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De- and Re-politicisation of Water Security as Examined Through the Lens of the Hydrosocial Cycle: The Case of Jakarta's Sea Wall Plan

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ABSTRACT: This article asks how the pursuit of major engineering works causes changes in existing water-society relations. We employ the concept of the hydrosocial cycle postulated by Linton and Budds (2014) as an analytical framework and draw specific insights from political ecology and science and technology studies (STS). Using as a case study a sea wall megaproject plan in Jakarta, Indonesia, we find that such a project can depoliticise the city's water security issues by rendering them technical and by dehumanising citizens and discounting the future. Using scientific language and logic, policymakers discourage the exploration of alternatives other than the sea wall. To repoliticise these water issues, we mobilise the concept of the hydrosocial cycle and tailor it to the context of large infrastructure. We identify departure points that may improve the current socio-natural process in Jakarta, particularly the empowerment of the middle class to voice their project-related concerns, and the recognition of the different capacities of each group in society to adapt to water-related hazards.

KEYWORDS: Water security, political ecology, hydrosocial cycle, sea wall plan, Jakarta, Indonesia

INTRODUCTION: LARGE INFRASTRUCTURE FOR A WATER-SECURE CITY

As the world becomes more urbanised,¹ the goal to achieve a water-secure city has never been more relevant. Water security has gradually been replacing Integrated Water Resources Management (IWRM) as a water management paradigm (Cook and Bakker, 2012; del Moral et al., 2014); it has gained increased interest in both academic scholarship and policy circles since its introduction in 2000. Some review articles (e.g. Cook and Bakker, 2012; Zeitoun et al., 2016) have captured the diverse conceptualisations of water security research, and as water challenges grow such scholarly attention appears to be continuing (e.g. Gober et al., 2015; Jepson et al., 2017). Focusing on the urban context, we follow Grasham et al.'s (2019: 3) definition of water security as "a tolerable and equitable level of chronic or intermittent water-related risk for urban dwellers". To date, water security research has covered a wide range of sectors (e.g. drinking water, water-related hazards, agriculture) at a variety of scales including those determined by political boundaries such as city and state, and natural boundaries such as

¹ According to the UN (2018), 68% of the world's population is projected to be urban by 2050, as compared to 55% in 2018 and 30% in 1950. This figure suggests that we now live in an 'urban age'. This widely adopted figure is, however, contended by Brenner and Schmid (2014: 731). They argue that the urban age thesis "is empirically untenable (a statistical artefact) and theoretically incoherent (a chaotic conception)" because there is no specific rule for drawing the boundaries of an urban, or urbanising, area. As a result, many countries differ in their classification of urban-rural areas.

catchment areas. In this paper, we are interested in analysing water security problems at a megacity level, with a megacity being defined as one with a population of more than 10 million (UN, 2018). As large and powerful political entities and as centres of economic growth, one of the main approaches to the enhancement of megacity water security is that of building large-scale hydraulic structures.

Some scholars, such as Linton and Budds (2014), have noted that in the past decade the hydraulic mission – which is the use of engineering works to exploit waterways in the service of humanity (Molle et al., 2009) – has given way to modes of water governance. Others, such as Crow-Miller et al. (2017), have observed the contrary, noting the large-scale water structures that are being built, or are planned, around the world. This trend demonstrates the (re)turn to investing in infrastructure for water management. Recent projects include south-to-north water transfer in China, interbasin water transfer in São Francisco, Brazil, the trans-Andean tunnel in Peru, and the sea walls in Jakarta and Dhaka. The justification of most of these projects has been the enhancement of water security in urban areas; dense with people and assets, these urban areas would receive more water and would be more protected from environmental hazards. Eighteen out of the 23 megacities are located in coastal areas and are therefore prone to water-related hazards (Pelling and Blackburn, 2013), further justifying the construction of such large infrastructures. The hydraulic mission is now being promoted as a way to guarantee water security in the face of increasing climate instability. Scott (1998) suggests that the construction of large infrastructures is a 'state simplification', meant to reduce the difficulty of solving complex water problems.

Discussion of water security and infrastructure in this paper is anchored in the concept of hydrosociality (Jepson et al., 2017), which has broadened the framework of the traditional hydrologic cycle to encompass the co-construction of water and society (Swyngedouw, 2009). Hydrosociality deliberately attends to water's social and political nature (Linton and Budds, 2014). Developed within the political ecology tradition and inspired by science and technology studies (STS), hydrosociality is characterised by its discussion of power and politics (de la Motte, 2013; Boelens, 2014; Meehan, 2014). (A number of theoretical developments in hydrosociality will be reviewed in the next section.) Here we use the term hydrosocial cycle, as postulated by Linton and Budds (2014), as a lens to analyse water security. Employing a relational-dialectical approach, Linton and Budds conceptualise the hydrosocial cycle as the "process of making and remaking (...) the social construction and production of water" (ibid: 171). A sea wall megaproject in Jakarta, Indonesia, is a vivid example of the way in which technological intervention changes existing hydrosocial relations.

Through the lens of the hydrosocial cycle, this paper seeks to explore the political ecology of water security by (i) examining the extent to which large infrastructure can change the existing water-society relations, and (ii) investigating how the state exercises its power through infrastructure. These issues matter because policymakers tend to think that they have solved the problems by pursuing large infrastructure, while in fact such large projects enhance water security for only a particular group and usually at the expense of other groups. Our main argument in this paper is that major engineering work has the potential to depoliticise the core business of water security in sustaining livelihoods. To repoliticise the issue, we propose to refine the concept of the hydrosocial cycle by placing a greater emphasis on the role of infrastructure and by exploring the heterogeneity within a society in terms of how different groups participate in, and are affected by, the cycle. This paper contributes to a wider conceptualisation of water, society and technology, and advances understanding of how infrastructure manifests the intricate connections between water security and power relations. As the power relations produced in the construction of basic infrastructure – such as the piped-water networks that many developing cities are urged to build (Khatri and Vairavamoorthy, 2007; McDonald et al., 2011) – are very different from those produced in the construction of large infrastructure, we do not consider the former in this article (Kooy, 2008; Warner, 2008; Bichsel, 2016; Obertreis et al., 2016).

This paper presents a literature review on hydrosocial research deriving from political ecology and STS, followed by an introduction to the case study and our research methods. Next, we discuss three

mechanisms by which infrastructure can depoliticise water and we analyse the role of state power in shaping this policy. Following that, the concept of the hydrosocial cycle is refined by emphasising the role played by a major water engineering project in changing water-society relations. The final section presents our concluding remarks.

HYDROSOCIALITY: WATER-SOCIETY-INFRASTRUCTURE

Some authors have argued that hydrosociality is the basis of water security (Jepson et al., 2017; Staddon et al., 2017). In this paper, we attempt to link water security and infrastructure in order to contribute to this conceptualisation, as large infrastructure generates unevenly distributed positive and negative consequences (Swyngedouw, 2009). The hydrosocial concept was inspired by the political ecology of water tradition as well as by the social study of science (Swyngedouw, 2004; Kaika, 2005; Budds, 2009; Linton, 2010). It emerged from criticism of the concept of the hydrological cycle as being not sufficient to understand the social aspects of water (Mollinga, 2014). Hydrologists tend to understand water as "behaving in a consistent, uniform and rational manner" (Budds, 2009: 420). According to the hydrosocial concept, water is important to human life not only because of its physical materiality – depicted as H₂O by Swyngedouw (2005), Budds (2009) and Jepson et al. (2017) – but also because of its social functioning.

Hydrosociality is not the only framework by which the relations between water and society are examined. Similar ideas with different conceptualisations and trajectories of analysis are shared by other approaches, such as waterscape (e.g. Baviskar, 2007; Loftus, 2007, Karpouzoglou and Vij, 2017), socio-natures (Castree and Braun, 2001), and socio-hydrology (Sivapalan et al., 2012; Wesselink et al., 2017). Karpouzoglou and Vij (2017) view waterscape as a perspective (rather than a theoretical framework) that emphasises the geographical situatedness in producing unequal hydrosocial relations. Castree and Braun (2001) develop socio-natures as an analytical lens through which to investigate the diverse social construction of nature and to examine how this process affects livelihoods, ecologies and politics. Unlike the approaches that have previously emerged from the social science root, socio-hydrology was developed among natural scientists, particularly hydrologists, who viewed the need to address the complexity and interdependence of water-related societal challenges. Developed from the positivist paradigm, socio-hydrology research focuses on incorporating human behaviour into socio-hydrological models (Wesselink et al., 2017). While both overlapping and having notable differences, these perspectives should be viewed as mutually reinforcing approaches to better understand the interaction between water and people.

The concept of hydrosociality itself has been developed in many ways. As a territory, hydrosociality consists of "a spatial configuration of people, institutions, water flows, hydraulic technology and the biophysical environment that revolve around the control of water" (Boelens et al., 2016: 1). As an assemblage, hydrosociality provides a bridge between a specific kind of water and a particular kind of social relationship (Linton, 2010). As a cycle – which is the focus of this article – hydrosociality is much more concerned with the cyclical making and remaking of that relationship as it travels through the social and water domains. This is the hybrid physical-social process that enables discussion on the production of social inequality and the power relations therein (Swyngedouw, 2009). The hydrosocial cycle also touches on the role of technology, albeit very lightly.

Focusing on the power and politics manifested in large infrastructures, we specifically draw insights from the STS traditions, especially the Large Technical Systems (LTS) school (Ewertsson and Ingelstam, 2004). We use this framework to examine the creation, development and consequences of technological innovation in its cultural and social contexts (Morita, 2017). From the STS perspective, infrastructure can be seen as a process (Carse, 2012), as relations between things (Larkin, 2013), as an inhabitable ground (Butler, 2014), as a source of possibilities (Corsín Jiménez, 2014), and as a political machine and a work in progress (Jensen and Morita, 2015). Despite these diverse conceptualisations, there is an agreed need

to perceive infrastructure beyond its physical qualities, since it can create new polities and can shape societies and environments (Jensen and Morita, 2015).

