process to identify and illuminate new opportunities – spaces, pathways, collective actions – to question and critically assess them from social and environmental perspectives. How do distributions happen, through which technological, institutional and organisational arrangements? And how are and can they be known, made intelligible? Studies of distributions are studies of how connections are made, but also of how divisions and choices happen, and about how they come about through the cultural production of difference.

Before I continue, allow me to share some stories of water distributions with you. To create some impression of logic, I have categorised these in three: (1) distributions of water, (2) distributions of voice and authority and (3) distributions of knowledge and expertise.²¹

Stories of distributions (1): distributions of water

Many of the water distribution questions that I am currently trying to make sense of concern the transfers of water that are taking place in many rural regions of the world, from lower-value food crops to higher value commercial crops or other higher-priority uses (industries, cities). Such transfers are actively promoted by national governments, in attempts to improve the productivity and efficiency of water used in agriculture, or to ‘save’ (conserve) water to either quench the thirst of growing cities and industries or protect ecosystems and future flows or stocks. They are made legally possible through the drastic reformulation of agricultural water rights, and justified by the dubious characterization of existing rural water uses as non-productive and wasteful. Such water transfers tend to remain at the margins of global (though not national and regional) water debates, as they occur in remote and marginal places, often affecting those with little powers and means of influence or resistance. How to understand such re-allocations, how do they happen, and what do they mean for the possibilities of different groups of people to make a living, accumulate wealth or indeed ‘develop’? And how do they re-shuffle and re-arrange powers and responsibilities for decision making?

Different studies suggest different possible scenarios. One possible scenario comes from the study of Milagros Sosa about mining companies in Peru (see Sosa and Zwarteven, 2012; Sosa and Zwarteven, 2014). On the face of it, this appears to be an almost classical case of dispossession and proletarianisation, with highland subsistence farmers selling²² their land and water to the mining company to themselves become wage labourers. Although employment is insecure, wages often are higher than what they would have earned as *campesi-*

nos. They also receive what for them are high prices when selling their land and water. These improvements in incomes are much appreciated. Mining companies also invest a lot in roads, schools and hospitals in the regions where they operate, effectively improving livelihoods, health and wellbeing. Yet, the *campesino* families are less happy with the often irrevocable changes in livelihoods and environments that mining companies also provoke. In particular the changes in the quantities and quality of water flows provoked by mining operations have generated and continue to generate fierce and sometimes violent protests.²³

The possibilities and powers *campesinos* have to hold the mining company accountable to its water-actions are very limited. This is because of their economic dependence on the mining company, but also because the mining company has become the *de facto* water manager in the area. It acquired the power to do so through its investments in water reservoirs; the physical control of water that these make possible form the basis for its managerial powers of control. In addition, formal accountability relations are mainly directed upwards, with the company having to comply with national and international regulations on the basis of technical information much of which it produces itself, rather than having to explain itself to the people who directly experience the implications of their mining actions.²⁴

The Sais in Morocco is another rural area that is witnessing rapid changes in water uses from low to higher value crops, changes that form part of larger rural transformations actively promoted by the government as part of its 'Plan Maroc Vert'. Manifestations of these changes include the privatization of former state cooperatives; the arrival of 'foreign' investors to the area; an increase of the irrigated area; the introduction of new crops (grapes for instance); the use of new technologies (drip irrigation systems) and the integration in new markets. Detailed studies of the everyday practices of irrigation and farming (by Maya Benouniche et al. 2014a and b, Lisa Bossenbroek et al. 2014, 2015 and Saskia van der Kooij et al. *forthcoming*)²⁵ shed an interesting light on how changes in water distributions – and in access and rights to water – happen through a combination of land transfers, new technologies and the re-negotiation of farmers' relations with each other and with government and private sector actors.

From some distance, it is possible to see contemporary Moroccan reforms and re-allocations as processes of accumulation by dispossession, with the privatisation of the cooperative lands allowing new investors to acquire the land- and water rights they need for profitable production. Indeed, the changes appear to favour those who are (considered) 'productive' and 'economically efficient' (some 'modern men'), while forcing those who do not

meet these criteria of modernity (including ‘traditional women’) to look for other livelihood opportunities, for instance by working as wage-labourers on the lands their parents used to own. When zooming in, however, the enormous diversity of farming styles and modes of organising farming production, and of irrigation methods, organisations and technologies is striking. Fitting this diversity with neat marxist or modernist categories and teleologies is not just difficult, but would also fail to do justice to the creativity and experiences of those living these changes.

