The evolution of Jakarta's flood policy over the past 400 years:

The lock-in of infrastructural solutions

Abstract

This paper presents an analysis of the evolution of flood policy in a city in the developing world. Jakarta was selected in order to analyse of the role of colonialisation on water policy. Drawing data from historical sources and interviews of key informants, we mapped the history of flood-related investments made in the city for the past 400 years. Using analysis informed by historical institutionalism, we argue that Jakarta's flood management institutions have been locked-in to infrastructural measures. Some major flood events were able to create critical junctures, resulting in the implementation of old policies and the instigation of flood research. However, they were not able to introduce institutional changes. The persistence of engineering driven solutions to cope with flooding can be explained by the positive feedback mechanisms taking place after major floods. Infrastructure, albeit expensive, provides a fast relief to flooding, which is ideal to short political cycles. Scientific knowledge introduced by the colonial government plays an important role in sustaining this persistence. The current massive seawall proposal to alleviate increasing flood risks due to land subsidence and sea level rise exacerbate the path-dependency of infrastructural measures.

Keywords:

Flood policy; postcolonial city; Jakarta; historical institutionalism; positive feedback

1. Introduction

Many cities in the world are struggling with a myriad of urban problems (UN Habitat, 2016). In the case of Jakarta, it also has to deal with the fact that it is sinking fast to the ground. Parts of North Jakarta is subsiding at an average rate of 15 cm per year (Abidin *et al.*, 2011) making it among the fastest sinking city in the world (Sherwell, 2016). Lying on a delta, Jakarta is naturally vulnerable to flooding (Valkenburg, 1936; Dudal, 2005). In 2007, a major flood inundated more than 60% of Jakarta's area; it resulted in 79 deaths, 500,000 people evacuated, and almost $680 million in losses (Bappenas, 2007). The flood[1] was caused by a combination of high rainfall intensity within the city, runoff water from upland areas, and high tides (Brinkman and Hartman, 2009). The government is now taking action to mitigate the impacts of land subsidence and sea level rise. Following a major flood in 2013, the Government of Indonesia launched an ambitious 32-kilometer offshore seawall project to close Jakarta Bay and

reduce sea level in the artificial coastal lagoon within the wall (NCICD, 2013). The NCICD plan has unsurprisingly sparked debates since its launch, particularly in social and environmental aspects (Octavianti and Charles, under review1).

This seawall plan complements a recent canalisation[2] project in a 19-km stretch of Ciliwung River, the city's largest river. This project is also controversial, not only because 70,000 of the river bank settlers were forcibly evicted (Van Voorst 2016), but also because the expensive project was perceived by some local experts (Monalisa, 2015) to be an unsustainable solution for the flooding problems. Both the seawall and canalisation projects represent infrastructural solutions to control water. While it was once common practice internationally, ecological approaches are gaining favour, such as the 'Room for the River' in the Netherlands (Rijke *et al.*, 2012) and the incorporation of ecology to flood management in Hungary (Werners et al., 2010). Although some places are still using (e.g. Osti, 2017), or are now returning to (e.g. Warner et al., 2017), infrastructural solutions to deal with frequent flooding.

Previous studies have looked at the effect of colonialism in shaping the present water infrastructures in postcolonial countries. Colonial governments have used science to secure colonial rule and justify their domination in their colonies (Adas, 1989), for instance in India and Egypt (Buckley, 1893). A variety of waterworks (dams, canals, and sluices) to control the flow of water was claimed as more rational and efficient than indigenous approaches (Murphy, 2009), although the outcomes were mixed (Beinart and Hughes, 2007). This 'imperial science' (Gilmartin, 1994) has played a significant role in how postcolonial governments govern their country. For example, Mustafa (2013) argues that policymakers' attempt to tame urban floods in Islamabad, Pakistan by stressing engineering solutions is partly a result of the colonial history of the country.

Jakarta is no exception; the city has been shaped physically by two grand floodways: the West and East Flood Canals with 14.5 km and 23.6 km respectively (Gunawan, 2010). Both canals were planned during the Dutch occupation, although the East Flood Canal was only constructed in 2003, when funding became available. This paper traces Jakarta's flood history and its policy evolution over the past 400 years to investigate how flood policy has evolved in response to major floods, and what pattern can be discerned to further understand the impacts of past decisions in contemporary measures.

Jakarta was occupied by the Dutch for more than three centuries.[3] This long colonial history has embedded certain characteristics and affected how postcolonial governments behave and set rules. Other scholars have conducted historical analyses of water policies in Jakarta, such as Argo (1999) and Kooy and Bakker (2008) in the drinking water sector, Putri (2014) in the sanitation sector and Gunawan (2010) in flood policy. They found that some characteristics, such as inequality, persist today in water policy. With regards to the current study, Gunawan (2010), who described historic flood events and some flood plans in great details, provides a good starting point for further analysis in the flood policy evolution.

Looking specifically at the NCICD plan, it is worth noting that the Government of the Netherlands plays a significant role in promoting NCICD, through a consortium of Dutch engineering consultants and a grant for conducting a feasibility study (Tyas, 2016). Jakarta has a long history of occupation by the Dutch and thus they governed, or more precisely created, the city's early water management. We are, therefore, interested in exploring whether this colonial legacy has either enabled or puts constraints on the present flood policies and how.

To understand how past decisions influence contemporary water policies, we employ historical institutionalism (HI) approach as the analytical framework in this paper. Institutional analysis is used because institutions manifest the structures and mechanisms of a social order, a reflection of how actors behave and function according to a set of rules (Thelen, 1999). It enables us to explain the variation in policy outcomes in different regimes by explaining the ways in which national and local political institutions are structured and how institutional reforms in the past were constrained by the established arrangements at a given time (North, 1990; Marshall and Alexandra, 2016). Diagnosing mechanisms that sustain particular institutional patterns can inform policy entrepreneurs on how to advocate radical policy changes (Thelen, 1999). The HI approach has been used to analyse reforms in water policy, for instance in the irrigation sector (Libecap, 2010), flood management (van Buuren et al., 2016), sanitation infrastructure (Meacham, 2009) and broader water governance issues (Sehring, 2009; Blanchet, 2015).

Along with rational choice institutionalism and sociological institutionalism, HI is a prominent approach in institutional literature (Fioretos et al., 2013). The emphasis of HI is on "how institutions emerge from and are embedded in concrete temporal processes" (Thelen, 1999: 371). Besides its historical orientation, HI differs from other social science approaches in its attention to real-world empirical questions and to the ways institutions structure and shape political behavior and outcomes (Steinmo, 2008). Although HI has historically emphasised institutional stability or path-dependency (Peters et al., 2005), analysing institutional changes is also an important element of HI (Thelen, 1999). Feedback mechanism developed under the HI corridor (Pierson, 2000) provides an analytical framework for analysing institutional reproduction or stability, while critical juncture works as a powerful tool to analyse institutional changes (Capoccia, 2016). During critical junctures, certain conditions disrupt the particular mechanisms sustaining a path's stability (Capoccia and Kelemen, 2007). As a result, the likelihood of policy change is higher than usual. We shall use both HI's elements in investigating the evolution of Jakarta's flood policy.

