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Understanding the Allure of Big Infrastructure: Jakarta's Great Garuda Sea Wall Project

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ABSTRACT: In response to severe flooding in Jakarta, a consortium of Dutch firms in collaboration with the Indonesian government has designed the 'Great Garuda Sea Wall' project. The master plan proposes to construct a sea wall to enclose Jakarta Bay. A new waterfront city will be built on over 1000 hectares (ha) of reclaimed land in the shape of the *Garuda*, Indonesia's national symbol. By redeveloping North Jakarta, the project promises to realise the world-class city aspirations of Indonesia's political elites. Heavily reliant on hydrological engineering, hard infrastructure and private capital, the project has been presented by proponents as the optimum way to protect the city from flooding. The project retains its allure among political elites despite not directly addressing land subsidence, understood to be a primary cause of flooding. I demonstrate how this project is driven by a techno-political network that brings together political and economic interests, world-class city discourses, engineering expertise, colonial histories, and postcolonial relations between Jakarta and the Netherlands. Due in part to this network, big infrastructure has long constituted the preferred state response to flooding in Jakarta. I thus make a case for provincialising narratives that claim we are witnessing a return to big infrastructure in water management.

KEYWORDS: Flood mitigation, Global South, infrastructure, hydrological engineering, urban flooding, Indonesia

INTRODUCTION

Historically and geographically, the construction of large-scale water infrastructure projects has been a central component in the production of 'modern' industrial society. The 20th century saw the emergence of the so-called 'hydraulic age', characterised by "state-led centralized approaches mobilizing large-scale technologies" (March, 2015: 232) in order to manage water. This included the proliferation of large-scale, modernist infrastructure projects, such as the Hoover Dam in the US and the Zuiderzee Works in the Netherlands. Such large-scale, technological water infrastructure projects have operated as "symbols of modernisation, development, and state power" (Wittfogel, 1957; Webber et al., 2015: 11). Scholars have observed the steady decline of this paradigm at the turn of the 21st century, and its replacement with demand-side technologies and water management strategies such as leakage reduction and metering systems, aimed at achieving increased efficiency and reduced water usage. This shift has largely been attributed to the increasingly central role of the private sector within water management, as well as growing resistance to the economic, social, and environmental costs of large-scale projects (Guy and Marvin, 1996; Gleick, 2000; March, 2015).

In recent decades a broader 'ecological turn' (Disco, 2002) in engineering has rolled out across Western Europe and North America specifically with regard to flood mitigation. This has imagined and promoted attempts to plan with nature, rather than control it, and demonstrated a shift away from an institutional reliance on hydraulic engineering and traditionally 'hard' infrastructure, and toward increased experimentation with 'softer' flood mitigation techniques. Such strategies include the utilisation and restoration of mangrove forests to protect coastlines against storm surges and tidal

flooding (Spalding et al., 2014), buildings designed to accommodate floodwaters (Koellner, 2016), and the Dutch programme of making 'room for the river' – moving dykes farther back from rivers to accommodate higher levels of water (Ruimte voor de Rivier, 2016). Therefore, while the Dutch have gained worldwide recognition for their expertise and ability to "[keep] the water out" (Bijker, 2007: 120), there is a trend in Dutch water management "in which the water is in fact being given room" (Metz and van den Heuvel, 2012: 9).

However, a recent wave of concrete-heavy, capital-intensive water infrastructure projects – such as China's North-South Transfer project, the largest water transfer project ever constructed (Crow-Miller, 2015), South Korea's Saemangeum, the 33-kilometre (km) sea wall, the longest human-made dyke in the world (Ja-young, 2017), and London's £270 million desalination plant (Loftus and March, 2016) – suggests that we may be witnessing a return to big infrastructure within water management. Understanding this shift, and the forces driving it, is of growing interest to scholars researching water politics around the world (Loftus and March, 2015, 2016). Heavily reliant on hydrological engineering expertise, hard infrastructure, and private capital, Jakarta's planned Great Garuda Sea Wall (GGSW) project might appear to reflect this observed return towards big infrastructure, but in Jakarta big infrastructure never left. The design of the GGSW is underpinned by the same modernist impulses that characterised water infrastructure projects of the 20th century – to display humankind's control over unruly nature, and to 'modernise' Jakarta. With an estimated cost of USD40 billion (Koch, 2015), the master plan proposes the strengthening of the existing sea wall (referred to as Stage A) followed by construction of a western and eastern offshore sea wall to close Jakarta Bay (referred to as Stages B and C) and protect the city from flooding. The closure of the bay will create a giant offshore retention lake, supported by pumping stations that will keep the water level low enough to facilitate the discharge of Jakarta's rivers into the sea. The project is "more than just a dike" (van den Boomen and Jones, 2014: 13): a new waterfront city will be constructed on more than 1000 ha of reclaimed land in the shape of the *Garuda*, a mythical bird and Indonesia's national symbol.