Whatever one’s frame of explanation, it is clear that the new, often more capital intensive, modes of production restructure labour and tenure relations and livelihoods at material as well as discursive levels in ways that are significantly marked by existing social hierarchies and institutions (Hartsock 2006). Gender is one such institution and an all-pervading one. New modes of farming, for instance, are leading to the professionalization and masculinisation of farming identities, offering new and exciting opportunities for young men to combine the activity of farming with modern ideals of manhood. Young men picture their future selves as white-collar clean-shaven entrepreneurs, who operate their drip systems from their mobile phones while strolling in the soukh. Opportunities for young women are much more restricted and less exciting, because the same professionalization of farming is gradually leading to stronger spatial and symbolic distinctions between the private-home-women’s domain and the public-work-men’s domain (Bossenbroek and Zwarteveen, 2015; Bossenbroek et al., 2014).

You might wonder: are these stories still about water governance? I think they are. For one, they show that water (re-)distributions are not neatly contained in a ‘water domain’; they are intrinsic to and help produce wider changes. In Peru as well as in Morocco, rapid processes of agrarian change and economic growth happen alongside with, and partly depend on, new modes of accessing and distributing water that are only partly the result of conscious water policies or management decisions, and may sometimes even go against them. The stories also usefully show that how and to whom water flows cannot be easily deduced from formal policies and legislation. Instead, water (re-)distributions occur through often messy, multi-layered and multiple negotiations, in which power, identity and politics are important. De facto powers to appropriate and control water are often yielded through technologies and infrastructure – such as tubewells – and are thus partly a function of (the properties or agency of) artefacts (as well as of the capacity to purchase or invest in those artefacts).

Stories of distributions (2): voice and authority

Such stories about distributions of water automatically lead into questions about how voice, responsibility and authority are distributed. How are possibilities to steer and somehow control distributions of water coordinated and organised? Whom to approach or hold accountable if water distributions are unjust or unsustainable, or where or to whom to go with expert advice for improving water governance? The above stories – to which I could add all the stories collected by my colleagues about urban water governance²⁶ – illustrate that water decisions and actions occur in complex environments in which numerous social actors strategize with varying degrees of influence and certainty. These actors do not only have widely differing perspectives and interests, but are also drawing on different resources, norms and legal repertoires to articulate, frame and defend their positions (Franks and Cleaver, 2007). Acknowledging this prompts modesty in terms of what can be changed or improved and how fast, and forces thinking about governance away from a still predominant ‘rationalist’ model of institutional and policy reform.²⁷

What, for instance, if de facto control over how water is used and allocated is coming to lie with international companies – as is the case of the Yanacocha gold mine in Cajamarca I just discussed – who often appear to be more accountable to their overseas headquarters and the final clients of their products than to governments or people in the regions where they operate? Possibilities to influence the behaviour of these companies are limited, and also ironic. They mostly consist of corporate social responsibility mechanisms and stewardship certifications, with standards set by the dominant market players themselves, such as the GlobalGAP Board members “who are all representatives of major producers or supermarket chains” (Vos and Boelens, 2014). There is not much these schemes do or can do to modify actual water flows. They can try and prescribe norms about ‘rational’ water use. However, and perhaps unless when contained in networks (and even then!),²⁸ measuring amounts and qualities of water is time-consuming and thus expensive. It is also never completely straightforward, because the outcomes of measurements depend on when and where they were done and on scalar assumptions used. All this means that checking whether water decision makers or users comply with the norms is difficult, and may itself become the topic of disagreements and disputes.

One way for agribusiness companies to show that they efficiently and rationally deal with water is by using drip irrigation systems: the use of drip irrigation is a proxy indicator of efficient, and therefore responsible, water

use. Yet, the relation between the use of drip irrigation systems and efficiency is contentious on many accounts, with increases in efficiency often entailing re-allocations of water rather than net water savings (see van der Kooij et al, 2013). Studies show that the spread of drip irrigation, although promoted by both governments and manufacturing companies on grounds of sustainability (water conservation), often happens because of commercial reasons (the sale of drip systems is a very profitable business)²⁹ or because drip allows saving labour, facilitating the ease of operations or (ironically) expanding areas irrigated. The mere use of the technology, therefore, says very little about the wisdom which with water is used or distributed.