This study builds on current understanding of the intersection of two fields: the politics of flood management and planning. These politics have been examined in multiple forms of analysis, using case studies worldwide. Amongst the frequent topics are the contention to build on a flood zone (e.g. Krause, 2012; Porter and Demeritt, 2012) and the scalar politics raised between the local and central governments

regarding the responsibility and authority to act on a flood event (e.g. Penning-Rowsell and Johnson, 2015; Moore, 2017). Our paper contributes to this discourse by bringing a postcolonial context and analysing to what extent the present flood policy is locked in to previous measures, despite increasing flood risks from global climate change, land subsidence and massive land transformations. In Jakarta, spatial planning has become an increasingly political process since the implementation of a decentralisation policy in 2001 (Silver, 2014). The connection between flood management and planning in the city can be seen ultimately in the eviction of 'illegal' kampungs (urban villages) in the name of flood mitigation (Leitner and Sheppard, 2017). Some evictions, however, were conducted to make space for commercial real estate projects to modernise the city and cleanse them from visible poverty (Leitner, Colven and Sheppard, 2017).

In this paper, we argue that Jakarta's flood policy discourse over the past 400 years has always been dominated by infrastructural solutions, the implementation of which are concentrated in the contemporary era. Some critical junctures, mostly those triggered by flood crises, were evident, but they were unable to bring radical changes, resulting in path-dependency of flood management institutions. We present a novel historical analysis of key flood management policies of each political regime along with its socio-economic and political condition in Section 3. Section 4 discusses the historical analysis against the HI framework, and section 5 concludes the argument presented in this paper.

2. Methodology

The data used in this paper comes from two main sources: secondary sources and key-informant interviews. Fieldwork was conducted in Jakarta from May to September 2016. Archival research was undertaken in ANRI (*Arsip Nasional Republik Indonesia* or The National Archives of the Republic of Indonesia) in Jakarta to find policy documents related to flood management in the colonial era and the early years of independence. Further historical analysis employes resources from credible secondary sources which includes books, academic journals and policy documents.

The historical and contemporary analyses include interviews of 38 key informants, which consists of policymakers, academics, NGO practitioners and individual experts (see Appendix 1 for the list of interviewees). Interviews are referred to by their code; CG: central government officials (6), LG: local government officials (8); AC: academics (10), NG: NGO activists (7) and KI: individual experts (7). To avoid bias, we aim for an objective understanding of Jakarta's flood policy evolution by considering views from outside of the government (academics, NGO activists and individual experts) as well as inside (national and local government officials). The interviews were conducted face-to-face in a semi-structured format. The questions in the interview were regarding the informants' views on flood control measures by the current government and, if relevant to their expertise, by that of preceding governments. We particularly used the interviews to understand the development of flood policy in the more recent period

(post-1945) and to help us identify secondary sources. Given the long period (400 years) under consideration in this research, our primary data collection was of secondary sources that we triangulated with the data collected from the interviews.

To trace the evolution of flood policy, we employ an approach developed by Sadoff et al. (2015), who divided water-related investments into three groups (3Ins): infrastructure, institution, and information (Table 1). They also noted other events, such as crisis and political events, that may affect the policy-making process. In Jakarta, we observe that major flood events affecting the city's economy and the changing of political leaders are the most influential factors in triggering policy responses. We follow North's (1990) definition of institution as "the rules of the game in a society, or more formally, are the humanly devised constraints that shape human interaction" (p.3). This broad definition allows us to include formal laws, policies, organisations (Streeck and Thelen, 2005), as well as informal network and coalitions (Marcussen, 2000) under the term institution. Sadoff et al. (2015) also adopted North's (1990) definition of institution as the rules of the game. The separation of investments into three groups (3Ins) does not necessarily mean that they are mutually exclusive. A decision to build infrastructure, for example, is the result of human interaction in formal or informal contexts and reflects how certain values in an institution develop. This infrastructure would later be an indication of how an institution was previously governed.

The approach that we undertake in this paper has been developed to ensure the data analysis is systematic. Historical institutionalists believe that "history is not a chain of independent events [and, therefore, are interested in] … these interactive effects on the interdependence of multiple causal variables" (Steinmo, 2008, p.166). To understand the pattern of a policy over a long period of time, investigation of causal structures of the social or political world requires the analysis to be done systematically (see Collier, 2011). By systematic analysis, we mean that the pieces of information collected from various sources are carefully triangulated and linked to explain the causal mechanism of an event; the cause and effects associated with a flood event. Due to space constraints, however, we do not explore an in-depth counterfactual analysis to answer: what would happen if actors chose a different path? (Peters, Pierre and King, 2005). The lack of a counterfactual analysis may lead to a seemingly descriptive one, but we hope our systematic event-based analysis will be able to meet our goal of understanding why a certain choice was made and why a certain outcome occurred.

This paper adopts a chronological review (Section 3) in line with the Historical Institutionalism framework to unfold the evolution of Jakarta's flood management institutions (and investments). This chronological order enables us to trace flood policy in the context of Jakarta's changing political and socio-economic conditions in each political regime. The timeline is divided based on radical political change, signified by new leadership and ideologies. These events were also reviewed through the lens of the New Institutionalism theory postulated by Scott (1995). Here we systematically traced flood-related investments by analysing them against three criteria: cognitive, normative

and regulative aspects. This approach enabled us to analyse the novelty of a policy response. The analysis was undertaken as part of a broader analysis of water policy evolution in Jakarta, that includes drinking water and sanitation policies.

Table 1. Framework for water policy evolution adopted from Sadoff et al. (2015)

Infrastructure	Institutions	Information
Construction, irrigation infrastructure, reservoir/dam/ hydropower, sewage/ sanitation infrastructure, environmental	Allocation, cooperation/new organisation, environmental, irrigation/ agriculture, policy, permit, plan	Monitoring/ measuring, hydro-meteorological, modelling, study/ report

3. The evolution of flood management institutions: the narrative

This section discusses the evolution of flood policies in Jakarta chronologically and, where possible, their connection to other water sectors as the city grows since colonial era in the 1600s up to the present time. Table 2 summarises key flood investments in each political regime. The first two regimes (colonial era) were dominated by investments in infrastructure and information (research on flood mitigation). Following the difficult times in the early independence period (1940s-1966), some key investments were made in the New Order era (1966-1998), such as small water retention basins within the city and canalisation projects following two major floods in 1976 and 1979. As the floods were getting worse, notably due to land subsidence, the government focused on infrastructure measures in the contemporary era by implementing old policies (e.g. the East Flood Canal), undertaking canalisation and, most importantly, launching an unprecedented scale of an offshore seawall to prevent the city from sinking further.

Table 2. A summary of key flood control investments in each political regime. The severity of flood depicted by areas inundated and/or total number of people affected is also presented, where data available.