The project was designed by a consortium of Dutch firms in coordination with the provincial government of Jakarta and several national government ministries: the Coordinating Ministry of Economic Affairs, the National Development Planning Agency, and the Ministry of Public Works. The master plan for the GGSW, funded by the Government of the Netherlands, emerges from "long-term cooperation between the governments of Indonesia and the Netherlands in the field of water management" (NCICD Consortium, 2014a: 13). While Dutch expertise has travelled to a range of sites worldwide, Jakarta is distinguished as a former outpost of the *Vereenigde Oost-Indische Compagnie* (Dutch East India Company) and an ex-colony. The project thus reflects a longer history of Dutch interventions in Indonesia. But how can we understand the implementation of big infrastructure in response to flooding in Jakarta? Loftus and March (2016) have argued that understanding the trend towards big infrastructure projects requires attention to the "financial and political networks" that underpin them (ibid, 4). Examining London's Thames Water Desalination Plan, they argue that the private utility company Thames Water has presented desalination as the obvious solution to London's water shortage problem by increasing drinking water supply for the city's residents. Yet, a "more profound motivation seems to be the need for new infrastructural forms within which to ensure speculative gains" (Loftus and March, 2015: 174). Therefore, they argue that the construction of the plant needs to be situated within a broader prioritisation of large infrastructure projects at the expense of "more mundane strategies of demand management and leakage reduction" (Loftus and March, 2016: 2).

Building on this, I will argue that the GGSW retains its allure in Jakarta because of a geographically and historically contingent "techno-political network" (Sneddon, 2015: 13) that brings together political-economic interests, mobile forms of expertise, and flows of capital. I use the term allure to capture how the Indonesian state remains orientated towards plans for large infrastructure projects, despite the challenges of realising them. Thinking the (re)turn to big infrastructure through Jakarta

provides a means to examine the techno-political networks driving the construction of concrete-heavy, capital-intensive infrastructure projects from the vantage point of a postcolonial mega-city. In Jakarta, colonial histories and postcolonial relations between Jakarta and the Netherlands have crucially shaped the techno-political network driving the GGSW. Such insights contribute to challenging the long-standing bias of urban studies, which has traditionally constructed theory largely from empirical research in Northern cities (Robinson, 2006; Roy, 2015).

This paper is organised into three parts. First, I summarise my theoretical framework drawing on science and technology studies, urban political ecology, and postcolonial urban theory in order to explain the allure of the GGSW in Jakarta. Second, I demonstrate that, while the project is presented as the preferable way to protect the city from the threat of flooding, it is not necessarily understood to constitute the most direct way to address the causes of flooding. This raises the question of why this particular project is being pursued over alternative flood mitigation strategies. Third, in seeking to answer this question, I illustrate how the GGSW emerges from a techno-political network produced through the interconnections of political and economic interests, world-class city discourses, technical expertise, and colonial and postcolonial relations that contribute to the allure of the project, driving it forward.

My analysis draws on critical discourse analysis of the project master plan, relevant engineering reports, and media and newspaper reports, as well as 20 semi-structured interviews conducted with engineers, financial consultants, architects, and national and provincial government officials and staff in Jakarta and the Netherlands. Interviewees were chosen because of their role in the design, development and/or potential implementation of the GGSW master plan. Themes discussed in the interviews included but were not limited to the rationale and motivations behind the project; the design and engineering decisions made during the process of drawing up the master plan; the nature of collaboration between Dutch firms and the Indonesian ministries; the anticipated environmental and social impacts of the project, and the concerns of the different government ministries regarding such impacts.

THEORETICAL FRAMEWORK: SCIENCE AND TECHNOLOGY STUDIES, URBAN POLITICAL ECOLOGY, AND POSTCOLONIAL URBAN THEORY

Scholarship in science and technology studies has contributed to our understandings of the co-production of politics and technology, capitalism and science. For example, through an ethnography of laboratories Latour and Woolgar (1979) sought to elucidate the co-production of the 'social' and the 'technical' (ibid, 31), as they observed scientists "[struggling] to produce order" from disorder (ibid, 36). Raising the question of why levees could not save New Orleans while dykes continue to protect the Netherlands, Bijker (2007) argues that dykes, dams, levees and other such "socio-technologies" are "thick with power relations and politics" (ibid, 115). By this, he means that socio-technologies do not exist in a political vacuum, but instead both shape, and are shaped by social structures. Also acknowledging nonhuman agency, scholars have used the term 'techno-politics' to capture the co-production of technology and politics, and the social and natural worlds (Hecht, 2001, 2011; Mitchell, 2002; Sneddon, 2015). Thus Timothy Mitchell (2002) argues that Egypt's economic disaster in 1942-1944 was produced through the "interconnections of war, disease, and agriculture" (ibid, 27), and can only be understood by attending to interactions between various elements: dams, mosquitos, synthetic fertilisers, war, and man-made famine. He therefore argues for examining the interconnections and interactions between human and nonhuman elements, thereby expanding traditional notions of agency within social science, in order to better attend to those "things that are clearly more than social" (ibid, 52).