Wittfogel (1957) was among the first authors to articulate the relationship between water and power. Referencing Karl Marx, he argues that a labour-intensive water infrastructure requires a coordinated system or a large centralised authority, creating a 'hydraulic society'. Wittfogel's technological determinism, however, has simplified the complex realities of the relationship (Peet, 1988; Livingstone, 2011). Hydrosocial studies were partly inspired by his work but there is a fundamental dissimilarity amongst them. Wittfogel considers humanity and nature to be separable and believes them to maintain discrete identities despite their interaction; by contrast, hydrosocialists maintain that they are internally related and are co-constitutive of each other (Swyngedouw, 2009; Obertreis et al., 2016).

Discussion of technology and society as explored in the STS literature can be a means to challenge large infrastructure's promise of water security. While promoters of large infrastructure foster the hope of livelihood betterment through technology, critiques that reveal the disappointment of that hope are not uncommon. The neediest group is likely to experience continued inequities, and even a deterioration in their living conditions. Human "freedom is annihilated by the rational-technological-instrumental imperative" (Harbers, 2005: 12). In the current STS discussions, the use of the terms 'activism', 'intervention' and 'engagement' signals a desire to critically address the way science and technology affect changes and redress inequities in particular cultural and institutional circumstances (Sismondo, 2007). In his discussion of the social aspects of technology, Latour (1987) suggests that a technological artefact will function "when all the relevant people are convinced". Elaborating on the definition of "relevant people", Geels (2005) suggests two basic groups: the "system builders" or "heroes" who can intervene in the system, and the "faceless automata following iron rules, institutions or given/functions" who can do nothing to influence the system. This insight is of interest here because it embraces the idea of human agency, which is lacking in much STS literature (Furlong, 2014).

While large infrastructure is portrayed as an apolitical means to achieve water security, it should not be assumed that scientists and engineers behind the infrastructure are not political actors; they act politically – consciously or not – through knowledge generation. The politics is thus often subtle and can be disguised as numerical justification (Gutiérrez, 2010; Zwarteveen, 2017; Landström and Whatmore, 2018). Scientific evidence is increasingly perceived by society as being socially constructed and politically motivated (Linton and Budds, 2014). Because of the domination of scientific and technical knowledge in many societies, engineers and other scientists are often positioned to exert a powerful influence on political agendas by, for example, foregrounding positive projected calculations and the stability of the system, and guaranteeing the outcome (Latour, 1987; Gutiérrez, 2010).

Some authors have analysed how depoliticisation occurs in environmental policies. One of the earliest authors looking at this issue is Ferguson (1994) who examines development projects in Lesotho. He investigates how ahistorical descriptions were used to characterise 'underdeveloped' countries and how technical solutions were proposed by experts with little information about the 'target group'. (Towards the end of this paper we shall refer to Ferguson's arguments, in discussing our findings from Jakarta's case). In a similar vein, Li (2007) explores experts' attempts to alleviate poverty in the highlands of Sulawesi, Indonesia, through community participation in the integration of conservation and development. She demonstrates how experts have devised technical solutions to conditions of poverty and injustice that are, in fact, rooted in the political economy. Studying water supply issues in India, Joy et al. (2014) argue that water problems are problems of justice because mainstream approaches to water allocation and legislation tend to normalise their distributional implications in such a way that the least powerful group suffers from exclusion and lack of access. Scientific findings have been used by engineers and natural scientists to justify water allocations that thereby appear to be inevitable and natural. Lastly, Atkins (2019) investigates the conflict that arose from the construction of the Belo Monte Dam in Brazil. Its proponents foregrounded the dam within the depoliticised context of economic benefits, which were then countered by the dam's opponents who brought forward the issue of political corruption. Atkins

asserts that this effort to repoliticise the dam's construction can influence developments beyond its immediate site and impacts. We build our arguments from this scholarship in our analysis of the depoliticisation mechanisms that affect large water infrastructure.

This section has discussed relevant insights from the hydrosocial literature and has reviewed research in STS scholarship that specifically addresses studies of infrastructure. To our knowledge, a conceptualisation of water security that pays close attention to infrastructure has not been widely undertaken and hence we hope this paper can contribute to scholarship in this area.

A MEGA SEA WALL IN JAKARTA BAY

In examining how large infrastructure may affect water-society relations, we use a sea wall megaproject in Jakarta, Indonesia, as a case study. The sea wall is part of a flagship megaproject of the National Capital Integrated Coastal Development (NCICD) that was proposed to save Jakarta from sinking. As a delta city, 40% of Jakarta's area is located below sea level (Firman et al., 2011). If this combines with land subsidence at an average rate of 15 cm per year (Abidin et al., 2011) – which is among the fastest in the world – together with eustatic sea level rise at a rate of 3 millimetres per year (Deltares, 2015), Jakarta's risk of sinking is extremely high.

In November 2013, the Indonesian government launched the NCICD project, consisting of the construction of a 32 km offshore sea wall, reclamation of 1250 hectares (ha) of land and the construction of a 7500 ha retention lake (NCICD, 2014), at a total cost of US\$40 billion. The offshore sea wall will function to reduce coastal flooding caused by sea level rise. The combined operation of a huge pumping system and a large retention lake (to reduce the mean sea level in the bay) is expected to minimise the risk of riverine flooding. It is predicted that some rivers in Jakarta will not be able to flow under gravity due to subsidence in the northern part of the city; therefore, the river water will be contained in the retention lake and pumped out to sea. To attract private funding, land reclamation was added to the plan. At the time of the launch of the NCICD project, the lake was also projected to be a water supply reservoir (ibid), but this plan was subsequently dropped because of the high cost of water treatment.

Since its launch, the NCICD project has undergone some changes. In 2016, a project to construct 17 artificial islands in Jakarta Bay was integrated with the NCICD plan by the Government of Indonesia, following a corruption scandal involving the islands' construction. The total reclamation area then became 5100 ha. In September 2018, the newly elected governor of Jakarta, Anies Baswedan, was faithful to his campaign promise to revoke the permits for the building of the 17 islands, which were opposed because of their anticipated massive environmental costs. In June 2019, however, he approved the issuance of 932 building permits on Islands C and D. He asserted that he had already kept his promise of stopping further reclamation (of 13 islands) and that the artificial islands – C, D, G and N – would be made available for public use (Aqil, 2019). In June 2019, the Indonesian Ministry of Public Works and Public Housing signed memorandums of understanding (MoUs) on the second phase of the NCICD project with Dutch and South Korean partners; the media release, however, did not give details of this 'second phase' (Iswara, 2019). It may refer to Phase B of the NCICD project, which is the construction of the offshore sea wall as outlined in the NCICD Masterplan (NCICD, 2014). At the time of writing, Phase A of the NCICD project – the strengthening of 20.1 km of the existing sea wall – is still underway, with funding from national and local governments and the private sector (Anwar, 2019). In the absence of a satisfying feasibility study the NCICD project was suspended, but this study has now been conducted by the Dutch and Korean partners, and the signing of the MoUs marks a new chapter for the NCICD project (NCICD, 2014).

The fundamental critique of the NCICD plan is that it does not contain concrete policy action aimed at solving land subsidence. The main cause of sinking is still debatable; the Jakarta Mining Agency data shows that "80 percent of the city's land subsidence is caused by building particularly high-rise towers, 17 percent by groundwater exploitation and 3 percent by natural causes" (Rukmana, 2008: 103). In 2016,

the first author of this paper attended a focus group discussion of experts in Bandung, Indonesia, comprised of university professors and practitioners; this forum agreed that lack of data made it impossible to determine the relative contributions of other factors, namely natural consolidation of alluvial soil and tectonic activities. Abidin et al. (2008, 2011), however, identify a correlation – if not a causal relationship – between the occurrence of land subsidence and the lowering of groundwater levels. An interviewee explained that it was difficult to determine the exact contribution of each factor as they are interrelated. Groundwater exists in the pore spaces between grains of soil and rock; as the water is extracted, the volume of the soil decreases resulting in the consolidation of the soil structure, especially soft alluvial soils like those of Jakarta. Subsidence is exacerbated when heavy loads (such as high-rise buildings) are added to the surface.

The urgent need to stop the subsidence is acknowledged in the master plan: "Not stopping subsidence means that Jakarta's coastal zone is subsiding deeper and deeper below sea level, making solutions for the flooding problems increasingly difficult and expensive" (NCICD, 2014: 35). Subsidence is mentioned more than 50 times in the master plan, yet the plan does not include a strategy to stop the subsidence itself but merely treats symptoms, with the offshore sea wall being presented as a solution. According to an interview with a government official, conducted in the course of this research, resources of time, energy and capital are focused on the pursuit of the NCICD plan, and consistent water supply and a ban on groundwater use have apparently become secondary objectives in Jakarta's water policy.

This paper drew data from policy document analysis as well as from interviews with key informants held in between May and September 2016, July 2017 and February 2018. A total of 48 key informants were interviewed, including central and local government officials, NGO activists, academics and individual experts. We asked for their professional assessments of the NCICD project according to their areas of expertise. Insights from interviews were then compared with NCICD policy documents. Drawing on informants' risk perceptions and on our own interpretations, we now will explore the externalities of the project which are poorly addressed in the public domain.

THE POLITICS OF WATER SECURITY: DEPOLITICISATION

Depoliticising water is a powerful strategy for dramatically transforming the existing hydrosocial configurations (Sultana, 2013). This is especially the case if stakeholders' interests strongly diverge from those of more powerfully represented political actors (Delgado, 2011). The sea wall produces new socio-natural relationships which transform the existing technological, institutional and symbolic arrangements. As observed in other studies (Swyngedouw, 2013; Joy et al., 2014), this depoliticisation affects the powerless group because the process produces, or worsens, social inequality. The first half of the subsequent section offers three mechanisms of depoliticisation in the process of enhancing water security through the construction of Jakarta's giant sea wall. The second half discusses power relations between state and society within the context of capitalist development in Jakarta.