One obvious lesson here is that labels or certificates meant to convince that the product you are buying is produced in water-wise ways should be treated with suspicion. Another is that attention to actual flows and the actual operations of water systems and technologies are important when trying to understand water distributions: water is notoriously capricious and seldom conforms to rules or regulations.³⁰

Stories of distributions (3): knowledge and expertise

These stories of distributions of water and of voice and authority are closely linked to stories of knowing and of intervening in them, with scientific or policy accounts of how distributions come about or should happen co-evolving with or co-producing particular water cultures, societal orders and identities. As noted, ways of knowing and forms of expertise are always part of distributional orders, rather than external to them.³¹ There is much to say about this (see for instance Boelens and Zwartveen 2005; Boelens 2008; Zwartveen 2006). Here, let me just reiterate that awareness of how all water knowledge comes from somewhere – is local – makes the question of how knowledge travels a pertinent one. The superiority of ‘scientific’ expertise – in terms of representational accuracy, technological supremacy or evolutionary advantage – cannot be taken for granted, nor can its often messy and sometimes clumsy production be screened off from scrutiny. Instead, it is necessary to continuously ask *why* some knowledges are more mobile, and carry greater authority, than others. How is it that the networks for some types of water expertise and for some water experts have acquired much wider extension than others? Why, for instance is it that so-called scientific measurements of changes in water qualities and quantities carry greater weight in assessing the environmental behaviour of the Yanacocha mining company of Milagros’ study than the experiences of the people living these changes? In officially and scientifically endorsed environmental impact as-

assessments, canals constructed by *campesinos* mysteriously disappear, as do visual testimonies of deteriorating qualities of water – such as yellowing pastures and sick cows. These assessments are based on temporal and spatial scales that may confirm to national and international norms and standards, but are difficult to match with the lived and place-based horizons of people living in the area (Sosa and Zwartveen 2014).

My point here is not that mining companies or scientists are lying. Rather, I want to illustrate that realities are performed or enacted in specific historical, cultural and material practices, linking them to specific histories and futures (Mol and Law 2002). Approaching realities as enacted and multiple shifts the terms of the debate away from the question of which knowledge is most accurate, to the question of what makes knowledge durable and mobile.

Why, for instance is calling water knowledge ‘Dutch’ a marker of its quality, mobility and exportability, whereas calling it ‘Ghanaian’ or ‘Bolivian’ would denote it as local and specific? When reflecting about the relevance of the institute, my colleagues at UNESCO-IHE produced a number of slides which clearly illustrate that most water science is produced in Northern countries, even when it is science about water problems in the South. The slides signal the need to for more Southern water scientists, thus underscoring the relevance of the institute. They can however also be read as visualisations of the legacy of colonialism – forcefully prompting the question: which and whose knowledges matter and count, and on which grounds? These are questions about truth, but at the same time these are questions about how powers of authority come about and are performed.

Water governance as the organisation of distributions (2)

Following these stories, the definition of water governance that I would like to propose is: “the practices of coordination and decision making between different actors around contested water distributions”. Such practices are thick with politics and culture, are linked to creative processes of imagining and producing collective environmental futures, and combine political problems of *scale* (spatial, ecological, administrative, temporal), with problems of *coherence* (the durable alignment of different people and different waters despite problems of incommensurability and political tensions) (Bridge and Perreault, 2009).

In thus engaging with water governance questions as questions of distributions, I would like to be particularly attentive to four topics or themes:

First, as I already suggested, I would like to dedicate explicit attention to the linkages between governance *processes* and *outcomes*. With this, I do not mean to already include ideas about what outcomes should be in definitions of governance,³² but I am interested in defining what ‘good governance’ is beyond process indicators (i.e. transparency, accountability, participation, integrity). This is because I am afraid that ‘good’ governance might produce ‘not good’ outcomes (or vice versa), and I therefore think that it is important that the linkages between process and outcomes are made the topic of investigation rather than assumed.