Informed by Mitchell's work, Sneddon (2015) conceptualises large dams as "technological and political objects" (ibid, 14) produced at the intersections of "altered hydrologies, technical expertise,

financial circuits, political desires, displaced communities, and hegemonic ideologies" (ibid, 2). He argues that the construction of dams abroad by the US Bureau of Reclamation throughout the 20th century was inseparable from broader geopolitical relations of economic development, as dams came to constitute a major component of US ideology and Cold War politics. Turning to the contemporary period, he argues that dams are produced through a "techno-political network" (Sneddon, 2015: 13) shaped by "shifting geopolitical alignments and environmental concerns about climate change and renewable energy" (ibid, 127), the increasing involvement of the Chinese state and other 'nontraditional' aid donor states, and anti-dam coalitions between affected communities, advocacy organisations, and scientists. Dams are therefore much more than technologies; they are produced by, and productive of politics.

Urban water infrastructure has received attention in urban political ecology (UPE). Swyngedouw (2006) argues that "[t]he urban world is a cyborg world, part natural part social, part technical part cultural, but with no clear boundaries, centres, or margins" (ibid, 118). Kaika (2005), meanwhile, advocates for a view of the city as a 'socio-natural hybrid', a term intended to capture that neither nature nor the city are "purely human-made nor purely natural" but are instead co-produced (ibid, 5). Studies of water infrastructure projects within this literature have examined the proliferation throughout the 20th century of large-scale water infrastructure projects symbolic of humans' control over nature (Kaika, 2005), and demonstrated their centrality to state-building programmes, developmentalist agendas, and the pursuit of 'modernity'. Kaika (2006), for example, observes the importance of the Marathon Dam to attempts to 'modernise' Athens. Kooy and Bakker (2008) demonstrate how the development of the city's water supply network was intended to showcase an "internationally modern Jakarta" (ibid, 1851), making a case for considering the water treatment plants constructed under President Sukarno as "modernist monuments" (ibid, 1852).

An emergent branch of UPE, termed 'situated urban political ecology', is taking up the insights of postcolonial urban theory. A subfield of urban studies that crystallised during the 1990s, postcolonial urban theory has sought to challenge traditional canons of urban theory on the basis that such scholarship is empirically and theoretically narrow (Robinson, 2006), and has tended to "generalize the experience of a handful of Euro-American cities as a universally occurring urban form" (Roy, 2015: 205). Borrowing from Chakrabarty (2000), postcolonial urban theory invites scholars to engage in practices of 'provincialisation', to recognise that theories emerge and are "drawn from very particular intellectual and historical traditions that could not claim any universal validity" (Chakrabarty, 2000: xiii). To "provincialise" urban theory (Sheppard et al., 2013; Sheppard and Leitner, 2015), then, is to generate "forms of theorization that are attentive to historical difference as a fundamental constituent of global urbanization" (Roy, 2015: 200). Studies in situated urban political ecology draw on this scholarship in order to "provincialize" urban political ecology. By broadening the sites of research beyond the Global North and engaging with "situated understandings of the environment, knowledge, and power", this scholarship aims to produce a "more theoretically heterogeneous UPE" (Lawhon et al., 2014: 498) that is better able to attend to historical and geographical specificity.

Working at the intersection of these literatures, I conceptualise the GGSW as the product of a geographically and historically contingent "techno-political network" through which the project is emerging as the preferred solution to Jakarta's flooding. This network comprises various elements, to be discussed in the remainder of the paper: world-class city aspirations, flows of capital, colonial and postcolonial relations, and transnational networks of expertise.¹ This facilitates an analytical approach that is attentive to the political and economic forces involved in the design, promotion, and

¹ As the focus of this paper is primarily the politico-economic forces driving the allure of the GGSW, I afford less attention to how nonhuman agency is shaping the project.

implementation of infrastructure projects, well suited for understanding how the GGSW retains its allure.