Political regimes	Major floods	Key flood control investments		
		Infrastructure	Institution	Information
Early occupation (1619-1810s)	1621, 1714, 1733 (malaria incident)	1620s-1650s: A system of canals within Batavia town 1718: Manual dredging (maintenance) 1725: Westward canals		
Moving to *Weltevreden* (1810s-1940s)	1854, 1878, 1918	1878: Upstream canal 1918: *Bandjirkanaal* (West Flood Canal) 1928: KIP (*Kampung* Improvement Programme)		1911: Research by *De Commissie voor den Waterafvoer de Watervoorziening van Batavia*

				1917: Research by H.V. Breen 1940s: Research by W. J. van Blommestein
Early independence (1940s-1966)	1942, 1965		1965: *Kopro Banjir*	
The New Order era (1966-1998)	1976 (26,000 evacuees), 1979 (20 people killed; 700,000 evacuees), 1996 (20 people killed; 2,640 evacuees; 745 houses affected)	1960s: Water retentions construction 1968: KIP (*Kampung* Improvement Programme)1978-1983: Canals and pumping station construction (Cengkareng and Cakung drains; Siantar pumping station); dredging (maintenance)	1972: PBJR 1973: *Jabotabek* concept	1972: Research by NEDECO
Contemporary Jakarta (1998-2016)	2002 (25% area inundated; 30 people killed; 380,000 evacuees), 2007 (60% area inundated; 79 people killed; 500,000 evacuees), 2013 (14% area inundated; 20 people killed; 50,000 evacuees)	2003: East Flood Canal 2009: World Bank's dredging projects (maintenance) 2013: Normalisation of some dams 2013: Canalisation of Ciliwung River	2008: Regulation on regional planning 2013: NCDID plan	2007: Research in collaboration with the government of Netherlands (JCDS study)

3.1. Early occupation: a walled town of Batavia (1619-1810)

Canals were the main feature to combat floods in Batavia (Jakarta's former name). Canal digging has been documented as early as the 5th century in *Prasasti Tugu* inscription (Heuken, 1983). This may have been the city's first attempt to cope with flood problems. The earliest recorded major flood happened in 1621 (Gunawan, 2010), three years after VOC (Ver*eenigde Oost-Indische Compagnie* or Dutch East India Company) conquered Batavia. The company soon built canals inside Batavia's inner walled town, raising ground levels with the excavated dirt. These canals served as the only means of transportation and drew Europeans to live along them (Abeyasekere, 1989). Within 30 years of occupation, more than five canals were built in 1.3 km^2 Batavia's area (Figure 1) (Abeyasekere, 1989; Putri and Rahmanti, 2010).

The canal system slowly caused the river to lose its current and, consequently, deposit copious amounts of sediment (de Haan, 1935). The eruption of Mount Salak in 1654 brought silt in high quantities, worsening the state of the river (Kanumoyoso, 2011). After a violent earthquake in 1699, the Ciliwung River changed its course and brought down high quantities of earth, choking the canals (Heuken, 1983). This was exacerbated by intensive land clearing for farming in the uplands and sand brought in by high tides, closing the mouth of the river (Kanumoyoso, 2011). As the population grew, these canals were quickly clogged due to their rubbish and sewage being deposited into the river (Abeyasekere, 1989), including pressed sugarcane from sugar plantation in the upstream areas. This waste ended up in the canals in front of the Batavians' houses and the running streams became a nuisance. No one paid attention to this poor stream condition (Jayapal, 1993) until in 1718 when VOC employed one hundred slaves to remove the mud from the canals (Vlekke, 1943). However, task was halted when it was seen to be endless (Blussé, 1986). Despite the clogging canals and their consequences, the canal approach was still viewed as the ultimate solution for flooding (Gunawan, 2010). In 1725, a series of flood canals were constructed westward of the town (Abeyasekere, 1989).

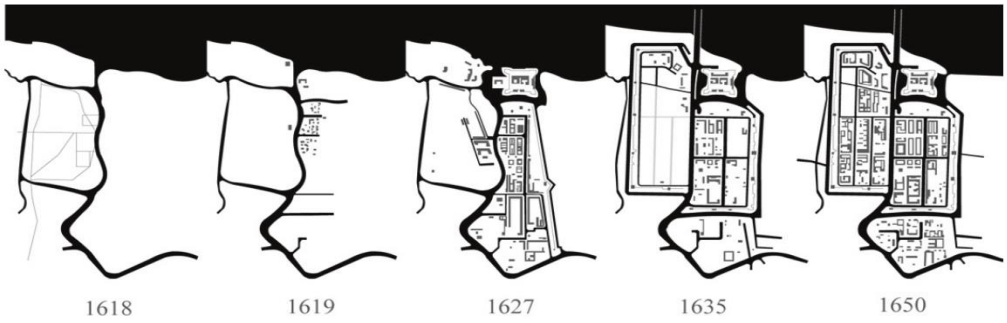

Figure 1. Batavia's transformation to colonial city with its geometric canal pattern during the first three decades of colonialism

(Source: Putri and Rahmanti, 2010)

The poor living environment in the walled town caused the deterioration in health conditions by the late 17th century. By that time, 4,000 slaves had to be imported to replace those who had died (Heuken, 1983). Their deaths were mainly caused by waterborne diseases, such as dysentery, cholera and typhoid (Abeyasekere, 1989) as Batavians took their drinking and bathing water from the same canal they threw their waste into. In 1732, a long canal called Moorkevart (main stream) was dug in Ommelanden (areas outside the walled town) to provide a better water source for Batavians (Blussé, 1986). The water supply increased but the stagnant pools remained and during dry season these pools became a breeding place of Anopheles sundaicus, a vector of malaria (Brug, 1997). A year later, a malaria epidemic struck Batavia causing more than 1,000 people to die (Brug, 1997), though only the Europeans had a sudden and high death toll from malaria, while the Chinese and Indonesians were less affected

by the disease (Vlekke, 1943). Europeans were thought to be strongly affected as their houses were clustered close together along the canal banks, similar to the prevalent design in the Netherlands (Jayapal, 1993). A series of public health fatalities in the ensuing decades culminated in 1775 with more than 3,000 people dying from malaria (Brug, 1997), changing Batavia's title from 'the Queen of the East' to 'the Graveyard of the West' (Blussé, 1986). Nothing significant was implemented by the company to deal with this on-going crisis (Argo, 1999).

The exploration, and further exploitation, of Ommelanden had a significant role in escalating the flood problems. Once Ommelanden was relatively safe from Bantenese attack, private initiatives to open industry outside Batavia started (Kanumoyoso, 2011). For example, the Chinese Kapitan Phoa Bigam dug a canal in 1648 to float timber from the woods catchment downstream to the harbour (Niemeijer, 2003). Starting in 1721, the emergence of sugar industry and rice paddy fields in the catchment areas degraded the environment, increasing runoff and pollution (Kanumoyoso, 2011). Economic motives to profit from farming activities created massive deforestation in Ommelanden. Sugar mills needed water to operate the plants, with firewood for fuel, therefore they were ideally located near rivers and forests. Private sectors continued to search for virgin forests for the mills (Boomgaard, 2005). Moreover, rice paddy fields needed constant water throughout the year, therefore, people began to build small dams to store water for their farms (Niemeijer, 2003). These practices changed the course of the rivers, while deforestation increased runoff to downstream areas, including Batavia.