Second, I would like to create explicit space and attention to how water governance arrangements, decisions and procedures are always deeply material: they are shaped by (while in turn shaping) technologies and ecologies, and bodies. Or, rather than confining governance questions to the domain of the social sciences (and treating them as being merely about ‘the social’), I would like to build on and further develop ways of grappling with water that are attentive to the interdependencies and co-evolutions between technologies, ecologies and societies. A careful and detailed consideration of, and respect for, *how* technologies work and are operated and of *how* waters ‘behave’ is important here.³³

Third, I would like to help create further intellectual space for recognizing and understanding how water governance is not just about the organisation of decision making with respect to water, but also about the production of social order via the administration of water (Bridge and Perreault, 2009). How do specific distributions of water depend on and help produce specific societal orderings? And how can changes in water governance help produce more equitable and sustainable societies? These questions include explicit attention to the entanglements between scientific orders – taxonomies, scales, logics, frames, discourses – and water-societal ones, in an attempt to nurture reflexive forms of public water expertise that embrace engagement instead of detachment.

And fourth, I would like to devote explicit attention to the exploration of scientific and policy dealings with distributions and how these travel through time and space – for instance in the form of models, guidelines or technologies. Such explorations will form a useful basis for developing forms of reflexivity or critique that are important features for new water scientists and ways of knowledge production.

I consider ethnographic (or perhaps technographic, see Jansen and Vellema, 2011) accounts of every-day *practices* of distributions (and of knowing them) a useful empirical basis from which to embark on these explorations. A focus

on practices entails dealing with the activities, 'doings' or performances of those involved in the mundane and everyday dealings with water (see Arend and Behagel 2011). Hence, rather than (just) engaging with debates on distributions on the basis of theoretical or ideological a priori's, and framing or explaining them in terms of universals (neo-liberalism, capitalism, liberal environmentalism, patriarchy, evolution), I think there is merit in attending to them through detailed studies of the messy, heterogeneous and worldly encounters through and in which they happen, are justified and contested.³⁴

Next to an emerging body of practice-based work on the governance of nature (Arts et al. 2013; Hajer and Wagenaar 2003), the idea, developed by Tsing that it is through contingent worldly encounters (Tsing proposes the metaphor of friction) that universals are brought into action, is an important source of inspiration here. In reaction to "popular over-enthusiasm for programmatic global predictions", and in an effort to avoid the idea that "new forms of empire spring fully formed and armed from the heads of Euro-American fathers", Tsing emphasizes the unexpected and unstable aspects of interactions. Yet, rather than retreating into the local or the particular in response, or overtly celebrating the creativity and autonomy of Southern communities to absorb and transform every imperial mandate, Tsing suggests the image of friction as a reminder of the importance of interaction in defining movement: connections and movements depend both on local and historical specificities as on cross-cultural and long-distance encounters (or universals) (Tsing, 2005).

I would like to approach attempts to know water governance not as quests for ultimate sets of general tools, guidelines or theories, but as never-finite engagements consisting of ways of doing, intervening and making that come from somewhere (have trace-able histories) and that go somewhere. The explicit anchoring of research in practical projects that aim to improve water distributions or solve distributional dilemmas is an attractive strategy here. The success of this strategy will importantly depend on the careful identification of partners – not limiting these to formal governance actors –; on the long-time nurturing of alliances, dialogues and networks; and on the creation of spaces and possibilities for fruitful meetings between different knowledges and knowers.³⁵

Results of the kind of studies that I propose will yield accounts of the many and diverse ways in which water distributions happen and are done, and of the many different ways they can be understood and assessed. There will be resonances between these accounts, but also gaps and frictions. Instead of new fundamentals and essences, comparing them will produce contrasts, shadows and highlights – fractional coherences, oscillations, interferences, inter-

actions – showing the makeshift links across distance and difference that allow some of them to travel (see Law 2002, Mol 2002).

No more heroes anymore?

What does all this say about the terms of existence for water heroes? Beliefs in old and new water heroes are implicitly based on a picture of water decision making as a pyramid-shaped hierarchy with some all-seeing and all-knowing authority sitting at its top. The role of water heroes, engineers or scientists, is to help these omniscient high-level decision makers in making the right decisions. There are two assumptions here: the first is that the building blocks of what engineers want to change are permanent, and can be unequivocally uncovered by sound and systematic scientific investigation (Mol 1999). The second is that water decision making has a clearly identifiable centre or head.