Mechanisms of depoliticisation

As water problems become more complex, depoliticisation continues to occur in many forms (Sultana, 2013; Swyngedouw, 2013). Joy et al. (2014) maintain that the mainstream approaches to water management still tend to "normalise and naturalise" the distributional implications of water problems. There are a variety of ways in which water depoliticisation may occur. We identify three interrelated mechanisms by which water security problems in Jakarta can be depoliticised by the construction of large infrastructure: rendering the issue technical, dehumanising the people, and discounting the future.

First and most importantly, depoliticisation occurs through framing water insecurity as a technical problem that can be solved by mobilising the right expertise. Li (2007), as quoted in Joy et al. (2014: 8), notes that "questions that are rendered technical are simultaneously rendered non-political". In Jakarta, rendering water insecurity as merely a technical matter does not solve the main problem, which is

essentially a governance issue. As we have discussed above, policies to stop subsidence are not integrated with the NCICD plan. The sea wall may reduce vulnerability to flooding but it treats just a symptom of the problem. As the ground continues to subside, the sinking will continue to be a threat. Over-extraction of groundwater is purported to be the culprit of land subsidence in Jakarta (see above discussion for the interrelated causes of subsidence). This extraction from a deep aquifer, especially for supply to high-rise buildings, is caused by poor quantity and quality of piped-water services, a factor which accounts for why many people still use groundwater despite their access to piped water (Kooy et al., 2016); low water service coverage (only 60% of people covered by the water service) is another important factor (PAM Jaya, 2016). From this we can infer the centrality of water governance issues to the problem of land subsistence. The political focus and resources given to the sea wall policy have diverted attention from solving the main governance problem and have assured policymakers and particularly the public that the problem is being solved.

The NCICD plan, in addressing the problem of flooding, claims "to provide a solution for long-term protection of Greater Jakarta against flooding from the sea" and to contribute to the alleviation of riverine flooding (NCICD, 2014: 11). Hydrologically, there are three types of flooding in Jakarta: riverine, coastal and local. Many of the recent major flood events have resulted from riverine flooding, as was the case in February 2007. This type of flooding is caused by heavy but brief storms from upstream catchment areas during the December to May wet season (Budiyono et al., 2015). Coastal flooding is caused by high tides in combination with subsidence, as occurred in November 2007; this type of flooding is predicted to get worse as the northern parts of the city continue to subside (Budiyono et al., 2016). Local flooding occurs when the drainage system is not able to capture, store or drain heavy rainfalls that occur within Jakarta's localities; this was the case in the flood event of January 2013. The impact of climate change cannot be proven (Brinkman and Hartman, 2009) but there are indications that these flooding events are becoming more frequent.

The large lagoon that is part of the NCICD plan is intended to buffer river outflows and thus counteract the increased coastal flooding that is being aggravated by subsidence; the control of river outflows in the coastal areas, however, is dependent on the flow from the wider catchment. It is therefore important to view flooding not only from the perspective of its biophysical characteristics but also from an urban governance perspective. Poor maintenance of infrastructural systems (e.g. canals and gates), as well as uncontrolled growth of the city are among the main factors contributing to riverine flooding. This planning problem has been highlighted by many authors (e.g. Steinberg, 2007; Octavianti and Charles, 2018a), especially as it affects Jakarta's water recharge areas in the southern parts of the city. This is exacerbated by the "socio-political, historical and spatial marginalisation in the city that has experienced centuries of colonial rule" and by post-independence in-migration (Goh, 2019: 251). However, policies to restrict development in the designated green areas have been weakly implemented (Gunawan, 2010). In public discourse the types and causes of flooding tend to be conflated, and the NCICD plan is believed by policymakers and by ordinary citizens to be able to reduce the intensity of flooding; the rapid development in the south may therefore not be slowed down anytime soon. The sea wall policy may even foreclose the opportunity to govern flooding issues that are related to spatial growth.

In addition to not solving the main problem, rendering the issue technical may cause overreliance on a vulnerable system. Currently, the northern flat part of Jakarta relies on a polder system to keep the area dry. Many flood events in this area have been caused by broken pumps, such as the 2008 flooding of the toll road running from the city centre to the Soekarno-Hatta International Airport (*The Jakarta Post*, 2008). In 2014, in another example, 16 (out of 92) pumps were broken (Fajri, 2014). The NCICD plan will depend on a well-operated pumping system to maintain reduced sea levels in the bay. The capacity of the pumps used is expected to be at least 730 m³/s (NCICD, 2014), which is the largest in the world, larger even than the 600 m³/s New Orleans' pumps (Locke, 2009). Securing a sustainable supply of energy for the pump operation is also important; it is a matter for consideration given the operation of a nearby power plant in Muara Karang may be disrupted by the reclamation site (*The Jakarta Post*, 2016). As

commented by a consultant in an interview conducted as part of this research, from these findings one can infer how this megastructure creates an interdependency with a vulnerable pumping system in a country that does not have a good track record in maintaining infrastructure.

Second, large infrastructure can dehumanise the anthropocentric nature of water security by abstracting the social element from the water security equation, what Linton (2014) calls a 'modern water' phenomenon. Processes of socio-environmental change are never socially or ecologically neutral (Keil, 2000), and different groups in a society have different capacities for adapting to certain interventions; improvement in one place or in one group often leads to a deterioration elsewhere. 'Organic' social differentiation based on wealth and power relations usually define the distribution of water risks (Swyngedouw, 2009), and the powerless group often bears the so-called inevitable consequences of infrastructure development.

We illustrate this connection between dehumanisation and water depoliticisation using the fishers' case in Jakarta Bay. Because the offshore sea wall will close the bay, with the space between the coastline and the sea wall utilised for land reclamation, the fishers will not be able to continue fishing there (van der Wulp et al., 2016). The narrative according to which the fishers will be evicted asserts that the water has been highly polluted and thus the fish caught are poisonous, and there is thus no future in the fishing industry. The government will compensate the fishers for their loss of income by offering them blue collar jobs on the newly artificial islands, on which a low-cost subsidised building will be allocated to them. This compensation clashes with many fishers' beliefs and identities, and is likely to worsen the already significant inequality in the city (Oxfam, 2017).

In Jakarta, the 'relevant people' in Latour's (1987) statement above can be interpreted as (i) the policymakers and the general public who must be convinced of the benefits of the infrastructure (as the first mechanism of depoliticisation has demonstrated), and (ii) the marginalised communities who must be convinced that they are part of the problem and that therefore their marginalisation or even eviction is fully justified. The latter attributes the main problem of subsidence and the related issue of water supply to other causes; it suggests that an implicit goal of the sea wall plan is the unification of a diversified urban society. As Larkin (2013) notes, the construction of large infrastructures suggests the increasing modernity of a city; this is a perceived value of the NCICD plan, which aims to transform Jakarta into a world class city (Wade, 2019). The danger in striving for this 'ideal' modern society is its aim of transforming a diverse socio-natural urban environment into a government-dominated system (Schmidt, 2014).

Third, depoliticisation occurs through discounting the long-term consequences of large-scale infrastructure. Construction usually takes place over many years, and the consequences can similarly play themselves out over decades. Policymakers most often do not address the long-term consequences or externalities of large infrastructures, either intentionally neglecting them or simply failing to detect them. The dominant positivist stance of engineers may hinder their inclusion of the seemingly abstract, non-quantified risks (Delgado and Zwarteveen, 2017; Zwarteveen, 2017). In an interview that was part of this research, a consultant commented that the manifesting of consequences outside of the spatiotemporal scope of assessment may also impede their detection. The tendency to deny the potential negative consequences of large infrastructure projects for future generations can be a violation of the widely acknowledged sustainability principle (Emas, 2015).

The coastal reservoir in Jakarta Bay that may end up as a large black lagoon serves as a harbinger of a possible negative future condition resulting from present decisions. Currently, Jakarta Bay is in poor environmental condition due to the domestic and industrial wastewater discharge from the metropolitan area (van der Wulp et al., 2016). The closure of the bay by the creation of an offshore sea wall makes the cleaning of rivers imperative. According to the NCICD Master Plan (NCICD, 2014: 123), the project "creates the necessary momentum to implement sanitation measures" in the city by aiming to increase sewerage coverage to 75% by 2020, from its 2018 coverage of 7%, which is one of the lowest in urban

Asia (KPPIP, 2018). However, neither the Jakarta provincial government nor the central government has made any firm commitment to realising this ambitious target. According to a representative from PAL Jaya (Jakarta's wastewater agency), the city is struggling to find investors for its sewerage project, which will require up to 70 trillion Indonesian rupiahs (IDR) (US\$5 billion). Without urgent measures to stop water contamination, the retention lake will turn into a large, polluted, anoxic lagoon or, as an NGO activist described it in an interview that was part of this research, "the biggest rubbish dump and toilet in the world".

Furthermore, considering the interdependent nature of water issues, problems in one sector may trigger problems in other sectors, leading to a vicious cycle if not carefully and immediately addressed. Environmental degradation, including the lake's poor water quality, may result in health risks for people in the area; this, in turn, could reduce perceived quality of life in the new waterfront city, which could then affect property prices and thus funding for the sea wall construction.

The three depoliticisation mechanisms may not be visible from the surface and may only be felt by the neediest groups in the society. We now seek to investigate how these mechanisms operate within the wider context of Jakarta's capitalist development.

State and society relations

In our previous analysis (Octavianti and Charles, 2018b), we have examined the political interactions between the many stakeholders involved in the NCICD policymaking process, including policymakers, private land developers, consultants, NGO activists and academics. Here, we focus on the power of the state, demonstrating how state power is consolidated through the NCICD plan and how Jakarta's spatial and capitalist development shapes the nature of the city's power relations.