In this period, policy responses to flood crises were slow and this can be attributed to several reasons. First, Batavia was established as a trading port, not as a colony (Abeyasekere, 1989); only policies supporting this function were sought. Second, VOC was the sole manager of the town. The company set policies to segregate Batavia's communities; only those working for the companies were included in social affairs (Vlekke, 1943). This policy did not address the majority of the community, including the so-called private citizens (Europeans who were not working for the company), Chinese, and Indonesians. Third, approval from the Netherlands' government was required for Batavia's strategic policies (Blussé, 1986). This procedure created substantial lag time between incidents and policy responses. Some VOC's elites proposed the creation of a city council, or *vroedscap*, to the government, but they did not succeed (Blussé, 1986).

3.2 Colonial times: Moving to Weltevreden (1810-1945)

The collapse of VOC in the late 18th century was followed by major reforms in Batavia's polity. Under the leadership of Governor General Herman W. Daendels (1808-1811), the colonial administration was moved to Weltevreden (Sutherland, 1979), six kilometres south of the old town. He also ordered the destruction of the wall surrounding the town. Whatever the cause for the high death rate, Batavians could easily see that the walled town was extremely unhealthy and practically inhabitable (Abeyasekere, 1989). The well-to-do people then began moving southwards, while the

poor who depended on seasonal labour remained in the deserted old town (Jayapal, 1993). Living in the south was considered healthier[4] and signified a new era of Dutch occupation in Batavia: from merely a trading port to a colonial capital of the Netherlands (Abeyasekere, 1989).

Since then, the colonial government exercised different types of polity in Batavia. The first one was forced cultivation system, or *cultuurstelsel*[6], (1830-1870) (Furnivall, 1939). Insignificant material gains to the colony and declining welfares among the natives resulted in the abolishment of this system in 1870 and its replacement with the Liberal Democratic system (Carey, 1980). The new system allowed private sectors to take over economic activities once controlled by the government. The new policy resulted in more money remaining in the colony, though with no significant improvements in the material living standard of the colony, particularly for the natives (Furnivall, 1939).

The beginning of the 20th century saw the introduction of a layer of new policy called 'ethical policy' (Abeyasekere, 1989). The ethical policy was proclaimed as a moral obligation towards improving the welfare of the colony. The government of the Netherlands disbursed money that can be used for education and infrastructure development in Batavia (Vlekke, 1943), and enabled local initiatives in the political arena. However, this decentralisation of power was also viewed as the colonial government's desire to slough off its urban responsibilities, due to the colony's growing financial and administrative burden to the government (Abeyasekere, 1989).

The combination of laissez-faire and ethical policies had a particular impact on water policies. This was the first time after three centuries of colonisation, water (particularly drinking water and sanitation) has been high on the colonial government's agenda (Kooy and Bakker, 2008). They wanted to create a hierarchy of decent colonies, while maintaining their high position as the colonial government (Milone, 1987). As a result, some investments were made in the water and sanitation sector, such as transferring artesian wells to the natives in 1920 (as the wells were redundant for Europeans who now enjoyed superior spring water) and Kampung Improvement Programme (KIP) in the natives' settlements in 1928 (van der Heiden, 1990; Hadimadja, 2012).

The case was different for flood policy. Compared with other water issues, flood has been the company's ultimate concern since the inception of Batavia (Argo, 1999). However, only after capital was available did the company start to make a comprehensive flood alleviation plan for the city.

The flood control plan was a result of favourable political conditions triggered by a flood crisis in 1918. Flooding in Weltevreden was more problematic as more people crowded the city[7] (Gunawan, 2010). At least two major floods (in 1854 and 1878) were recorded before the 1918 flood (Sedlar, 2016). Some canals were dug upstream to divert flood water as a response to 1878 flood (Abeyasekere, 1989). However, this

response was relatively smaller in scale in comparison to the policy response following the 1918 flood. As more capital was available in Batavia from liberal and ethical policies, large infrastructure could be built to alleviate flooding. Policy responses to flood were particularly important to secure private investment in Batavia at that time. The core of the flood control plan was to build the West Flood Canal, or *bandjirkanaal*, to carry surplus water from Ciliwung River westward of the city and to the sea. The canal was an engineering triumph and presented signs of modernisation in Batavia, while also providing an abundance of water from a distant river (Argo, 1999).

3.3 Early independence: Soekarno's Jakarta (1945-1966)

In the early years of Indonesia's independence in 1945, Soekarno, the first president of Indonesia, was a central figure in deciding the development of Jakarta. As an architect, he believed that architecture and town planning could serve to create an ideal society (Leclerc, 1993). His vision was to transform Jakarta into an international city, a show-piece of Indonesia that is full of magnificent structures (Crouch, 1980). He realised his vision, which was not supported by the economic reality, by creating grand symbols to show off to the world that Jakarta was an equal to any great modernity. His approach was criticised by some scholars: "[Jakarta] was strong on rhetoric and symbols and weak on revolutionary reality" (Abeyasekere, 1989: 167). As resources were directed to achieve his vision, limited resources were available for the government to address basic services.

With the help of international scholars, Jakarta's first attempt to create a master plan was initiated in this period and finished in 1960 (Forbes, 1990). The master plan included the expansion of industrialised estate, investment in housing programmes, an extension of water supply, drainage, rubbish collection and the preservation of green areas in the southern part of the city (Abeyasekere, 1989). Soekarno played a major role in designing the master plan as he imposed his own priorities on the planning team. However, staff shortage and the political condition hindered the plan's execution (Tambunan, 1996). It was impossible even to have it discussed, much less approved. Some observers found that this was actually good because the plan was unrealistic. The master plan was then allowed to slip into oblivion (Abeyasekere, 1989).

Jakarta's early development as an independent city affected the severity of flood problems within the city. One of Soekarno's grand projects[8] was the construction of a 300-hectare sports complex in Senayan in 1962. The construction required people living in Kampung Senayan to move to other areas, such as Kemang and Tebet (Gunawan, 2010). Those two areas had been designated as green areas for stormwater infiltration, since colonial times, and therefore only five percent of the land in these areas should be built on. Moreover, the emergence of new towns[9], such as Grogol, Rawamangun, and Kebayoran Baru, as a response to the housing crisis exacerbated flood problems as they were built on dried swamps (Gunawan, 2010). Those newly developed areas that were

not in accordance with the city planning, at least the plan from colonial times, have been frequently inundated since then (Silver, 2008; Rudi, 2015).

To address the flooding problem, Soekarno created an institution called Kopro Banjir (*Komando Proyek Penanggulangan Banjir Jakarta* or Command of the Flood Mitigation Project) in 1965, in which he primarily used a flood control plan created during colonial time (Caljouw et al., 2005; Gunawan, 2010). A long-term project was announced by the Department of Public Works, namely:

> the construction of 89 kilometres of canals, and the dredging of 750,000 cubic metres of earth in rivers and estuaries, as well as the construction of pumps, bridges, and flood control gates and the relocation of residents from an area of 478 hectares (Sethuraman, 1976: 39).

However, the plan was not implemented due to funding constraints (Caljouw et al., 2005).