In my talk I have argued that both assumptions are untenable: water expertise is deeply entangled with politics and markets, while water governance is polycentric (or perhaps centre-less). This is why I think it is doubtful whether the new water experts that are needed will ever assume the same heroic status as 'our' grandfathers.³⁶ My conclusion is that it may in fact be better to entirely let go of hopes that such new heroes will ever emerge, because their existence may imply and produce a dangerous concentration of knowledge, power and authority. Old and new heroes should, I think, be treated with suspicion. Instead, solving today's water problems requires the burgeoning of many different kinds of knowledge and many different knowing identities and cultures; accepting that these knowledges and knowers will never be easily reconciled but will always be contested; and being pragmatic about the negotiations and struggles that knowing and dealing with water entails. Rather than confident finalities and masterful knowing, perhaps pleasures of friendliness, trust, conviviality and companionable connections are better guides to develop new modes of engaging with and intervening in water; modes that are modest and open to unpredictabilities, contingencies and the limits of understanding.³⁷

A word of thanks

Friends, colleagues, beloved ones. I have come to the end of my talk and would like to use the remaining minutes to express a few words of thanks.

First of all, I would like to thank the Executive Board of the University of Amsterdam and the Dean of the Faculty of Behavioural Sciences for offering me this opportunity to become, for the first time in my academic life, part of a 'real' social science environment. So far, the interactions with my many new colleagues in the Governance and Inclusive Development Group have been thoroughly pleasant, inspiring and enjoyable. I admire your theoretical literacy, eloquence and patience and am excited about the prospect of further developing collaborative projects on water; projects that combine scientific excellence with the desire to make a difference and that help breed a new kind of committed water experts.

I also thank UNESCO-IHE for welcoming me to the institute. Looking back, I am grateful for the kind but firm efforts of Pieter and the members of the Water Governance group to convince me of applying. I thank them, as well as Pieter, Charlotte and Stefan, for having made the transition from Wageningen to Amsterdam and Delft a smooth one. UNESCO-IHE is an institute with a wonderfully diverse mix of extremely committed staff, with an even more wonderful and diverse group of students. That normalcy is always re-negotiable is one of the nicest things about working at IHE and explains why I already feel that I belong. I look forward to further help the institute achieving its mission, perhaps slightly redefining it in the process.

To my colleagues at the Water Governance Group: Frank, Zaki, Hermen, Jeltsje, Maarten, Klaas, Michelle, Maria, Jaap – and Joyeeta, Nicky, Hebe and Michaela – you are the best! This is perhaps a good moment to recall that it is thanks to your and Rhodante's efforts to carve out a space for critical social science within the institute that the group exists. I will do my utmost best to protect and further strengthen this much needed space in an environment of doers and solvers – here we'll make grateful use of and will need our UvA and KIng's College allies! I am simultaneously proud and in awe to be working with all of you. I hope that we will succeed in finding or creating the energy and motivation to 'slow down', a slowing down that is needed to put your – our – acquired wisdoms into words and for further developing a distinct, new and relevant water voice.

To my old friends and colleagues from Wageningen: perhaps I do not miss the Wageningen university environment, but I do miss you. Let's continue identify possibilities for working together, and use the multiplication of our institutional affiliations as a source of strength, rather than as one of alienation. Rutgerd: although we are no longer sharing a room, it is wonderful and somewhat miraculous that we remain close colleagues at the UvA. Stay close.

To all the PhD and MSc students I am working with and have worked with: thank you for creativity, insights, and struggles. Your intimate and long-term

dealings and engagements with water distributions are my most important source of intellectual inspiration. Don't ever become disciplined.

Allow me to also mention and thank four persons who – each in their own way – have helped me discover my talents and ambitions, but who died too soon to be here today. Gerrit van Vuren, my former colleague, who saw a professor in me long before anyone else did; Jan Lever, my father-in-law, for whom the mere fact of belonging to his family entitled me to a professorial title; Juus Lever my mother-in-law; *zij zou ze nog steeds geen cent geven*. And Tommie, my dog. Four-legged shaped barking love is the better kind.

My parents, Hette en Geery: you have produced three very opinionated, passionate and strong-willed daughters. I am not sure that was the intention, but I for one would like to thank you for it! Imke en Ellen: weird sisters come in threesomes. Let's continue cherishing the sisterhood, the weirdness, as well as the threesomeness. Erik, Robert, Marianne, Sietze, Joost, Rutgerd: thanks for existing, for being around, for caring – and perhaps most of all for making fun of and with me and challenging me.