CONTESTED NARRATIVES, CONTESTED SOLUTIONS: CONSTRUCTING THE GGSW AS THE 'OPTIMUM WAY'

Jakarta has long experienced flooding, but it has become more frequent and more extreme in recent decades with major flood events in 1996, 2002, 2007, and 2013. Flooding poses a threat to the national economy, causes damage to buildings, roads and infrastructure, contributes to the spread of water-borne diseases, displaces residents, and claims lives. In Jakarta, it is the product of both human and nonhuman agency, of "natural ecologies and urban development" (Padawangi and Douglass, 2015: 519). As a delta city with a rainy season spanning October to February, Jakarta is naturally exposed to flooding from high precipitation events. The threat of flooding has been exacerbated by urbanisation, land use change, and a loss of porous surfaces to absorb rainfall (Padawangi and Douglass, 2015). To date, one of the city's primary responses has been a strategy of *normalisasi* (normalisation), which involves dredging and widening rivers and waterways in order to facilitate the flow of water through the city and into the Java Sea. Utilising heavy machinery and large amounts of capital, these large-scale interventions have been used to justify the forcible eviction of residents from settlements situated along the city's riverbanks and reservoirs (Sheppard, 2006; Leitner et al., 2017), such as the high profile eviction of residents from Kampung Pulo in August 2015 (The Jakarta Post, 2015a; van Voorst and Padawangi, 2015).

Figure 1. The current sea wall at Pluit in North Jakarta, 2015 (source: Author).



The city's location on the northern coast of Java also exposes it to tidal flooding, which is exacerbated by both sea-level rise and high rates of land subsidence. Rates of land subsidence average 7.5 cm per year, reaching 17 cm in some northern locations (NCICD Consortium, 2014a: 16), earning Jakarta the reputation as one of the world's fastest sinking cities. The current sea wall (Figure 1) barely holds back the waters buffering Jakarta's coast. Scientists in Indonesia continue to debate the primary cause of land subsidence; it has been attributed to several factors including the weight of construction loads leading to soil compression, the natural consolidation of alluvial soil, and groundwater extraction (Abidin et al., 2011). While the groundwater and subsidence report accompanying the GGSW master plan notes that "[t]here is an enormous lack of data for sound analysis of current subsidence rates, let alone future predictions" (NCICD Consortium, 2014c: 9), land subsidence has become a major research agenda in recent years. Dutch consultants argue that groundwater extraction is the primary cause of land subsidence (Brinkman and Hartman, 2008; Deltares Taskforce Subsidence, 2015), with independent Dutch research institute *Deltares* repeatedly stressing the need to 'stop the sinking' by means of reducing groundwater extraction (field notes, 18 September 2015). This was also emphasised during interviews with consultants and experts: "What needs to be done is very simple. Stop extraction" (interview with Dutch expert #032, 3 December 2015). According to this narrative, groundwater extraction occurs due to the absence of an alternative water supply:

You have to have an alternative source [to groundwater]. If that source is not there... people will always keep on pumping, whether it's illegal or not (Interview with consultant #008. 20 November 2015).

From the perspective of these consultants, a reduction in groundwater extraction through regulation and the provision of a surface water supply would alleviate subsidence. Without such measures, groundwater extraction, and thus land subsidence will likely continue. This was reflected in the comments of one interviewee that stopping groundwater extraction would be impossible without developing an alternative water supply:

We try to decrease the groundwater extraction... we put taxes on the groundwater. But it doesn't matter how high the tax because we don't have water. That's the problem (Interview with provincial government staff #034. 3 August 2016).

Subsequently, local authorities and consultants have begun advocating for reducing groundwater usage through taxation and for developing alternative sources (Deltares Taskforce Subsidence, 2015). However, the master plan has been designed on the basis of the assumption that Jakarta will continue to sink into the near future, increasing the risk of flooding to an unacceptable level: "It is unlikely that subsidence will be slowed down in the foreseeable future as it will take time to develop and implement alternatives for groundwater extractions" (NCICD Consortium, 2014a: 71). This was reflected in the comments of one consultant that to stop the groundwater extraction within the required time period is not considered a "realistic expectation" (interview with consultant #003, 25 September 2016). This discourse enables engineering consultants and political elites to present the sea wall project as "the best hydraulic solution for the flooding problem" (NCICD Consortium, 2014a: 33); the "optimum way" (van den Boomen and Jones, 2014: 13) to protect Jakarta.

An examination of the master plan, and interviews with provincial and national government officials and staff, financial consultants, engineers, and architects involved with the development of the master plan, reveal that the project is not necessarily considered to address what these experts understand as a major factor contributing to flooding: land subsidence. It does not include any direct measures to slow, or stop land subsidence. Indeed, the call for tenders stipulated that the project should be designed for the coastal zone, meaning that water supply does not fall within the remit of the GGSW and is not directly addressed. Yet, land subsidence will remain an issue for Jakarta even if the GGSW is implemented. For this reason, challenging representations of the GGSW as the optimum way to protect the city from flooding, critics argue that the project fails to address the causes of flooding (Koch, 2015).