The intricate relationship between state governance and water policy is a function of bureaucratic culture and sociopolitical structure (Nickum, 2010). Rather than viewing a state as an organised political entity (e.g. Fontana, 2010), we follow Ferguson's (1994) conception of the state as a mechanism for coordinating power relations or congealing power. State power in that sense refers to "a mode of power that relies on state institutions but exceeds them" (ibid: 273). There are several roles that a state adopts in a centralised government (Strang, 2016); it can act as 'other' than the people, as representative 'of' the people, and 'as' the people themselves. In a democratic political setting, the state acts as a representative of the people but it may shift towards enforcing autocratic behaviours. Where the state is very powerful, it can operate independently of the society it is meant to serve (Herzfeld, 1991).

Indonesian democracy is still 'young' as it emerged only in 1998, a result of the *Reformasi* (Reform) that followed the fall of the authoritarian Soeharto regime (1967-1998). In the name of securing the economic and political stability required for national development, Soeharto governed Indonesia through military and police force. He presided over a repressively controlled system and nurtured alliances with foreign and local capitalists (Robison and Hadiz, 2004). In this new era of democracy, however, Indonesia still "represents a particularly extreme example of oligarchic dominance and distortion (...). [T]he top 500 oligarchs are about 600,000 times richer than the average Indonesian" (Winters, 2012: 2), and the country is still controlled by a handful of elites who benefitted from years of association with the Soeharto regime. This is because capitalism was incubated within the state itself; democratisation provided a pathway to power for the oligarchs who had been incubated and nurtured in Soeharto's 'New Order' dictatorship (Hadiz and Robison, 2013). The civil society groups, while active and robust, are badly fragmented and poorly organised, and provide no effective counterbalance to the grip of the oligarchs (Aspinall, 2012).

As observed by Webber (2006), in the decade following the important milestone of the *Reformasi*, Indonesia's democracy took the form of patrimonial democracy; the effectiveness of the government was limited because power flowed directly from the leader and a handful of elites. Patrimonialism has deep roots in Indonesia's political history, but Webber was optimistic that electoral competition would

move it in a more liberal direction (see also Hadiz and Robison, 2013). Individual rights and freedoms are officially recognised and protected, but the exercise of political power is still limited by the rule of law. According to the Democracy Index assessment of 167 countries, Indonesia is a "flawed democracy". While having relatively "free and fair elections", Indonesia still has "significant weaknesses in other aspects of democracy, including problems in governance, an underdeveloped political culture and low levels of political participation" (The Economist Intelligence Unit, 2017: 54). One can argue, however, that Indonesia's democracy status has significantly improved; voter turnout in the 2019 presidential elections was 81%, or 158 million out of almost 200 million eligible voters (Farisa, 2019).

In line with Hadiz and Robison (2013: 40), we highlight the importance of looking beyond the question of "whether Indonesia has 'transitioned to democracy', or whether its democracy has now 'consolidated'"; we instead scrutinise the configurations of sociopolitical power shaping the evolution of Indonesian democracy. Given its political context, the NCICD case provides an interesting political arena in which to observe how the project's image is shaped by the confrontation between civil society groups and elite stakeholders.

Some authors have analysed the important transformations that Jakarta has undergone, and their insights can inform how the depoliticisation mechanisms discussed above operate and why they are effective. Tracing the arc of colonial, postcolonial and neoliberal politics, Kusno (2015: 53) contends that "the power of Jakarta (...) is attributed to its long entanglement in Dutch colonial connection centuries ago, while its recent fortunes or misfortunes owe to the forces of postcolonial nation-building and the current phase of capitalist modernisation". The development of neoliberal ideology from the time of Soeharto continues to influence the contemporary era (ibid, 2013).

Analysing Jakarta's development along with that of other mega urban regions in Southeast Asia, Douglass (2010) concludes that Jakarta has morphed from being an appropriator of rural surpluses (precolonial to late 1960s), to export-oriented industrialisation (late 1960s-1980s), to becoming a centre of retail consumption (1980s-1997). This last stage of development was made possible by the advent of a new era of megaprojects that occurred throughout the world from the mid-1980s onwards (Altshuler and Luberoff, 2003). In Jakarta, it created a significant new middle class and a new layer of built environment. Aspiring to become a world-class Asian city, the government began to promote privatisation and megaprojects by relaxing or even eliminating many of the regulations on land use, and in the process reducing public oversight. After the 1998 Asian financial crisis, Jakarta experienced a decade of renewed neoliberal reform together with the emergence of 'democratic' governance, a shift which has greatly affected its built environment and its citizens.

Investigating the linkages between Jakarta's flood infrastructure and wider spatial transformations, Batubara et al. (2018) find that the logic of capitalism underlies the infrastructural approach in the city and as a result (re)produces an uneven urbanisation. Their analysis also points out that the production of Jakarta's contemporary landscape is linked to Soeharto's New Order regime under a specific system of crony capitalism (Kunio, 1990), a mechanism that is evidenced by, for example, the issuing of permits to a crony of Soeharto to convert 831 ha of mangrove forest in northern Jakarta into the luxurious Pantai Indah Kapuk development. According to the 1985-2005 Jakarta spatial plan, this area was designated as 'protected forest area' important for rainwater retention (Leaf, 2015). This is not the only case where commercial projects have been built on designated green areas. Some recent governors have commented that removing such buildings would be 'impractical'. Clearly it is impossible to separate Jakarta's transformations from the influence of the powerful elites nurtured during the New Order era.

We argue that the massive changes that Jakarta has undergone spatially and politically in the past few decades affect the depoliticising of agendas and the normalisation of the NCICD plan. Public awareness of the 'crisis' of Jakarta's sinking and the resulting urgent need for action neutralises concern over the negative consequences the megaproject may have. The state uses scientific language – not the explicitly repressive approaches that were used in the New Order period – to justify and maintain the large

infrastructure policy. Framing the issue 'scientifically' is an approach to curbing social power that is not unrelated to an autocratic mode of governance. The state closes down the possibility of exploring other alternatives, depriving the public of the opportunity to engage with the policy process.

As some have demonstrated (e.g. Furlong, 2014; Bijker, 2017), science and technology increasingly shape how society works as well as how the state rules the people. Supported by scientific language and logic, the state is able to powerfully legitimise its proposal for large-scale infrastructure. The complex engineering works that the NCICD plan assembles act to silence civil society groups. In general, there is a modern trend to retreat from 'truth language' to 'trust language' (Elzinga, 1997); the public tends to trust the infrastructure without seeking the truth (if a genuine truth actually exists). By its fixation of meaning on the sinking problem and the sea wall solution, the state manages to narrow the solution down to the sea wall. The state's obligation is to protect its people, especially the most vulnerable groups; it may, however, be causing them harm by, for example, displacing them without proper compensation.

To add another layer of complexity, this sophisticated and complex flood defence was developed based on input from the Dutch consortium Deltares, and design work was done by the Dutch architecture firm KuiperCompagnons; local experts were only minimally involved (Salim et al., 2019). After the major flood of 2007 (one of the largest floods in Jakarta's history), the Government of Indonesia, through the Ministry of Public Works, asked for help from the Dutch government. The Netherlands is known as the world's water expert and during the colonial era was involved in early phases of Jakarta's development (Octavianti and Charles, 2018a) making them Indonesia's most suitable partner for solving this water problem. However, 'outsourcing' the entire design process to another country sparked suspicion among NGO activists and concerned academics (Colven, 2017). The complex modelling of the NCICD plan has been justified to the public unaccompanied by clear and sufficient information. Analysing newspaper articles addressing issues around the NCICD plan and land subsidence, Octavianti and Charles (2018b) argue that land subsidence has been problematised in such a way as to frame the NCICD plan as the only solution. It is not surprising to learn that a (simplified) scientific argument has been used to justify this megaproject. While scientists are truly concerned that complex scientific language may overwhelm the public, it is ironic that fear of Jakarta's sinking was exploited to capitalise the project.

Modern states have been characterised by the degree to which they control the development and deployment of water infrastructure (Molle et al., 2009). Swyngedouw (2015), for instance, in describing Spain's hydraulic state-making, observes how the priorities of local society and the environment have been subsumed to economic and political priorities. The state, as Walker (2014: 390) argues, should function "as coordinator of collective action and as an intermediary between the public and private spheres". The nature of the state's role, however, has changed. In Jakarta, the state has used scientific language to help slowly diminish its mediating role. Without intending to demonise the experts involved in the sea wall project, we merely suggest that weakened social power can possibly lead to autocratic management within water policy. To date, the NCICD plan has involved a dynamic policymaking process, relatively uncontested at the time of its launch in 2013, then highly debated following a corruption scandal in 2016. A political event like corruption acts as an efficient window of opportunity or critical juncture to strategically adjust the policy framework of a project like NCICD (Octavianti and Charles, 2018b). In the absence of such an event, the social and environmental impacts associated with the project can be cushioned by the promise of enhanced safety and development.

Having identified three mechanisms of depoliticisation, and the state-society power relations underpinning this process, we now reflect on Ferguson's (1994) findings on the process of depoliticisation in Lesotho's development projects. He argues that the promise of the elimination of poverty through agricultural transformation in Lesotho is "a point of entry for an intervention of a very different character" (ibid: 255). This also seems to be the case in Jakarta. A disaster preparedness scheme aimed at reducing Jakarta's risk of sinking serves as an entry point to the NCICD plan for wider political interests. Its reclamation element provides an opportunity for elites to access interesting development contracts and

concessions. Salim et al. (2019) suggest that the NCICD project allows New Order elites, now marginalised by democratisation, to form 'growth coalitions' which give them privileged access to contracts.