Everyone else, colleagues, friends: thank you, too.

And finally Anne: thank you. I love you.

Notes

1. See for instance van der Ham, 2003 and 2007; de Schipper 2008; Rooijendijk 2009.
2. An interesting special issue of the journal *Social Studies of Science* (2012 42(2)) brings together a number of articles that illustrate how water and society, and water and culture, co-constitute each other. In its introductory comment, Wiebe Bijker asks the question whether it would be useful (and possible) to study societies as water cultures (Bijker, 2012). Also see an article in *De Groene Amsterdammer* critically discussing the idea that the Dutch are a 'water culture' (Aart Brouwer 2006).
3. See for instance Lange and Thomas 2012, in an article in *De Groene Amsterdammer*. Also see Reuss, 2002.
4. The term 'water wizard' comes from the novel of A. Den Doollaard "Roll Back the Sea". At the occasion of its appearance, *The Miami News* wrote on the 14th of August 1948: "Out of that fight, Den Doollaard has developed a full-bodied, meaty novel, his engineers real men of science, his contractors sharp and cagey businessmen, his workers working until they fall asleep on their feet" (...) It's the dramatic new version of the unforgettable story of the little boy who stopped the dike leak with his finger." (see <http://www.adendoolaard.nl/verjaagde-water>). The term water wizards is also used by Erik van Vleuten and Cornelis Disco in their article on how the Dutch dealings with water have gone hand in hand with the shaping of the Dutch landscape, its economy and polity (Vleuten and Disco, 2004).
5. Cordula Rooijendijk, in her historical account of Dutch dealings with water, for instance laments the contemporary lack of 'visionaries': "There are no deeply religious water engineers anymore, who aspire to protect the Netherlands against water at any cost; for years there has been no-one who assumes the role of the cistercians: Andries Vierlingh, Jan Adriaenzoon Leeghwater, Nicolaas Cruquius or Cornelis Lely. The belief has gone, society is secularized. Also the belief in the malleability of society has disappeared. (Rooijendijk, 2009: 386, my translation).
6. As Bakker (2007) notes, this is the optimism of an increasingly dominant philosophy of development, variously termed "liberal environmentalism" (Bernstein 2001), "green neoliberalism" (Goldman 2005), or market environmentalism (Bakker 2004).). It consists of a mode of resource regulation which aims to deploy markets as the solution to environmental problems (Anderson and Leal 2001). Through establishing private property rights, employing markets as allocation mechanisms, and incorporating environmental externalities through pricing, proponents of market environmentalism assert that environmental goods will be more efficiently allocated if treated as economic goods, thereby simultaneously addressing concerns over environmental degradation and inefficient use of resources (also see Ahlers 2010).
7. Richard Norgaard is one of the many who have articulated this view (Norgaard, 1988).
8. Such infrastructural projects have in no way disappeared. In the 1990, the construction of dams and large infrastructural projects became less popular because

of a proliferation of very critical reports and civil society protests that unveiled how such projects generated very high social and environmental costs, while its benefits were much lower than first promised. Today, (plans for) large infrastructural projects are again booming, often to produce ‘green’ energy. (See for instance Merme et al. 2014.)