The counter-narratives mobilised by critics present the project as an urban development project masquerading as flood mitigation (Elyda, 2013).

Criticisms of the GGSW reflect a more general critique of the state's pursuit of highly visible, concrete-heavy technological responses to flooding, waged by academics both within and beyond Indonesia, community organisations and NGOs, and the media. Observing an impulse to "conquer nature" (Kusno, 2011: 527) characteristic of this dominant paradigm of water management in Jakarta, critics argue that it reflects an unwavering belief in the ability of 'heroic engineering' (Turpin cited in Tibke, 2015) to circumvent environmental challenges and deliver what one critic (working for a community organisation) termed 'technological salvation' (field notes, 25 September 2015). These critiques legitimate alternative modes and models of flood mitigation. Thus, community organisations such as Ciliwung Merdeka and the Urban Poor Consortium have called for in-situ upgrading of existing settlements as an alternative to the large-scale displacement of riverbank communities for dredging projects (van Voorst and Padawangi, 2015; Munk, 2016). These groups have proposed alternative designs for *kampung susun*: 'community-based vertical villages' (Budiari, 2016). Instead of the construction of new, capital-intensive, large-scale projects, other critics have proposed increased investment in sanitation,² for example through the construction of a high-capacity wastewater treatment plant, and the maintenance of existing infrastructure (The Jakarta Post, 2015b).

Further, the Indonesian government remains ambivalent towards the project. During interviews, consultants of Dutch firms stressed the difficulty of securing and maintaining Indonesian commitment, signalled, for example, by the lack of a formal team initially assigned to the project by the government. Interviews also revealed that there has been "some resistance on the environmental issues" from individuals within the Indonesian government regarding the potentially negative impacts of the project (interview with Dutch expert #032, 3 December 2015). Given the current levels of pollution in Jakarta's rivers, one of the primary concerns is that closing Jakarta Bay could lead to an increased concentration of pollution, with some concerned that it could turn into a "septic lagoon" (Sherwell, 2016). This risk is acknowledged and emphasised in the master plan, which makes clear that the success of the project in part hinges upon improving the levels of sanitation in the city's rivers. As the engineering report accompanying the master plan states: "to realise an acceptable water quality in the retention lake, pollution in the rivers has to be reduced" (NCICD Consortium, 2014b: 28). Consultants also reinforced the importance of this during interviews. Nonetheless, concerns remain as to whether water sanitation will be improved in time:

Can you imagine we release the water from here [the rivers] – not good water, not clean water but dirty water – into here [Jakarta Bay]? And then what's happening? We have a big problem (Interview with provincial government staff #034, 3 August 2016).³

The staff of Indonesian government ministries have also questioned whether such a large-scale and complex project is necessary, as reflected in the comments of one provincial ministry staff member as they described the debates within the government:

So, I mean, is the Giant Sea Wall really the answer? (...) Do we really need that? (...) Why don't we dig into the more, you know, crucial reason of flooding (...) Don't do like a big project for having a big, sophisticated

² While the Japanese International Cooperation Agency (JICA) is currently working on a citywide sanitation programme, progress to date has been slow.

³ A study produced by Research and Development Centre for Marine and Coastal Resources within the Ministry for Maritime Affairs and Fisheries concluded that the project could contribute to coastal erosion, damage coral reefs, and cause eutrophication in Jakarta Bay, in addition to displacing fishing communities and disrupting their economic activities (Poernomo et al., 2015; Elyda, 2015).

and prestigious project, that's the debate (Interview with provincial government staff #009, 17 November 2015).

Perhaps reflecting such concerns, the government has yet to make a final decision on whether to proceed with the GGSW. The ambivalent position of government staff raises the question of why this particular flood mitigation infrastructure project is still on the table. This is made further perplexing by the statements of numerous consultants, both during interviews and publicly in the media, that stopping groundwater extraction within the foreseeable future would render the outer sea wall (referred to as Stage B and C of the project) unnecessary:

The cheapest and easiest solution is to stop the sinking. The only thing Jakarta needs to do is to stop the deep groundwater use and the sinking will stop within five to ten years. Then you do not need a closed Jakarta Bay, you do not need a giant seawall (Consultant cited by The Jakarta Post 2015b).

I hope that they are able to stop the groundwater extraction in the coming 15 years, and are able to design a Stage A which is very good and sustainable, that maybe you don't need stage B and C (Interview with consultant #026, December 14, 2015).

The ambivalence of Indonesian support for the project raises the question of why a project of this scale, ambition, and financial cost is still being considered by the Indonesian state and promoted by Dutch consultants over, for example, more "mundane" (Loftus and March, 2016: 2) strategies that might address the causes of flooding more directly (developing alternative water sources to curb groundwater extraction, or investing further in water sanitation in order to use the city's 13 rivers as a source of surface water). In the following section, I discuss how long-standing political ambitions to redevelop North Jakarta, Jakarta's colonial history and postcolonial relationship to the Netherlands, and the mobilisation and circulation of technical expertise have contributed to the allure of the GGSW.