Ferguson (1994: 357) then hypothesises that the development apparatus works as a machine that is able, with the flick of a switch, to protect "even the most sensitive political operations" from the effects of politics, what he calls the "anti-politics machine". We argue that such a mechanism occurs to some extent in Jakarta. The complex nature of the sinking process and the scientific justification of the NCICD plan makes the workings of the plan inaccessible to most people. However, instead of viewing the NCICD plan as a form of anti-politics machine, we see it as one part of a series, or system, of anti-politics configurations. Jakarta's flood mitigation strategy has followed a characteristic infrastructural approach, including an ongoing 19 km canalisation project of major rivers and the construction of grand canals in the western (14.5 km) and eastern (23.6 km) parts of the city (Octavianti and Charles, 2018a). The NCICD program is the largest scheme in the city's history and supports the operation of the entire configuration of infrastructure.

Lastly, Ferguson (1994) observes that the expansion of state power in the depoliticisation process may actually weaken its power. In its role of overall coordinator, the state does not expand its power but instead expands the extent and reach of the loops around existing power relations. In Lesotho, the national government occupied a less powerful position than did the developmental agencies and donor countries. Similarly, in Jakarta some indicators of a reduction of the relative power of the state have also been observed. For example, Basuki Tjahaja Purnama, Jakarta's former governor, was criticised for not being able to revoke the reclamation permits given to private developers. He argued that the permits had been legally issued by a regulation that was in place prior to his tenure (Huda, 2016). The state, in this sense, handed over the future contingencies of the project to private developers (Wade, 2019). In the even longer run, state power over the megaproject is likely to be further reduced because of its accessibility only to (foreign) experts.

We have explained thus far how the present and potential depoliticisation actions have been influenced by Indonesia's political structure and Jakarta's capitalist development. In order to minimise externalities and inequalities caused by the pursuit of the sea wall's construction, we suggest a strategy for resituating politics in Jakarta's water security issues.

REPOLITICISING WATER THROUGH THE HYDROSOCIAL CYCLE

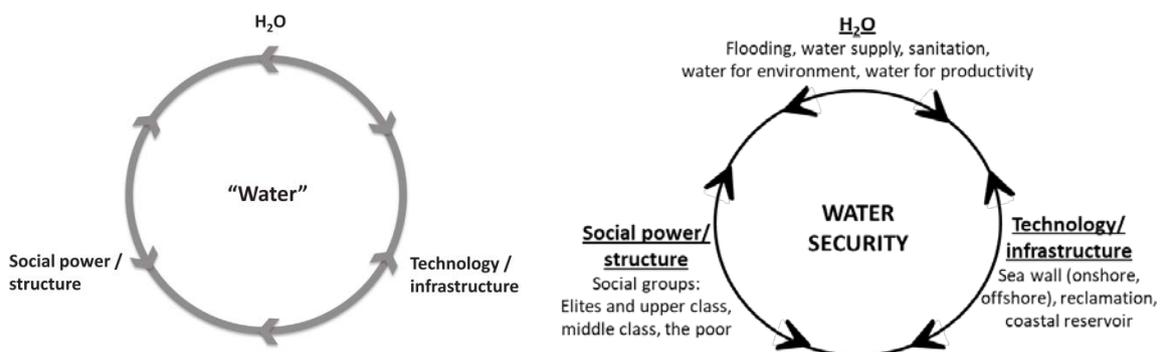
As water has specific contextualised meanings that link spatial and temporal scales and produce specific sources of power relations (Bakker, 2012), we tailor the concept of the hydrosocial cycle to the context of large infrastructure. Constituting more than just background, infrastructure can fundamentally change or even disrupt power relations. Infrastructure and water security are highly political; however, the repoliticisation proposed here is targeted not at infrastructure but at the issue of water security. Taking a step back and viewing the depoliticising mechanisms discussed above through the lens of the hydrosocial cycle, we are hoping to identify sites for repoliticisation of the issues.

The hydrosocial cycle concept represents water's broader social dimensions by internalising the politics of water, as opposed to simply treating water as the *object* of politics (Linton and Budds, 2014). Three components of the cycle – water's materiality (H₂O), technology/infrastructure, and social power/social structures – interact in a two-directional cyclic relationship (Figure 1a). 'Water' (identified in the centre of the circle) is the outcome of this socio-natural process; it acquires a new meaning from the co-constitution of ideas, discourse and power relations in any assemblage of socio-natural processes. The main characteristic of the hydrosocial cycle is that the socio-natural processes occur *internally*; this means "a shift from thinking of relations *between* things – such as the impacts of humans on water quality – to the relations *constituting* things – such as the cultural, economic and political processes that constitute the particular character of desalinated water, treated drinking water or holy water" (Linton and Budds, 2014: 173, emphasis in original). In mobilising the concept, we propose to refine 'water' to 'water

security' as a goal in the centre of the circle. This is not only to build an explicit connection between the hydrosocial cycle and water security but also to highlight the importance of the cycle as the basis for securing water. This suggests that any attempts to improve water security should not under-represent society as one of the elements of the cycle.

In the current discourse promoting the NCICD plan, the interaction between water and society is viewed as a linear relationship. The offshore sea wall – the main component of the plan – is sold to the public as a disaster preparedness scheme. Technology is believed to improve the materiality of water (H₂O) and to further improve people’s overall livelihood. Such a linear perspective is problematic as it eliminates the capacity of the components' internal interaction to create the many externalities that have been discussed above. In Jakarta, we identify multiple assemblages emerging from socio-natural processes which, together, constitute what 'water security' feels like to the people. These include: the different types of water that together constitute 'urban' water, the different social groups and their power relations, and the different and corresponding elements of the megastructure. Below we examine the elements comprising Jakarta’s hydrosocial cycle – technology, H₂O and society (Figure 1b) – and then discuss potential sites at which the whole constellation can be shifted.

Figure 1. a) The hydrosocial cycle as proposed by Linton and Budds (2014); b) our interpretation of the hydrosocial cycle as it operates in Jakarta’s case.



In the hydrosocial cycle there is no beginning or end, as changes to any element affect the whole socio-natural process. It is our view, however, that in Jakarta it is likely to be large infrastructure that disrupts the process. It is worth remembering here that the NCICD plan is comprised of several elements: the onshore sea wall (the urgent need for which has been agreed to by both the proponents and opponents of the plan); the offshore sea wall (the main component of the plan); and the reclamation and coastal reservoir. While the offshore sea wall may initially fulfil its flood-control purpose, it is not clear how externalities have been incorporated into the policymaking process. The sea wall and reclamation will significantly alter the hydraulic conditions in the bay, which will in turn affect at least sediment deposition and wave-tide-circulation system. Therefore, it may improve the materiality of water in terms of protection from flooding, but there may also be severe consequences which in turn affect the social domain, further transforming the cycle.

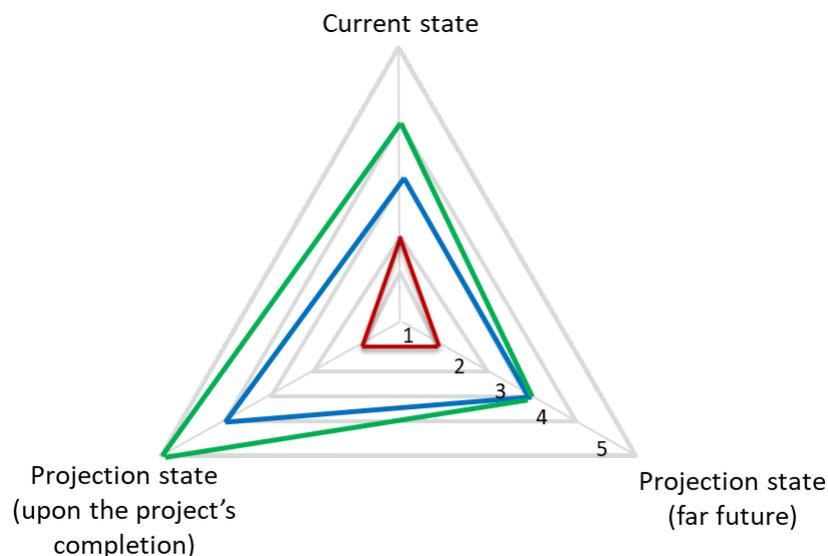
In terms of the materiality of water (H₂O), we have till now focused primarily on flooding, and have tended to underplay the interrelationship with other forms of urban water including drinking water, sanitation, water for environmental needs, and water for economic growth. Although all these types of water shape the experience of water security, in any given context one form of water tends to predominate; in a water-scarce area, for example, people will be likely to prioritise drinking water over safe sanitation facilities. The interactions of urban water in Jakarta are quite clearly producing the city’s subsidence; it is also understood how the NCICD plan may affect these interactions. Briefly, as residents

and businesses have not had reliable access to water, they have been accessing groundwater as their main water source, a practice which has been purported to be the main reason for land subsidence. Furthermore, the offshore sea wall will close off Jakarta Bay and will trap the poor-quality water flowing from the metropolitan catchments. The inadequate sanitation system in the city is the main contributor to the deterioration of the coastal environment (van der Wulp et al., 2016). It is therefore of major importance to also acknowledge the effect on hydrosocial relations of the interaction of diverse types of water beyond the coastal areas.

The final element in the hydrosocial cycle is social structure and its embedded power. Urban areas have been characterised by large inequalities that stem from the city's historical transformations (OECD, 2018). Urban society is not uniform; it consists of heterogeneous groups that have unequal vulnerability to environmental shocks (Grasham et al., 2019). Environmental injustice can exacerbate existing social inequalities of class, gender, age and ethnicity (Nightingale, 2011). Elites and upper class individuals are powerful and have the capacity to reduce their vulnerability to environmental hazards. The poor communities have the least power to voice their concerns and have historically been marginalised. The 'middle class' is characterised differently in different cultures but generally lies between the two in terms of power and wealth.