9. Indeed, the very use and popularity of the term ‘governance’ partly stems from critiques of state-centered notions of regulation and administrative power (see Bridge and Perreault, 2009).
10. See for a nice example Ranganathan, 2014.
11. Caroline Dominguez-Guzmán, a PhD student I am collaborating with is currently studying this.
12. According to Jeroen Vos and Anais Marshall in a yet to be published paper, the luxury products that are consumed in the USA and Europe do not add any significant value to local food security, while the use of the water by agribusiness companies, who are paying 7 US\$ per day, does in general not generate sufficient income for a healthy diet, especially because prices for food, drinking water and housing have gone up, while health and education services are being privatized, also increasing prices (Vos and Marshall, forthcoming). The study of Harriet Larrington-Spencer about the winners and losers of grape production in Maharashtra shows that the production of export grapes is provoking a re-allocation of water to those who can afford to make the investments in new technologies. The experiences of grape-farmers and labourers are, however, full of perplexities (Ramamurthy, 2003) making a clear identification of winners and losers difficult (Larrington-Spencer, 2014).
13. Jaimie Linton’s book “What is water? The history of a modern abstraction” is a fascinating and detailed analysis of the history of the modern discipline of hydrology, showing how science works to abstract the meanings of water from the processes and relations of which it is part (Linton 2010, also see Loftus 2011 for a review, placing the book in wider attempts to think relationally about water).
14. For one possible way of operationalizing this for water rights, see Boelens and Zwarteveen (2005) and Roth, Boelens and Zwarteveen (2005).
15. These terms are all proposed by ‘social’ water scientists. Interestingly, proposals are also emerging from natural scientists to better include ‘the social’ in their work (see for instance Costanza et al., 1997; Sivapalan et al. 2012). A review of different attempts to combine ‘the social’ with ‘the natural’ in water studies shows that there is remarkably little interaction and exchange between them: although (claiming to) bridge disciplines, the scientists involved in this work often remain in their own cultural and epistemic comfort zones (Zaag and Zwarteveen, *work in progress*).
16. One possible way of dealing with complexity is to leave the modern world of the single epistème – which would map complexities on a continuum between order and chaos – and accepting that there are different worlds that overlap and coexist without necessarily adding up: different modes of ordering, logics, frames, styles, repertoires, discourses that each produce their own simplicities or impose their own silences. These come into being through practices, and work and relate in different ways (Mol and Law 2002).

17. Of course, water engineers, whose very job it is to intervene, have always accepted descriptions of their work as creative and productive, rather than as just descriptive. Yet, they have often relied on the same nature-society (or technology-society) distinctions to define their work as technical and therefore nonpolitical, thereby also protecting their expertise and exclusive access to reality.
18. Haraway, in her book “Modest_Witness@Second_Millennium. FemaleMan©_-Meets_OncoMouse™” summarizes some of the terms and metaphors circulating in “the net of the virtual community of feminist science studies, where retooled modest witnesses surf: strong objectivity (Harding 1992); agential realism (Barad 1995a and 1995b); modest interventions (Heath forthcoming); boundary objects, borderlands; communities of practice, articulation work, misplaced concretism, and feminist method (Star 1994); cyborgs and situated knowledges (Haraway 1991); border crossings and narrative strategies (Traweck 1992); science as social knowledge (Longino 1990)” (Haraway 1997: 268-269).
19. Michael Goldman’s analysis of how “water for all” became hegemonic is insightful here (Goldman 2007). Also see Wanvoeke et al. 2015, which tells the story of the travels of smallholder drip irrigation as a successful innovation (Wanvoeke et al 2015).
20. Possible ways of ‘rendering technical’, and of screening distributional questions off from explicit deliberation include ascribing scarcities to natural causes (Mehta, 2001; Ahlers, 2010; Bakker, 2000), delegating the allocation of water to the invisible hand of the market (Joy et al., 2014; Boelens and Zwarteveen 2005; Zwarteveen and Boelens 2014). Referring to water problems as ‘global’ problems (part of ‘global water systems’ (Pahl-Wostl *et al.* (2008)), constituting them as universal humanitarian threats affecting ‘all of us’ also may make difficult distributional and intrinsically political dilemmas disappear (see Swyngedouw 2010).
21. This categorisation is loosely based on the ‘echelons of rights’ framework (see Zwarteveen et al 2005): an attempt to list and catalogue how struggles and contestations about water distributions can become manifest.
22. Land and water transfers in the cases studied by Milagros happened through long-winded processes of negotiations. Some of these were legal (without making them necessarily fair), but others consisted of more dubious transactions, such as the when the mining company offered high sums of money in return for the *campesinos* giving up their water rights (see Sosa and Zwarteveen 2012).
23. The movie “The Devil Operation”, produced and directed by Stephanie Boyd, gives a shocking account of the violence that accompanies these protests, and of how they are marked by enormous differences in power and resources between the *campesino* communities and the mining company (Boyd 2012).
24. The study of Milagros Sosa is part of the research programme “Struggling for water security” , financed the Netherlands Organisation for Scientific Research (NWO).
25. These studies were done in the context of the research project “Drip Irrigation Realities in Perspective”, partly financed by NWO (as part of the Programme “Responsible Innovation” (MVI)), and partly by CIRAD and the Wageningen School of Social Sciences.