UNDERSTANDING THE ALLURE OF THE GGSW

The tension between claims that the GGSW is the optimum way to protect the city from flooding, and those that it does not actually address the causes of flooding, raises the question of why this particular project continues to be promoted over alternative flood mitigation strategies. In this section, I examine the elements of the techno-political network through which the GGSW emerges as the preferred solution to the threat of flooding in Jakarta, continuing to drive it forward. First, I examine how the project is driven by the politico-economic interests of governing elites, property developers, and the Dutch water sector, in addition to desires for flood safety. Secondly, I discuss how its allure is bolstered through historical and contemporary transfers of knowledge and expertise, and educational and training networks, between the Netherlands and Indonesia.

Speculative urbanism, world-class city building and the reimagining of North Jakarta

In the context of Southern cities, scholars have observed the role of infrastructure projects in the construction of internationally recognised and competitive world-class cities. As "the dream world of postcolonial development" (Roy, 2011: 260), the world-class city has become a powerful imaginary informing the development agendas of cities across the Global South. Attempts to achieve a "world-class aesthetic" (Ghertner, 2015) have typically produced a mode of urbanisation characterised by high levels of investment in visible, 'modern' infrastructure projects. In Jakarta, infrastructure projects and high-end real estate development are pursued by political elites in order to transform Jakarta into a modern, world-class city. As an 'integrated' coastal defence and urban development project, the GGSW is alluring not only because it would protect the city from flooding, but also because it promises to showcase Jakarta as a 'world class' metropolis through the construction of new waterfront city, complete with a central business district, residential, commercial, and green space, and transportation

infrastructure on reclaimed land. Land reclamation is particularly attractive to the provincial government of Jakarta, given the difficulties of land acquisition, high land prices, and a perceived lack of space for urban development. From their perspective, reclamation offers a means to create new land, free from the complexities of the existing and "messy" city (interview with provincial government staff #034, 3 August 2016).

The GGSW design proposes several opportunities for investment – including property development on extensive land reclamation, and the construction of a toll road. It is claimed that these will cross-subsidise the costs of flood mitigation infrastructure: "solving urban problems and at the same time generating revenues to finance flood protection" (NCICD Consortium, 2014a: 33). The master plan includes an explicit discussion of 'transforming threats' (posed by flooding) into 'opportunities' (for urban development and revenue generation). Speculative investment, land reclamation and urban development are naturalised as solutions to the problem of a sinking Jakarta, providing the magic bullet in a situation where the state is reluctant or unable to front the costs of the planned flood mitigation infrastructure that the master plan deems necessary. The GGSW thus constitutes a form of "speculative urbanism", whose feasibility hinges on the city's success in "luring" investors (Goldman, 2011: 230).

Additionally, by attracting private capital investment to North Jakarta, its proponents wage that the project will act as a "catalyst for development of the coastal zone" and economically revitalise this neglected part of the city (NCICD Consortium, 2014a: 33). These proposals align with long-standing political ambitions to construct Jakarta as a modern and internationally recognised global city. In the post-Independence era, the then-President and trained civil engineer and architect Sukarno undertook several mega-development projects intended to symbolise Indonesia's greatness as an independent nation, such as the Jalan Thamrin avenue, the national Monas monument and the Senayan stadium, in an attempt to "de-colonize the urban landscape" (Cybriwsky and Ford, 2001: 204). Such projects were continued into the New Order era under President Suharto, during which time the Golden Triangle commercial district emerged, accompanied by high-rise office buildings and luxury hotels (Silver, 2007). More recently, and partly in preparation for hosting the 2018 Asian Games, President Jokowi's administration has prioritised the construction of several mega-infrastructure projects in Jakarta, such as a mass rapid transit (MRT) system and the Serang-Panimbang toll road.