3.4 The New Order era (1966-1998)

When President Suharto (1966-1998) came into power, the New Order[10] era begun; the role of Ali Sadikin (1966-1977) to govern Jakarta early in this period was indispensable. His main task was to deal with the massive population increase[10] resulting in squatters in many unoccupied lands, even in dangerous places, for example top of levees, under bridges, and along canals (Hadimadja, 2012). About 70,000 people squatted illegally on the city fringes (Abeyasekere, 1989). Clearing illegal squatters for new projects, such as road widening and river normalisation, was expensive and time-consuming. Illegal occupation of empty urban spaces was also partly due to a policy not to disclose city planning to the public to avoid land speculation. His attempt to reduce urban influx by introducing the 'closed Jakarta' policy was unfortunately not successful (Hadimadja, 2012). This urbanisation has been described as a failure of the national government to provide work outside Jakarta (Mulyana, 2012).

Flooding was still a major problem in this era and a variety of responses were observed. Kopro Banjir created in 1965 was transformed to PBJR (*Proyek Pengendalian Banjir Jakarta Raya* or Jakarta Flood Control Project) in 1972 (Gunawan, 2010). The latter covered surrounding areas of Jakarta, contributing to runoff in the catchment. Large infrastructure was constructed in the 1960s such as Pluit Dam, Setiabudi Dam, Melati Dam and Tomang Dam (Hadimadja, 2012). A collaboration study between the Department of Public Works and NEDECO, a Dutch consultant, was conducted in 1973. They proposed to continue the West Flood Canal, built in 1918, to the sea and construct the East Flood Canal to divert Ciliwung River eastward of the city (NEDECO, 1973). At least two major floods inundated Jakarta during this time: in 1976 and 1979. Due to funding constraints, Cengkareng and Cakung drains, which were much smaller in scale, were built to replace the West Flood Canal and East Flood Canal, respectively (Gunawan, 2010). Sadikin asserted his pessimism in dealing with the flood issue: unless the flood

alleviation master plan is fully implemented, not fragmented, this perennial problem of Jakarta will never be accomplished (Liputan 6, 2014). However, the cost to eliminate flooding was too expensive; it was estimated to be around USD 800 million in 1972 (Hadimadja, 2012).

Population growth unfortunately did not pair with improved urban services. Neo-liberal policies were pursued to provide water and sanitation services to the people, restricted to those who could pay (Kooy and Bakker, 2008). The canal systems built during the colonial period continued as the main site for bathing and laundry (Argo, 1999). The limited urban services, however, were rationalised by the government as a mean to curb excessive urbanisation (Argo, 1999). Inspired by Kampung Improvement Programme (KIP) in the 1920s, Sadikin conducted a similar programme in 1968 (Hadimadja, 2012). The programme aimed to upgrade the physical environment of these *kampungs*, such as lining drains, providing water hydrants and toilet blocks, without disturbing the social arrangements in them. Sadikin prioritised improvement in the oldest and the poorest *kampungs*. The programme was a huge success and was replicated in many areas in Indonesia. However, *kampungs* built on illegal land or in unsafe areas were excluded (Hadimadja, 2012).

City planning is essential to control development in Jakarta. As a military-bred governor, Sadikin was strict in implementing the master plan. He asserted that *"I don't want to 'prostitute' myself. If we want to save Jakarta, we must obey the city planning"* (Gunawan, 2010: 84). However, Jakarta's Master Plan 1965-1985 fell far behind the needs of the growing population. While sectoral plans were in place for water supply, sewage, and transport, the lack of coordination in implementing the plan was deemed problematic (Castles, 1989). This has been passed down all the way to the current administration. One of the achievements in planning was the recognition of a regional planning framework called Jabotabek (Jakarta-Bogor-Tangerang-Bekasi). The main idea was to curb the growth of Jakarta in favour of other cities and to incorporate regional solutions to the flooding problem (Caljouw et al., 2005).

After Sadikin's era, the flood control plan as reflected in Jakarta's Master Plan 1985-2005 was still largely devoted to flood control and drainage. Several priorities include the construction of Depok Dam, improving coordination between various agencies, and regulating urban construction in the southern part of the city (Pemda Jakarta, 1991). Despite city planning, Jakarta continued to experience rapid growth by the building of new towns and superblocks under the control of President Suharto[12] (1967-1998) (Pratiwo and Nas, 2005).

3.5 Contemporary Jakarta (1998-2016)

Political and financial crises in 1998 forced Suharto to step down from the presidency after 32 years. This moment signified a new political regime in Indonesia, from New Order to democracy. It entailed the decentralisation of power from central to

local governments, allowing local governments greater authority and resources to manage their own jurisdiction (Bunte and Ufen, 2009).

Between 1998-2016 floods were more frequent and immense, occurring in 1996, 2002, 2007 and 2013. Unlike the insignificant response to the 1996 flood due to unfavourable political and economic environments, the 2002 flood was able to trigger the implementation of the East Flood Canal that had been delayed for 30 years. Jakarta had largely recovered from the Asian crisis and capital was now available to fund the project. However, the canal was only finished in 2010 because of land acquisition and funding problems (Simanjuntak et al., 2012).

A major flood in 2007 was one of the worst floods in Jakarta's history. The government responded by conducting a river dredging project assisted by the World Bank (The World Bank, 2008) and undertaking flood control research in collaboration with the government of the Netherlands (Ministry of Public Works, 2011; NL Agency, 2012). When another flood hit Jakarta in 2013 and submerged the city's central business district, the government made serious efforts by conducting river canalisation in a 19-km stretch of Ciliwung River (PU, 2016). A new discourse about land subsidence, as discussed in the introduction, emerged after the 2013 flood, despite the fact that subsidence was recognised as early as 1926 in academic circles (Schepers, 1926; Suharto, 1971). To deal with the increased risk of flooding due to subsidence and sea level rise, the NCICD (National Capital Integrated Coastal Development) plan was launched, consisting of the construction of a sea wall, a retention basin, and land reclamation in Jakarta Bay (NCICD, 2013). Many stakeholders (primarily NGO activists and concerned academics) doubt the efficacy of this mega structure to deal with the flooding threats (Octavianti and Thanti, under review2).

Other than infrastructure measures, non-structural measures to control flood also emerged in policy discourses. Governor Sutiyoso (1997-2007) coined the term *megapolitan* to refer to Jakarta and its surrounding areas (Sutiyoso, 2007). He blamed rapid development in Puncak area (uplands of Jakarta) as the culprit of the 2002 major flood. The central government was involved by enacting regional spatial planning law for this area, Law No 5 Year 2008 for Jabodetabekpunjur (with the inclusion of Depok-Puncak-Cianjur). In 2014, Governor Joko Widodo (2012-2014) signed a pact with other regional leaders to take real action to reduce the risk of flooding in Jakarta (Syailendra, 2014) while Bogor has been conducting a moratorium on hotels and villas development in its city centre (LG8). However, it seems that these non-structural measures are only secondary and complementary to the main infrastructure measures.