26. They invoke metaphors of informality (Ahlers et al. 2014, Schwartz et al., 2014), and talk of ‘splintered networks’ (Kooy 2015) or ‘meshwork’ (Schwartz et al., 2014).
27. While rarely spelled out, such a rationalist model continues to underlie much thinking about and acting on water problems: the image of a central (often state) unit that oversees (manages, controls, monitors) the ‘overall system’, preferably defined following hydrological boundaries: an aquifer, river basin, irrigation system or water supply facility. Some streams of Integrated Water Resources Management thinking appear to further nurture this model in arguing in favour (and suggesting the possibility) of integration not only of knowledge and information, but also of powers of legislation and implementation.
28. The problem of head-enders taking more water than their share in surface irrigation systems is one I grew up with. How difficult it is to precisely distribute water according to agreed schedules at system levels, or to match water gifts to crop water requirements at plot levels, is something I have learned and am learning among others from Lucas Horst (the title of his book “The dilemmas of water division” is telling), Harm Boesveld and Maya Benouniche.
29. I thank Jeroen Vos for pointing this out to me. The profitability of drip irrigation systems also makes drip manufacturing companies attractive for speculative investments. Slogans of saving water and protecting the environment that are seldom tested for their accuracy thus allow both the greenwashing of agribusiness operations, and serve as an effective promotional campaign to sell more drip systems.
30. Karen Bakker’s famous characterisation of water as a ‘non-cooperative’ commodity also refers to this (Bakker 2004).
31. Zegwaard et al. give a nice example of this: they show how with climate change, the professional water management community in the Netherlands started using future rather than past or current flood events to gain political and societal momentum for (additional) funds to intervene in the Dutch delta. In the process, the ontological definition of deltas – and thus the nature of the reality to be governed – also changed, something that happened through an ‘expansion of reality’ (stretching temporal and spatial scales of flood events). (Zegwaard et al., 2014). For an interesting account of how scientific imaginations of the climate as a global system co-evolved with calls for global governance, see Miller, 2004. For a reflection on the implications of making the globe the frame of reference for environmental knowledge-making processes and planning see Tsing, 2005 (chapter 3). Also see Norgaard et al, 2008.
32. Lautze et al. point at the tendency to conflate processes with outcomes in many popular definitions of water governance, and make a plea for reserving the term water governance for “the processes and institutions by which decisions that affect water are made” (Lautze et al. 2011).
33. Saskia van der Kooij’s study on the Krichfa canal in Morocco is an interesting example here (Kooij et al, *forthcoming*). Hermen Smit provides another beautiful example with his analysis of the interactions between morphological changes of an irrigation canal (because of siltation) and the identities of and relations between people who have a stake in it, showing the implications of these interac-

tions for distributions of water, land, labor and capital in the irrigation scheme (Smit *forthcoming*).

34. I am copying from an article by Bueger on the study of practices: “the practice theoretical vocabulary has several advantages for the study of politics. It allows for inter-paradigmatic dialogue (Adler and Pouliot, 2011), to better conceptualize short-term social change (Neumann, 2002), to get closer to the everyday activities of those speaking, writing, and doing politics (Freeman et al., 2011), to find an appropriate conceptualization of agency-structure dynamics (Adler and Pouliot, 2011), to conceptualize ontological grey zones such as the hybrid zones of governance in-between a private-public or state-non-state relation (Abrahamsen and Williams, 2009), to re-appreciate the role of things and objects (Walters, 2002; Pouliot, 2010), or to develop forms of analysis resonating with other communities than scholarly ones (Freeman et al., 2011).” (Bueger, 2014: 384).
35. The *Justicia Hídrica* network is a source of inspiration here, see www.justiciahidrica.org.
36. Interestingly, but perhaps not surprisingly, the (auto-) biographies of old water heroes, just as accounts of what engineers do in actual practice, often yield much less heroic accounts of their works and achievements. These are descriptions full of trials and errors, of failures, of uncertainties, of long-winding and messy negotiations, of *bricolage* and tinkering... (see for instance Ozden 2014, Pascon 1973; Reuss 2008).
37. I am borrowing these metaphors and formulations from J.K. Gibson-Graham (2006).

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