Another central component of efforts to position Jakarta as a world-class city has been the long-standing attempt by the Indonesian state to radically reimagine North Jakarta as the city's "last frontier for capitalist urban development" (Kusno, 2011: 515). Long considered peripheral to the city, home to some of the city's poorest residents, fishing communities, and industrial spaces, in recent decades North Jakarta has come to represent "the last chance to remake the image of the capital city in which the nation is at stake" (Kusno, 2011: 527). This began in the mid-1990s with plans under the then-Governor Sutiyoso for a new waterfront city on 2,700 ha of land reclaimed from Jakarta Bay. Beyond leveraging revenues for the Suharto family and their allies, this national project was intended to "provide Jakarta's affluent residents with facilities comparable to those found in Singapore" (Silver, 2007: 199). Concessions were granted to developers in the mid-1990s, but the plans remained unrealised due to the 1997 *krismon* (Asian financial crisis). Despite opposition from fishing and coastal communities, NGOs including KIARA (The People's Coalition for Fisheries Justice), and KNTI (Indonesian Traditional Fishermen Union), and the Coalition for Saving the Jakarta Bay, a group comprised of fishing communities and environmental activists (Bakker et al., 2017), reclamation projects have resumed in recent years, culminating in a planned 17 new islands in Jakarta Bay. In promising a new waterfront city on additional reclaimed land, the GGSW dovetails with historical and enduring desires to develop Jakarta as a competitive world-class city, increasing its allure with political elites. Thinking through the return to big infrastructure through Jakarta demonstrates how the GGSW has in part been propelled by the state's desire to construct an internationally competitive city. The circulating imaginary of becoming a world-class city thus constitutes an important element within the techno-political network from which the GGSW emerges.

In addition, the GGSW promises economic opportunities through real estate development and land reclamation. The project legitimises other land reclamation projects undertaken by private property developers, such as plans for the 17 islands, by connecting urban development to concerns about securing the city and its residents from the threat of flooding. Through lucrative international contracts, the Dutch water sector – comprising knowledge institutes, consultancy firms, and dredging companies – also potentially stands to benefit from implementation of the project. The interest of Dutch industries in Indonesia was perhaps most aptly signalled by a 2013 trade delegation from the Netherlands, the largest since Indonesian independence, with more than 100 representatives of Dutch businesses accompanying Prime Minister Mark Rutte to Jakarta (Jakarta Globe, 2013). The delegation was intended to usher in a new phase in Indo-Dutch relations, marked by the signing of the Joint Declaration on a Comprehensive Partnership (Jakarta Globe, 2013). Rutte led a second trade delegation to Jakarta in 2016, accompanied by 50 water-sector companies (Bakker et al., 2017). Thus, whereas the technopolitics literature stresses the political ambitions and motivations shaping the implementation of technologies, the case of Jakarta demonstrates the role of capital in contributing to the allure of the GGSW: its implementation could provide economic opportunities for the provincial government and property developers through real estate development, and potentially for the Dutch water sector by creating demand for dredging services and consultancy expertise. I turn to the role of mobile forms of Dutch technical expertise, and educational and training networks, in the following subsection.

Jakarta's colonial history and postcolonial context

With much of the Netherlands at or below sea level, and drawing on centuries of experience in deploying engineering expertise to protect its coasts from encroaching seas, the Dutch have firmly established themselves as global experts in all things relating to water. At the time of writing, Dutch engineering firms and dredging companies are involved in 312 overseas projects in more than 100 countries (Dutch Water Sector, 2017). In Jakarta, Dutch interventions are further rooted in a reiterating history of colonial relations linking Indonesia to the Netherlands. From the Dutch colonial period, Dutch knowledge and expertise have travelled to, and acted upon Jakarta: "Technical solutions have been practiced in Jakarta since the Dutch colonial period" (Padawangi et al., 2016: 150). Through these historical connections, numerous Indonesian government officials and staff have received professional qualifications from Dutch universities such as UNESCO-IHE, TU Delft (Delft University of Technology) and Wageningen University (Ter Braak, 2016). Additionally, the Dutch occupy a privileged position as 'trusted advisors' to the Indonesian state (interview with Dutch expert #032, 3 December 2015), working with government ministries to offer their expertise with regard to water management.

A key sector of the Dutch economy receiving explicit support from the Government of the Netherlands, the Dutch Water Sector has worked to promote the export of Dutch expertise, knowledge, and skills worldwide to ensure the growth of this billion-euro industry. A Memorandum of Understanding governing cooperation in the field of water has existed since 2001 between the Ministry of the Environment and Forestry, and The Ministry of Public Works and Housing of the Republic of Indonesia, and the Ministry of Infrastructure and the Environment of the Netherlands. Most recently updated in 2015, this Memorandum lays the framework for intensive cooperation between Indonesia and the Netherlands, including staff training, educational programmes, and exchanging experts. It also creates new spaces for the circulation of Dutch expertise through conferences and workshops.