A remarkable direction of spatial planning was evident in this period. There was a slight decrease in population growth within Jakarta as people preferred to live in surrounding cities: Bogor, Tangerang and Bekasi (Panggabean, 2012). Northward development by the creation of a waterfront city (Sidarta, 1996; Pemda Jakarta, 2012) is now pursued by the government and developers. This development was supported by a

law, Presidential Decree No 52 Year 1995 about Reclamation of North Coast of Jakarta. Jakarta is land constrained thus it cannot expand to the west, south or east. The creation of new land by reclamation was perceived by the government as a way to provide new urban space (Pemda Jakarta, 2012). However, this waterfront area exposes people and assets to environmental hazards, such as land subsidence, sea level rise, and coastal flooding.

4. The lock-in of infrastructural measures

In this section, we analyse the development of flood policy described in the previous section against the historical institutionalism framework. We argue that policy responses to flood events were reproduced over times with only marginal alterations to the main infrastructural ideas.

Some flood crises (1621, 1918, 2003, and 2013) were able to create critical junctures, which are, "the *relatively* short periods of time during which there is a *substantially* heightened probability that agents' choices will affect the outcome of interest" (Capoccia and Kelemen, 2007: 348, italics in original). The main outcome of those crises was instigating the implementation of old policies, although they were not able to shift the policy response from infrastructural approach. We also observe that conducive political and economic conditions are necessary in order for flood crises to be influential. For example, the introduction of ethical policy in the beginning of 20th century was the political condition needed to facilitate the construction of the West Flood Canal by the colonial government, as a response to a major flood in 1918. Similarly, the East Flood Canal was constructed in response to the 2002 flood, when under the right economic condition when Jakarta's economy had recovered from the 1998 financial crisis.

An attempt to shift the preferences to non-structural measures, for instance, controlled development in the region, was evident on several occasions. It was started in 1970s with the introduction of the Jabotabek concept, then in 2002 with the *megapolitan* model and in 2013 when the ruling governor signed a pact with other local leaders to take real action. However, those attempts were still unable to break the strong belief policymakers have in infrastructural solutions.

An analysis of policy responses to flooding, as summarised in Table 2 (see section 3), suggests that infrastructural approach from colonial times, especially canalisation, has made a resurgence in contemporary Jakarta. No large infrastructure was built between 1945 to 1998 (early independence and New Order era). Sadikin was able to construct several dams within the city during the oil boom in 1973; since then the flood control plan of 1972, which was dominated by infrastructural solutions, had not been fully implemented. This was mainly due to unstable economic conditions prior to the Asian financial crisis. However, during the New Order era, it may have been corruption (Brown, 2006; Greenless, 2008) and Suharto's nepotism and cronyism (Pratiwo and Nas,

2005) in Jakarta's urban development sector that contributed to the poor implementation of the plan.

Policy responses, especially to the recent floods (2002, 2007 and 2013), perpetuate lock-ins on infrastructural policies that have created institutional stability through a positive feedback cycle. This 'positive feedback' is the main element characterising a path-dependent institution (Pierson, 2000). This causal link between a policy and its impact strengthens the preference of similar policies over time, for example, the ongoing canalisation project. The canalisation is technically simple and provides quick alleviation of flooding within the design limits; more importantly, its quality of being readily implemented matches well with the short political cycles (Figure 2). This is related to the political setup in Jakarta. The western-style parliamentary system attempted by the Indonesia government in the early years of independence has historically made politicians emphasise short-term goals to acquire political support at the expense of long-term goals (Jayapal, 1993). They engage in fierce rhetoric and excessive use of power (Argo, 1999). Canalisation, therefore, fulfils this goal to acquire political support.

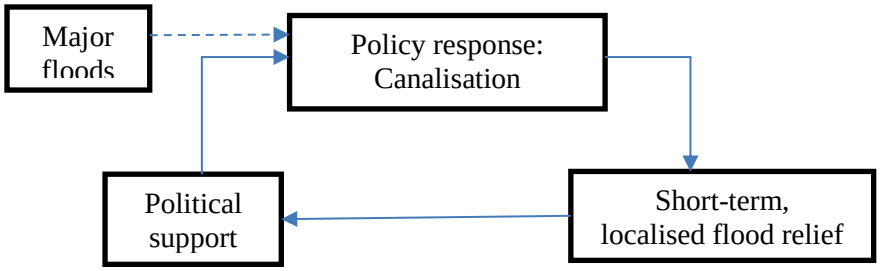

Figure 2. Positive feedback of Jakarta's flood policy: Major floods were almost always responded by infrastructural approach that gives fast yet unsustainable relief

Canalisation only treats the flooding as an end-of-pipe problem, and therefore does not address the root cause of the flood, which is perceived locally to be a combination of more impervious surfaces and increased rainfall intensity (AC6, LG1, Kompas, 2013). It requires continual investment in maintenance that is not keeping pace, as one informant noted: *"Within the last four months [June-September 2016], there have been at least five dike failures – Pantai Mutiara, Muara Angke, Pondok Labu, Pesanggrahan, and Kemang"* (NG7). Moreover, it continues the colonial practice of transferring the flood problems to poorer areas, providing protection only to businesses and elite areas.

We have identified at least three factors for keeping this preference for an infrastructural approach to floods. First, decades of investment in flood mitigation infrastructure have created sunk costs that are too 'costly' to be recovered (Stinchcombe, 1968). Pursuing the same path was considered by policymakers as a consistent approach to flood management in order to get the most out of the 'lost' capital. There continues to be an emphasis on infrastructure in flood management

budgets, such was highlighted by an informant: *"for infrastructures, such as normalization or canalisation, [the total budget allocated] is IDR 5.4 trillion [approximately USD 400 billion], whilst for catchment management [the budget allocated] is only IDR 15 billion [approximately USD 1.1 million]"* (NG3). An informant suggested that the budget plan should shift the emphasis to behavioural and environmental adaptations, rather than just infrastructural solutions: *"we need to change the budgeting plan's nomenclature, funding is needed for public engagement to create behaviour change"* (NG6).

Second, borrowing insights from sociological theorists, we argue that policy makers are hindered by cultural constraints in making decisions. They have to follow the 'script' or 'shared cognitions' that have been established in the society over a long period of time to gain legitimacy (Stinchcombe, 1997) - at least legitimacy gained from their circles. This constraint has created, "new problems … solved using the same cultural template" (Thelen, 1999: 387). One of the most notable cases of 'shared cognition' is institutionalised rent-seeking behaviours. Not only do individuals shape institutions, but institutions also shape the way individuals behave. The bureaucracy in the Indonesian New Order Regime during President Soeharto's time (1967-1998) developed this rent-seeking motivation (McLeod, 2000). In the water sector, infrastructure is viewed as the best way to pocket extra income for many individuals or groups. Poor accountability in budget plans and reports strengthen this preference in that era. An informant confirmed that for 'old-thinking' bureaucrats, a flood is a blessing as it mobilises infrastructure funding. This finding also echoes that of Suhardiman and Mollinga (2016) who found institutionalised corruption in Indonesian irrigation sector.