The fishing community is likely to be the group most impacted by the construction of the sea wall. Over time, however, coastal communities – including elites living in the waterfront areas – may feel the impact of the poor management of coastal waters. Figure 2 shows the benefits and disadvantages of Jakarta's sea wall project on three social classes in three temporal scenarios. We predict that the NCICD project will yield only short-term benefits for the upper and middle classes. Upper class citizens may in the long term experience a massive reduction in water security if no steps are taken to mitigate the deterioration of the waterfront environment. While the figure is based on hypothetical calculations, such visualisations can aid in articulating the project's potential impacts on different groups over time. This is also in line with Salim et al.'s (2019) 'maladaptation' argument, which suggests that the project could increase vulnerability to climate shocks.

Figure 2. Illustration of the different levels of water security anticipated from the NCICD project for three social classes in Jakarta (upper/green, middle/blue and lower/red), over three different timescales: current state; projection state expected once the project is completed and fully functioning; and the long-term projection state ('1' is the lowest level of security and '5' is the highest).



A new articulation of water security is informed and co-constituted by the different types of water, the state of infrastructure and the interaction of social groups; this is set against external factors such as the historical political structure and its attendant discourses, and the involvement of foreign experts. It is a dynamic cyclical process which is continually transformed as changes occur to its components. The plurality in the society must be highlighted in order to prevent deterioration in socio-natural relations that may result from, or be exacerbated by, the introduction of large infrastructure. Addressing the situation in this way can create an entry point for making changes and can reveal the ways in which social inequalities can be produced and sustained through water.

Recognising social plurality is a basic political condition that enables rights to be debated and socially negotiated (Mouffe, 1993). For Fontana (2010: 4), "civil society is not one and harmonious, as in Plato's ideal Polis city, but a plurality of spaces, socio-political and physical/territorial". By appreciating this plurality, contestation of unequal treatment with regard to water security can have more political clout (Joy et al., 2014). We particularly want to highlight the need to shift the power base to the middle class² in order to influence the NCICD policy. The rise of the middle class in Indonesia has been consistent with the wider trend in other Southeast Asia's metropolitan regions; beginning in the mid-1980s, it has continued to grow since the 1997 financial crises. It has led to the increase in megaprojects in the region (and their consequences), as indicated by the proliferation of new towns in the Greater Jakarta (Firman, 2004). As the largest group within Indonesia's population, its middle class supports the economic growth of the country through its consumption, wealth creation and taxation. Liddle (2013) asserts that economic growth is beneficial for democracy as a progressive middle class demands rule of law and political participation. Their power is notably lower than that of the elite, but the middle class is usually more concerned with the quality of government services and can become a powerful voice in demanding improvements in governance (World Bank, 2017). Furthermore, in an era where people are increasingly connected through social media, their collective power is significant (Mahault et al., 2017). For all these reasons, it seems promising to appeal to the middle class for help in achieving collective water security by amplifying the marginalised voice of the poor.

In this section, we have argued the importance of recognising social diversity in conceptualising water security. It is a stance that should not be read as romanticising marginalised citizens; instead, we aim to show how inequality and insecurity are produced through infrastructure and how the groups with the least power are blamed for the collective insecurity.

CONCLUSION

This paper has sought to examine the political ecology of water security in the context of large infrastructure. We argue that major hydraulic works have the potential to depoliticise water security by rendering water issues as merely technical problems, dehumanising the people and discounting future consequences. The causes of water insecurity in Jakarta are political and structural, and not simply geographical and technical; stakeholders are therefore not a neutral instrument. As the paper has demonstrated, technology and society are inseparable, and they are important entities in the co-constitution of the socio-natural process. Unsurprisingly, however, large infrastructure has been devised to abstract the societal dimension in which the technology operates and used to purposely divert attention from the actual complex problem of sinking. These depoliticisation mechanisms have deep roots in Indonesia's political structure and in Jakarta's spatial and political transformation, especially during Soeharto's repressive New Order regime (1967-1998). These have had a strong influence on capitalist development in the city, including the capitalism value embedded in the NCICD policy.

² According to Rastogi et al. (2013), the 'middle class' (which is further divided into 'upper middle', 'middle' and 'emerging middle' class), refers to households whose monthly expenditures are between IDR1.5 and 5 million (US\$100-340). In 2012, there were 109.2 million people in this group. This number is expected to be 168 million in 2020, which will make it the largest group (64%) in the country.

In the long term, depoliticisation may trigger autocratic management of Jakarta's water policy. This autocracy may appear to be subtler than the conventional authoritarian mode of governance, but may even so not provide opportunity for public involvement in the decision-making process or for the exploration of alternative strategies for water security. To avoid such an end, we propose to refine the concept of the hydrosocial cycle by tailoring it to the large-infrastructure context. Mainly, we suggest the recognition of social diversity and the empowerment of the middle class to voice their concerns with regard to the achievement of collective water security.

In framing water security as one face of a broader transformative politics, we borrow from Sultana and Loftus's (2012) insights on the human right to water. Rather than being an 'empty signifier', water security can be regarded as the focal point of a political struggle to achieve a water-secure future without exacerbating inequalities – an approach which positions people and politics at the centre of water security. As Butterworth et al. (2010: 74) suggest, there is an urgent need to "recognize water politics as a reality and also an opportunity... [and] a catalyst for public involvement and change". In the end, water security will be achieved by citizens, not by engineers, politicians and business people.

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REFERENCES

- Abidin, H.Z.; Andreas, H.; Djaja, R.; Darmawan, D. and Gamal, M. 2008. Land subsidence characteristics of Jakarta between 1997 and 2005, as estimated using GPS surveys. *GPS Solutions* 12(1): 23-32.
- Abidin, H.Z.; Andreas, H.; Gumilar, I.; Fukuda, Y.; Pohan, Y.E. and Deguchi, T. 2011. Land subsidence of Jakarta (Indonesia) and its relation with urban development. *Natural Hazards* 59(3): 1753-1771.
- Altshuler, A. and Luberoff, D. 2003. *Mega-projects: The changing politics of urban public investment*. Washington, DC: The Brookings Institution and Lincoln Institute of Land Policy.
- Anwar, M.C. 2019. Wah, Cegah Jakarta Tenggelam, RI Gandeng Korsel dan Belanda (Wow, Prevent Jakarta from sinking, Indonesia partners with South Korea and the Netherlands). CNBC Indonesia. www.cnbcindonesia.com/market/20190628143713-17-81404/wah-cegah-jakarta-tenggelam-ri-gandeng-korsel-dan-belanda (accessed 28 June 2019)
- Aqil, A. 2019. Anies approves buildings on controversial reclaimed islets. *The Jakarta Post*. www.thejakartapost.com/news/2019/06/14/anies-approves-buildings-on-controversial-reclaimed-islets.html (accessed 14 June 2019)
- Aspinall, E. 2012. Still an age of activism. *Inside Indonesia* 1-21. www.insideindonesia.org/index.php?option=com_content&view=article&id=2883:still-an-age-of-activism&catid=171&Itemid=129&tmpl=component&print=1&layout=default&page=
- Atkins, E. 2019. Disputing the 'National Interest': The depoliticization and repoliticization of the Belo Monte Dam, Brazil. *Water* 11(103): 1-21.
- Bakker, K. 2012. Water: Political, biopolitical, material. *Social Studies of Science* 42(4): 616-623.
- Batubara, B.; Kooy, M. and Zwartveen, M. 2018. Uneven urbanisation: Connecting flows of water to flows of labour and capital through Jakarta's flood infrastructure. *Antipode* 50(5): 1186-1205.
- Baviskar, A. 2007. *Waterscapes: The cultural politics of a natural resources (Nature, culture, conservation)*. Delhi: Permanent Black.
- Bichsel, C. 2016. Water and the (infra-)structure of political rule: A synthesis. *Water Alternatives* 9(2): 356-372.

- Bijker, W.E. 2017. Sociohistorical technology studies. In Jasanoff, S.; Markle, G.E.; Peterson, J.C. and Pinch, T. (Eds), *Handbook of Science and Technology Studies*, pp. 229-256. SAGE Publications.
- Boelens, R. 2014. Cultural politics and the hydrosocial cycle: Water , power and identity in the Andean highlands. *Geoforum* 57: 234-247.
- Boelens, R.; Hoogesteger, J.; Swyngedouw, E.; Vos, J. and Wester, P. 2016. Hydrosocial territories: A political ecology perspective. *Water International* 41(1): 1-14.
- Brenner, N. and Schmid, C. 2014. The 'urban age' in question. *Urban Worlds* 38(3): 731-55.
- Brinkman, J.J. and Hartman, M. 2009. Jakarta flood hazard mapping framework. In The International Conference on Urban Flood Management, pp. 1-9, <http://library.wur.nl/WebQuery/titel/1939477>.
- Budds, J. 2009. Contested H2O: Science, policy and politics in water resources management in Chile. *Geoforum* 40(3): 418-430.
- Budiyono, Y.; Aerts, J.; Brinkman, J.J.; Marfai, M.A. and Ward, P. 2015. Flood risk assessment for delta mega-cities: A case study of Jakarta. *Natural Hazards* 75: 389-413.
- Budiyono, Y.; Aerts, J.C.J.H.; Tollenaar, D. and Ward, P.J. 2016. River flood risk in Jakarta under scenarios of future change. *Natural Hazards and Earth System Sciences* 16: 757-774.
- Butler, J. 2014. Rethinking vulnerability and resistance. Plenary Conference at the XV Simposio de la Asociación Internacional de Filósofos (IAPh), Universidad de Alcalá (Madrid), 24th June, pp. 1-19, 2014, www.institutofranklin.net/sites/default/files/files/Rethinking_Vulnerability_and_Resistance_Judith_Butler.pdf
- Butterworth, J.; Warner, J.; Moriarty, P.; Smits, S. and Batchelor, C. 2010. Finding practical approaches to integrated water resources management. *Water Alternatives* 3(1): 68-81.
- Carse, A. 2012. Nature as infrastructure: Making and managing the Panama Canal watershed. *Social Studies of Science* 42(4): 539-563.
- Castree, N. and Braun, B. 2001. *Social nature: Theory, practice, and politics*. Oxford: Blackwell Publishing Ltd.
- Colven, E. 2017. Understanding the allure of big infrastructure: Jakarta's Great Garuda Sea Wall project. *Water Alternatives* 10(2): 250-264.
- Cook, C. and Bakker, K. 2012. Water security: Debating an emerging paradigm. *Global Environmental Change* 22(1): 94-102.
- Corsín Jiménez, A. 2014. The right to infrastructure: A prototype for open source urbanism. *Environment and Planning D: Society and Space* 32(2): 342-362.
- Crow-Miller, B.; Webber, M. and Molle, F. 2017. The (re)turn to infrastructure for water management? *Water Alternatives* 10(2): 195-207.
- de la Motte, R. 2013. *Liquid dynamics: The hydrosocial cycle and the radical politics of water*. University of Manchester.
- del Moral, L.; Pita, M.F.; Pedregal, B.; Hernández-Mora, N. and Limones, N. 2014. Current paradigms in the management of water: Resulting information needs. *Publicaciones Instituti Geographici Universitatis Tartuensis* 110: 21-31.
- Delgado, J.R.V. 2011. *The ethno-politics of water security: Constructions of ethnicity and gender in strategies to control water in the Andes of Peru*. Wageningen University.
- Delgado, J.R.V. and Zwarteveen, M. 2017. Queering engineers? Using history to re-think the associations between masculinity and irrigation engineering in Peru. *Engineering Studies* 9(2): 140-160.
- Deltares. 2015. *Sinking cities: An intergrated approach towards solutions*. Deltares18 3. Delft/ Utrecht, The Netherlands, <https://doi.org/10.1046/j.1365-2451.2002.00341.x>.
- Douglass, M. 2010. Globalization, mega-projects and the environment urban form and water in Jakarta. *Environment and Urbanization Asia* 1(1): 45-65.
- Ezlinga, A. 1997. The science-society contract in historical transformation: With special reference to "epistemic drift". *Social Science Information* 36(3): 411-445.
- Emas, R. 2015. *The concept of sustainable development: Definition and defining principles*. Brief for GSDR, <https://doi.org/10.1016/j.marpol.2014.01.019>