For example, as part of the Training and Exposure Programme 2014-2016, 24 participants from the provincial government of Jakarta completed a three-month internship programme in Rotterdam in order to "learn the best practices adopted by Dutch engineers, practitioners, administrators and policy-makers" (Dutch Water Sector, 2014a). Meanwhile, the Young Water Professionals programme is designed to offer training to Indonesian staff in 'non-technical' management skills (Dutch Water Sector, 2014c), and teams of Indonesian university students compete in the Netherlands-Indonesian Water Challenge to develop 'innovative and sustainable solutions' to water problems, all aimed at developing

the 'capacity' of young professionals (Dutch Water Sector, 2014b).⁴ Thus, beyond exporting technologies and designing master plans for implementation, the Dutch Water Sector is actively involved in training young Indonesian professionals in water governance, potentially contributing to Dutch expertise being recognised and adopted as 'best practice'. This is highly significant given the central role these individuals will play in planning Jakarta's future. As the Dutch Water Sector website acknowledges, "Jakarta will rely on these professionals to improve the city's resilience towards many urban and environmental issues" (Dutch Water Sector, 2014a).

Much as Michael Goldman (2005) observes how World Bank training programmes constitute a crucial element in the transnational policy networks that circulate and legitimise particular forms of knowledge, training networks between the Netherlands and Indonesia contribute to facilitating the importation of Dutch technologies and expertise, helping to maintain the privileged position of Dutch experts within Jakarta. In this way, historical and enduring educational and training networks have the potential to shape the forms of flood mitigation that gain traction in Jakarta. More specifically, they may contribute to maintaining an institutional culture within the Indonesian government that privileges Dutch hydrological engineering. While many have voiced criticisms of the GGSW and other such technological solutions to flooding in Jakarta, the state continues to pursue these strategies with the support of Dutch consultants, marginalising alternative visions for flooding mitigation.

Thus the continued consideration of the GGSW by the Indonesian state can be attributed in part to the mobilisation and promotion of engineering expertise shaped by historical and contemporary networks of expertise between the Netherlands and Jakarta. In Jakarta, technological responses to flooding have been practised since the colonial era, enduring in part due to the continued presence of Dutch experts. As Mochamad Basuki Hadimuljono, Minister of Public Works and Housing for Indonesia writes: "Indonesia is a showcase example of the Netherlands' water expertise" (cited in Ter Braak, 2016: 3). Looking at big infrastructure through the lens of Jakarta the colonial histories and postcolonial present of networks of expertise are crucial for understanding how particular projects are promoted and made alluring.

CONCLUSION: THINKING THE (RE)TURN TO BIG INFRASTRUCTURE THROUGH JAKARTA

While engineering consultants and political elites frame Jakarta's planned Great Garuda Sea Wall project as "the best hydraulic solution for the flooding problem" (NCICD Consortium, 2014a: 33), the project does not directly address land subsidence, understood to be a primary cause of flooding. Nevertheless, it continues to be championed by experts and considered by the Indonesian government. In order to understand how and why this is so, this paper has examined how a geographically and historically contingent techno-political network – formed through political and economic interests, world-class city aspirations, engineering expertise, capital flows, colonial histories, and postcolonial relations between Jakarta and the Netherlands – contributes to the project's allure and propels it forward. The world-class city aspirations of political elites are crucial in driving infrastructure projects, shaping which are made possible. Drawing on their post-colonial influence, the Dutch have been instrumental in shaping flood mitigation in Jakarta, with contemporary knowledge transfers and networks of expertise from the Netherlands to Jakarta that promote Dutch engineering expertise, of which the GGSW is a product, even as the same actors promote a very different 'ecological turn' elsewhere.

⁴ Interestingly, the first of these challenges was aimed at developing solutions for the sustainable development of Jakarta Bay. The winning design, from a student team at *Institute Teknologi Bandung* (Bandung Institute of Technology) was for a floating fishing village designed to raise environmental awareness and showcase the fishing industry.

Indeed, the case of Jakarta suggests a need to provincialise emergent narratives charting the apparent rise, fall and return of big infrastructure. Heavily dependent on engineering expertise, hard infrastructure, and private capital, Jakarta's planned GGSW might appear to reflect a broader observation of a return to big infrastructure within water management. However, the historical dominance of hydrological engineering in Jakarta and an enduring institutional preference for big infrastructure suggests that the 'hydraulic age' may have never waned here. Instead, large-scale, concrete-heavy infrastructure projects – such as river normalisation and sea walls – continue to constitute the dominant institutional response to flooding, underwritten by the long history of Dutch engineering interventions, and educational and training networks promoting such approaches.

In tracing the techno-political network through which the GGSW emerges, I thus go beyond analyses of the contemporary economic and political motivations (Loftus and March, 2016) that underpin big infrastructure projects, by drawing attention to enduring colonial histories and postcolonial relations that underpin the GGSW, and drive it forward. In order to understand the allure of big infrastructure projects in specific sites and cities, we need to trace the emergence and evolution of the geographically and historically contingent techno-political networks through which such projects emerge. In the case of Jakarta, such an analysis denaturalises narratives that present the GGSW as the optimum way to protect the city. This holds open the potential to make space for a discussion of alternative responses to flooding that have been otherwise seemingly been foreclosed.

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