Third, the ongoing canalisation project may be a reflection of the unconscious bias to pursue the same approach as the colonial government. As an attempt to escape imperialism, Soekarno tried to create an image of the modern city, that is Jakarta (Pratiwo and Nas, 2011). However, he has been criticised for spending too many resources to create modern monuments in the midst of under-resourced urban services (Abeyasekere, 1989), which echoed the colonial government approach to prioritise European communities over the natives. This unconscious bias seems to be the case for the canalisation project. As discussed earlier, colonial governments often used 'imperial science' to justify their superiority over the colony (Adas, 1989). Colonial expertise embedded in the city's canal system has made the current Jakarta government, unconsciously, pursue a similar approach to what the colonial government did during colonial times (Kusno, 2013). "Such an inheritance is so embedded that the post-colonial governments have not successfully broken it. What seems to be a colonial matter, persist today" (Argo, 1999: 73). Jakarta is no longer under colonisal rule, however "the western spirit … remained the driving forces behind the structure of society" (Abeyasekere, 1989: 124), and this has been reflected in the ongoing river canalisation project.

While the colonial legacy of infrastructure in Jakarta's flood policy may have had its limitations in addressing the current situation, it is not to say that it was inappropriate at the time. Jakarta's low-lying areas are prone to flooding; this can be seen in the 1621 flood when there were only 10,000 people living in Batavia. The Dutch's very first attempt to build a canal system as a response to this flood *may* have been the most appropriate policy, and technology, at that the time. However, as Jakarta has developed considerably, it is important to re-examine whether or not these approaches are still the most appropriate.

Population growth in the city has contributed to the severity of the flood condition today. Figure 3 shows how Jakarta's population increased dramatically after Indonesia declared its independence in 1945. The population in 1949 (1.3 million people) was more than double that of 1945 (600,000 people). Indeed, independence ignited hope that motivated people to search for a better life in the capital, but uncontrolled urbanisation influx encroached the city's water ecology to cope with a surplus of water. Canals are now easily clogged from domestic waste thrown into them. We argue that the decisions made under colonial rule played a role in influencing Jakarta's flood mitigation today.

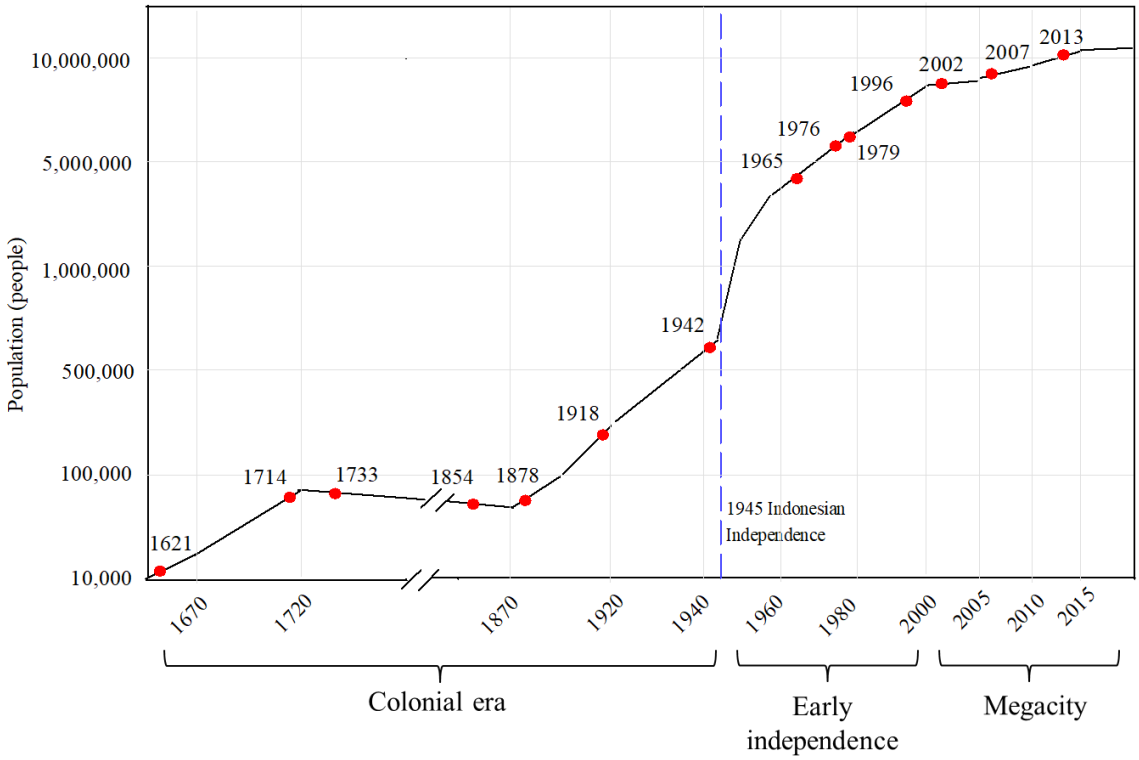

Figure 3. Population growth in Jakarta and major flood events (red dots) (Data: Heuken, 1983; Gunawan, 2010; BPS, 2015)

Focusing on the continuation of infrastructural measures in Jakarta, one may argue that during colonial times canal building was deemed necessary basic infrastructure. Nonetheless, does the accumulation of assets and the increasing number of people living in the megacity today justify the continuation of infrastructural measures? The city has had no space nor time to implement (and experiment on) other measures of flood mitigation, meanwhile, there is insufficient evidence to show that relying on infrastructure will provide long-term protection with the changing nature of the city and the environment.

The NCICD plan is influenced by infrastructural values embedded in the city's canalisation system. It is similar in logic to the existing structural approach, or what Campbell (1997) termed institutional bricolage, in which "an innovative process whereby new institutions differ from but resemble old ones" (p.22). Policymakers' tendency to minimize decision-making costs rather than maximize goal attainment when coping with policy choices (Cohen, March and Olsen, 1972) reflects the importance of maintaining status quo. NCICD might be an attempt to maintain status quo in structural measures. This may also be due to internalised cultural constraints which then become a limitation to policymakers (DiMaggio and Powell, 1991). Even when they attempt to redesign the institution, the emergent institutional forms will tend to be "isomorphic" with the existing ones (Thelen and Conran, 2016). In other words, there is a considerable impact of policy inheritance reflected in the NCICD. Another factor that may also contribute to its persistence is the learning effects of pursuing the same path for so long; knowledge gained in the operation of a particular system leads to higher returns from its continuing use (Arthur, 1994).

Policy preference to the NCICD demonstrates that curative over preventive measures tend to be chosen to cope with water-related disasters. The role of groundwater extraction has not been addressed, but rather the response to the crisis was the proposal to build a massive sea wall. A supporter of the NCICD argued that: "NCICD is different, we have moved on from incremental policy responses to one that is massive" (KI6). The scale of the plan is no doubt unprecedented but, by and large, the plan still resembles the old structural approach.