- Ewertsson, L. and Ingelstam, L. 2004. Large technical systems: A multidisciplinary research tradition. In Olsson, M.O. and Sjostedt, G. (Eds), *Systems approaches and their application: Examples from Sweden*, pp. 291-309. Stockholm: Kluwer.
- Fajri, F. Al. 2014. 16 Pompa rusak, Jakarta Utara terancam banjir besar (16 Pumps are broken, North Jakarta is threatened by major floods). *Warta Kota*. 14 November 2014.
<http://wartakota.tribunnews.com/2014/11/14/16-pompa-rusak-jakarta-utara-terancam-banjir-besar>
- Farisa, F.C. 2019. KPU Sebut Partisipasi Pemilih pada Pemilu 2019 Capai 81 Persen (KPU notes voter participation in the 2019 election reaches 81 percent). Kompas.
- Ferguson, J. 1994. *The anti-politics machine: "development", depoliticization, and bureaucratic power in Lesotho*. Minneapolis; London: University of Minnesota Press.
- Firman, T. 2004. New town development in Jakarta Metropolitan Region: A perspective of spatial segregation. *Habitat International* 28(3): 349-368.
- Firman, T.; Surbakti, I.M.; Idroes, I.C. and Simarmata, H. a. 2011. Potential climate-change related vulnerabilities in Jakarta: Challenges and current status. *Habitat International* 35(2): 372-378.
- Fontana, B. 2010. Political space and hegemonic power in Gramsci. *Journal of Power* 3(3): 341-363.
- Furlong, K. 2014. STS beyond the "modern infrastructure ideal": Extending theory by engaging with infrastructure challenges in the South. *Technology in Society* 38: 139-147.
- Geels, F. 2005. Co-evolution of technology and society: The transition in water supply and personal hygiene in the Netherlands (1850-1930)-a case study in multi-level perspective. *Technology in Society* 27(3): 363-397.
- Gober, P.A.; Strickert, G.E.; Clark, D.A.; Chun, K.P.; Payton, D. and Bruce, K. 2015. Divergent perspectives on water security: Bridging the policy debate. *The Professional Geographer* 67(1): 62-71.
- Goh, K. 2019. Urban waterscapes: The hydro-politics of flooding in a sinking city. *International Journal of Urban and Regional Research* 43(2): 250-272.
- Grasham, C.F.; Korzenevica, M. and Charles, K.J. 2019. On considering climate resilience in urban water security: A review of the vulnerability of the urban poor in sub-Saharan Africa. *WIREs Water* 1-11,
<https://doi.org/10.1002/wat2.1344>
- Gunawan, R. 2010. *Gagalnya sistem kanal: Pengendalian banjir Jakarta dari masa ke masa (The failure of the canal system: Jakarta's flood control strategy from time to time)*. Jakarta, Indonesia: Kompas.
- Gutiérrez, R.A. 2010. When experts do politics: Introducing water policy reform in Brazil. *Governance: An International Journal of Policy, Administration and Institutions* 23(1): 59-88.
- Harbers, H. 2005. Introduction: Co-production, agency and normativity. In *Inside the politics of technology: Agency and normativity in the co-production of technology and society* Harbers, Hans, pp. 10-27. Amsterdam, the Netherlands: Amsterdam University Press.
- Hadiz, V.R. and Robison, R. 2013. The political economy of oligarchy and the reorganisation of power in Indonesia. *Indonesia* (96): 35-57.
- Herzfeld, M. 1991. *The social production of indifference: Exploring the symbolic roots of Western bureaucracy*. New York: Berg.
- Huda, L. 2016. Kirim Surat ke Istana, Ahok: Reklamasi Tak Bisa Dibatalkan (Send a letter to the Presidential Palace, Ahok: Reclamation cannot be cancelled). *Tempo*. <https://metro.tempo.co/read/787221/kirim-surat-ke-istana-ahok-reklamasi-tak-bisa-dibatalkan> (accessed 1 August 2018)
- Iswara, M.A. 2019. Jakarta's giant sea wall gets Dutch, Korean help. *The Jakarta Post*.
www.thejakartapost.com/news/2019/07/03/jakarta-s-giant-sea-wall-gets-dutch-korean-help.html (accessed 3 July 2019)
- Jensen, C.B. and Morita, A. 2015. Infrastructures as ontological experiments. *Engaging Science, Technology, and Society* 1: 81-87.
- Jepson, W.; Budds, J.; Eichelberger, L.; Harris, L.; Norman, E.; Reilly, K.O.; Pearson, A.; Shah, S.; Shinn, J.; Staddon, C.; Stoler, J.; Wutich, A. and Young, S. 2017. Advancing human capabilities for water security: A relational approach. *Water Security* 1: 46-52.

- Joy, K.J.; Kulkarni, S.; Roth, D. and Zwarteveen, M. 2014. Re-politicising water governance: Exploring water re-allocations in terms of justice. *Local Environment* 19(9): 954-973.
- Kaika, M. 2005. *City of flows: Modernity, nature, and the city*. New York: Routledge.
- Karpouzoglou, T. and Vij, S. 2017. Waterscape: A perspective for understanding the contested geography of water. *WIREs Water* 4(e1210): 1-5.
- Keil, R. 2000. *Political ecology: Local and global*. London: Routledge.
- Khatri, K.B. and Vairavamoorthy, K. 2007. Challenges for urban water supply and sanitation in the developing countries. UNESCO_IHEJune, <https://doi.org/10.1201/9780203878057.ch7>
- Kooy, M.; Walter, C.T. and Prabaharyaka, I. 2016. Inclusive development of urban water services in Jakarta: The role of groundwater. *Habitat International* 73: 109-118.
- Kooy, M.E. 2008. *Relations of power, networks of water: Governing urban waters, spaces, and populations in (post)colonial Jakarta*. University of British Columbia.
- KPPIP. 2018. Pengolahan air limbah Jakarta (Jakarta's wastewater treatment plan). <https://kppip.go.id/proyek-prioritas/air-dan-sanitasi/pengolahan-air-limbah-jakarta/> (accessed 1 August 2018)
- Kunio, Y. 1990. *Kapitalisme semu Asia Tenggara*. Jakarta: LP3ES.
- Kusno, A. 2013. The post-colonial unconscious: Observing mega-imagistic urban projects in Asia. In Bharne, V. (Ed), *The emerging Asian city : Concomitant urbanities and urbanisms*, pp. 168-178. Abingdon, UK: Routledge.
- Kusno, A. 2015. Power and time turning: The capital, the state and the kampung in Jakarta. *International Journal of Urban Sciences* 19(1): 53-63.
- Landström, C. and Whatmore, S.J. 2018. Virtually expert: Modes of environmental computer simulation modeling. *Science in Context* 27(4): 579-603.
- Larkin, B. 2013. The politics and poetics of infrastructure. *The Annual Review of Anthropology* 327-343, <https://doi.org/10.1146/annurev-anthro-092412-155522>
- Latour, B. 1987. *Science in action: How to follow scientists and engineers through society*. Cambridge, MA: Harvard University Press.
- Leaf, M. 2015. Exporting Indonesian urbanism: Ciputra and the development vision of market modernism. *South East Asia Research* 23(2): 169-186.
- Li, T.M. 2007. *The will to improve: Governmentality, development, and the practice of politics*. Durham, NC: Duke University Press.
- Linton, J. 2010. *What is water? The history of a modern abstraction*. Vancouver: UBC Press.
- Liddle, R.W. 2013. Improving the quality of democracy in Indonesia: Toward a theory of action. *Indonesia* 96: 59-80.
- Linton, J. 2014. Modern water and its discontents: A history of hydrosocial renewal. *WIREs Water* 1: 111-120.
- Linton, J. and Budds, J. 2014. The hydrosocial cycle: Defining and mobilizing a relational-dialectical approach to water. *Geoforum* 57: 170-180.
- Livingstone, D.N. 2011. Environmental determinism. In Agnew, J.A. and Livingstone, D.N. (Eds), *Sage Handbook of Geographical Knowledge*, pp. 368-380. London: SAGE Publications.
- Locke, S.F. 2009. How it works: Protecting New Orleans with the world's largest flood pump. *Popular Science*. <https://www.popsci.com/scitech/article/2009-08/saving-new-orleans-worlds-largest-water-pump> (accessed 11 September 2018)
- Loftus, A. 2007. Working the socio-natural relations of the urban waterscape in South Africa. *International Journal of Urban and Regional Research* 31(1): 41-59.
- Mahault, B.; Saxena, A. and Nisoli, C. 2017. Emergent inequality and self-organized social classes in a network of power and frustration. *PLoS ONE* 12(2): 1-23.
- McDonald, R.I.; Douglas, I.; Revenga, C.; Hale, R.; Grimm, N.; Grönwall, J. and Fekete, B. 2011. Global urban growth and the geography of water availability, quality, and delivery. *Ambio* 40(5): 437-446.
- Meehan, K.M. 2014. Tool-power: Water infrastructure as wellsprings of state power. *Geoforum* 57: 215-224.

- Molle, F.; Mollinga, P.P. and Wester, P. 2009. Hydraulic bureaucracies and the hydraulic mission: Flows of water, flows of power. *Water Alternatives* 2(3): 328-349.
- Mollinga, P.P. 2014. Canal irrigation and the hydrosocial cycle: The morphogenesis of contested water control in the Tungabhadra Left Bank Canal, South India. *Geoforum* 57: 192-204.
- Morita, A. 2017. Multispecies infrastructure: Infrastructural inversion and involuntory entanglements in the Chao Phraya Delta, Thailand. *Ethnos, Journal of Anthropology* 82(4): 738-757.
- Mouffe, C. 1993. *The return of the political*. London: Verso.
- NCICD. 2014. Mastre Plan: National Capital Integrated Coastal Development (draft). November. Jakarta, <http://en.ncicd.com/ncicd/downloads/>
- Nickum, J. 2010. Water policy reform in China's fragmented hydraulic state: Focus on self-funded/managed irrigation and drainage districts. *Water Alternatives* 3(3): 537-551.
- Nightingale, A.J. 2011. Bounding difference: Intersectionality and the material production of gender, caste, class and environment in Nepal. *Geoforum* 42(2): 153-162.
- Obertreis, J.; Moss, T.; Mollinga, P.P. and Bichsel, C. 2016. Water, infrastructure and political rule: Introduction to the special issue. *Water Alternatives* 9(2): 168-181.
- Octavianti, T. and Charles, K. 2018a. The evolution of Jakarta's flood policy over the past 400 years: The lock-in of infrastructural solutions. *Environment and Planning C: Politics and Space* 37(6): 1102-1125.
- Octavianti, T. and Charles, K. 2018b. Disaster capitalism? Examining the politicisation of land subsidence crisis in pushing Jakarta's sea wall megaproject. *Water Alternatives* 11(2): 394-420.
- OECD. 2018. *Divided cities: Understanding intra-urban inequalities*. Paris: OECD.
- Oxfam. 2017. Towards a more equal Indonesia. Jakarta, https://d1tn3vj7xz9fdh.cloudfront.net/s3fs-public/bp-towards-more-equal-indonesia-230217-en_0.pdf
- PAM Jaya. 2016. Cakupan layanan air bersih (Water service coverage).
- Peet, R. 1988. Wittfogel on the nature-society dialectic. *Political Geography Quarterly* 7(1): 81-83.
- Pelling, M. and Blackburn, S. (Eds). 2013. *Megacities and the coast: Risk, resilience and transformation*. London: Routledge.
- Rastogi, V.; Tamboto, E.; Tong, D. and Sinburimsit, T. 2013. Asia's next big opportunity: Indonesia's rising middle-class and affluent consumers. BCG Perspectives, www.bcg.com/en-gb/publications/2013/center-consumer-customer-insight-consumer-products-indonesias-rising-middle-class-affluent-consumers.aspx
- Robison, R. and Hadiz, V. 2004. *Reorganising power in Indonesia: The politics of oligarchy in an age of markets*. London; New York: Routledge Curzon.
- Rukmana, D. 2008. The growth of Jakarta Metropolitan Area and the sustainability of urban development in Indonesia. *The International Journal of Environmental, Cultural, Economic and Social Sustainability* 4(1): 99-105.
- Salim, W.; Bettinger, K. and Fisher, M. 2019. Maladaptation on the waterfront: Jakarta's growth coalition and the Great Garuda. *Environment and Urbanization Asia* 10(1): 63-80.
- Schmidt, J.J. 2014. Historicising the hydrosocial cycle. *Water Alternatives* 7(1): 220-234.
- Scott, J.C. 1998. *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven: Yale University Press.
- Sismondo, S. 2007. Science and technology studies and an engaged program. In Hackett, E.J. (Ed), *The Handbook of Science and Technology Studies*, pp. 13-32. Cambridge, MA: MIT Press.
- Sivapalan, M.; Savenije, H.H.G. and Blöschl, G. 2012. Socio-hydrology: A new science of people and water. *Hydrological Processes* 26(8): 1270-1276.
- Staddon, C.; Sarkozi, R. and Langberg, S. 2017. Urban water governance as a function of the 'Urban Hydrosocial Transition'. In Karar, E. (Ed), *Freshwater governance for the 21st century*, pp. 81-102. Cham: Springer International Publishing.
- Steinberg, F. 2007. Jakarta: Environmental problems and sustainability. *Habitat International* 31(3-4): 354-365.
- Strang, V. 2016. Infrastructural relations: Water, political power and the rise of a new "despotic regime". *Water Alternatives* 9(2): 292-318.

- Sultana, F. 2013. Water, technology, and development: Transformations of development technonatures in changing waterscapes. *Environment and Planning D: Society and Space* 31(1): 337-353.
- Sultana, F. and Loftus, A. 2012. *The right to water: Politics, governance and social struggles*. London: Routledge.
- Swyngedouw, E. 2004. *Social power and the urbanization of water*. Oxford: Oxford University Press.
- Swyngedouw, E. 2005. Dispossessing H2O: The contested terrain of water privatization of water privatization. *Capitalism Nature Socialism* 16(1): 81-98.
- Swyngedouw, E. 2009. The political economy and political ecology of the hydro-social cycle. *Journal of Contemporary Water Research & Education* (142): 56-60.
- Swyngedouw, E. 2013. UN Water Report 2012: Depoliticizing water. *Development and Change* 44(3): 823-835.
- Swyngedouw, E. 2015. *Liquid power: Contested hydro-modernities in twentieth-century Spain, 1898-2010*. Cambridge, MA; London: The MIT Press.
- The Economist Intelligence Unit. 2017. Democracy Index 2016: Revenge of the "deplorables", www.eiu.com/Handlers/WhitepaperHandler.ashx?fi=Democracy-Index-2016.pdf&mode=wp&campaignid=DemocracyIndex2016
- The Jakarta Post. 2008. Editorial: Flooded airport access. *The Jakarta Post*. 9 February 2008, www.thejakartapost.com/news/2008/02/09/editorial-flooded-airport-access.html
- The Jakarta Post. 2016. Q&A: The problem with Jakarta's land reclamation. *The Jakarta Post*. 7 April 2016, www.thejakartapost.com/academia/2016/04/07/qa-the-problem-with-jakartas-land-reclamation.html
- UN. 2018. *World Urbanization Prospects: The 2018 Revision, Key Facts*, [https://doi.org/\(ST/ESA/SER.A/366\)](https://doi.org/(ST/ESA/SER.A/366)).
- Wade, M. 2019. Hyper-planning Jakarta : The Great Garuda and planning the global spectacle. *Singapore Journal of Tropical geography* 40: 158-172.
- Walker, G. 2014. Water scarcity in England and Wales as a failure of (meta)governance. *Water Alternatives* 7(2): 388-413.
- Warner, J.F. 2008. The politics of flood insecurity: Framing contested river management projects. Wageningen University, the Netherlands.
- Webber, D. 2006. A consolidated patrimonial democracy? Democratization in post-Suharto Indonesia. *Democratization* 13(3): 396-420.
- Wesselink, A.; Kooy, M. and Warner, J. 2017. Socio-hydrology and hydrosocial analysis: Toward dialogues across disciplines. *WIREs Water* 4(e1196): 1-14.
- Winters, J.A. 2012. Pathways to a people's president. *Inside Indonesia* 1-16, www.insideindonesia.org/index.php?option=com_content&view=article&id=2884:_____pathways-to-a-people-s-president&catid=171&Itemid=129&tmpl=component&print=1&layout=default&page=
- Wittfogel, K.A. 1957. *Oriental despotism: A comparative study of total power*. New Haven: Yale University Press.
- World Bank. 2017. Indonesia's middle class vital for the country's future. Jakarta, www.worldbank.org/en/news/press-release/2017/12/04/indonesia-middle-class-vital-for-the-country-future
- van der Wulp, S.A.; Dsikowitzky, L.; Hesse, K.J. and Schwarzbayer, J. 2016. Master Plan Jakarta, Indonesia: The Giant Seawall and the need for structural treatment of municipal waste water. *Marine Pollution Bulletin* 110(2): 686-93.
- Zeitoun, M.; Lankford, B.; Krueger, T.; Forsyth, T.; Carter, R.; Hoekstra, A.Y.; Taylor, R.; Varis, O.; Cleaver, F.; Boelens, R.; Swatuk, L.; Tickner, D.; Scott, C.A.; Mirumachi, N. and Matthews, N. 2016. Reductionist and integrative research approaches to complex water security policy challenges. *Global Environmental Change* 39: 143-154.
- Zwarteveen, M. 2017. Hydrocracies, engineers and power: Questioning masculinities in water. *Engineering Studies* 9(2): 78-94.

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