Finally, as a perennial problem for Jakarta, flooding is always 'floating' in the government agenda, but only major floods can push the problem to the decision agenda[13] where flood has a greater chance to trigger policy actions. Tracing the evolution of flood policy, we can say that flooding has always been the government's top water-related priority. This is attributed to flooding's destructive nature and the loss of life it causes (LG2). However, water-related policies are interdependent: poor sanitation has caused severe pollution and waterborne disease outbreaks during floods (Abeyasekere, 1989); insufficient water supply provision has led to excessive groundwater extraction and land subsidence (Abidin et al., 2011). These interactions of water issues suggest that flooding should not be considered in isolation with other water policies in a dynamic urban environment.

5. Conclusion

In this paper, we have demonstrated how flood policy in Jakarta has been dependent on infrastructural solutions. Colonialism has played a significant role in this policy preference. The colonial government used their water expertise to establish their superiority in the colony, from transforming Batavia into a canal city in the early 17th century to a construction of the large West Flood Canal in 1918. In each political regime, flood plans were partly implemented due mainly to funding constraints. This implementation deficit characterising most developing countries meant ideas are 'recycled' into subsequent plans. As a result, engineering driven solutions dominate even today.

By employing an historical institutionalism approach, we found that although critical junctures were evident in the pathways, they did not create radical change to the flood management institutions. Strong positive feedback cycles reproduced similar responses to flooding. This, we argue, is a result of concerted efforts to sustain the pattern over time, cultural constraints hindering innovation, and unconscious bias towards colonial science. A recent proposal to build a 32-km offshore sea wall to protect the sea from flooding (the NCICD plan) emerged when a major flood hit the city in 2007. The massive scale of the sea wall advances the path-dependency of infrastructure measures.

Tracing a flood history spanning almost four centuries, we agree that massive land transformation, not only in Jakarta but also in the surrounding areas, has a major role in flooding events. Managing flood risks means managing growth and development beyond the city's political boundaries; that is part of the politics of planning. This also suggests that long-term mitigation of flooding cannot be achieved by merely constructing infrastructures within the city and downstream (i.e. seawall).

We hope this paper is a useful conceptual contribution not only to the historical institutionalism scholarship but also to the literature on the politics of flood management and planning. Flood management, like virtually all policy domains, is shaped by political relationships manifested over time in institutional rules and norms. The historical institutionalism approach helps to illuminate the causes of flooding and patterns of flood policies in Jakarta, and most importantly, shed light at the extent the current policy has been influenced by old structural values. However, this finding should not discourage policy entrepreneurs to advocate change because path dependence or lock-in does not necessarily mean that future paths are predetermined by these historical circumstances.

Notes

1. Almost every rainy season, Jakarta is flooded. A terminology of *banjir lima tahunan* (five-year cycle flood) was popular to refer to major floods that happened in a five-year cycle, starting in 1996, 2002, 2007 and 2013.
2. Canalisation is an engineering practice to line natural river with artificial materials, especially concrete, to secure a defined dimension to carry flood water. There is an ambiguity between the terms 'canalisation' and 'normalisation'. Normalisation, we reckon, is a practice to normalise (to return to a normal situation) river banks, that does not necessarily include the practice of canalisation. The term normalisation is commonly used in Jakarta for the canalisation practice. However, in this paper, we use the term canalisation consistently to refer to the river lining efforts.
3. Jakarta was the centre of trading during VOC time, and had been constantly under the governance of the Dutch and its allies. However, the exact total of colonialisation time in Indonesia as a whole is still a controversy. Many Indonesians believe the Dutch domination over Indonesia archipelago was 350 years in total (1619-1942). But Resink (1968) argued that this is not the case as there was a variegated pattern of Indonesian states maintaining themselves even until the 20th century with the overt or passive occurrence of Dutch colonial authority.
4. The mortality rate of Europeans declined significantly because they moved from the Malaria-ridden lower town to an area less subject to flooding and with better access to water via deeper artesian wells (Abeyasekere, 1989).
5. In the Forced Cultivation system, farmers were mobilised to plant high-value crop that had to be sold at low fixed prices (Vlekke, 1943).
6. Although more people came to Batavia, high mortality rate due to persistent unhealthy conditions restricted the town's population growth (Hugo, 1980).
7. Such grand projects are also popularly called as *proyek mercusuar* (lighthouse project). Suharto, who replaced Soekarno, used the term to refer to grand projects that would demonstrate Indonesian's status in the world (Bourchier and Hadiz, 2003).
8. During this period, the government specified eight new towns within Jakarta: Ancol (803.3 hectares), Kampong Gusti/ Pluit (1,415.6 hectares), Jelambar (571.6 hectares), Tomang Barat (645.7 hectares), Tanah Kusir (428.13 hectares), Tebet (288.96 hectares), Kebayoran Baru (801.6 hectares) and Rawamangun (470.5 hectares). By the end of 1960, the total area of Jakarta was 590 km^2, with 180 km^2 dense region occupied by 65 percent of people (the total population was 3.6 million in 1966) (Gunawan, 2010).
9. The New Order (*Order Baru*) is a term coined by President Suharto to refer to characterise his regime as he came to power in 1966. He used the term to contrast his rule with that of his predecessor, Soekarno (Legge, 1968).

10. In 1966, Jakarta was inhabited by 3.6 million people (Abeyasekere, 1989).
11. Argo (1999) argued that Suharto was much more realistic in terms of planning, in comparison with Soekarno. However, corruption flourished during Suharto's New Order regime. This practice, we argue, contributed to the lack of implementation of flood control plan that required large investment.
12. We adopted this idea of government and decision agenda from Kingdon (2014). According to him, a government agenda is "the list of subjects that are getting attention", while decision agenda is "the list of subjects within the governmental agenda that are up for an active decision" (p.4).

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Appendix

Table 3. Overview of interviewees

Note: KI: individual expert, AC: academics, NG: NGO activist, CG: central government official, LG: local government official

No	Code	Description and position	Field of expertise or institution (in single quotation mark)
1	CG1	Central Government official (minister's staff)	Water policy
2	CG2	Central Government official (director)	Conservation
3	CG3	Central Government official (director)	Catchment protection
4	CG4	Central Government official (director)	Inland water management
5	CG5	Central Government official (director)	Coastal water management
6	CG6	Central Government official (director)	Sanitation
7	LG1	Local Government official (deputy)	Environment and spatial planning
8	LG2	Local Government official (head)	'Water Management Agency '
9	LG3	Local Government official (staff)	'Jakarta Water Regulatory Body'
10	LG4	Local Government official (head)	'Local Development Planning Board'
11	LG5	Local Government official (director)	'Jakarta's Water Supply Company'
12	LG6	Local Government official (head)	'Housing Agency'
13	LG7	Local Government official (director)	'Jakarta's Wastewater Company'
14	LG8	Local Government official (Mayor)	Impact of Jakarta's development in surrounding areas
15	AC1	Academician (local university)	Social and environmental science
16	AC2	Academician (local university)	History of Jakarta
17	AC3	Academician	Water policy
18	AC4	Academician (local university)	Urban development
19	AC5	Academician (local university)	Urban development

20	AC6	Academician (local university)	Urban development
21	AC7	Academician (local university)	NCICD – technical challenges
22	AC8	Academician (local university)	Water supply
23	AC9	Academician (local university)	Urban development
24	AC10	Academician (local university)	NCICD – policy making process
25	NG1	NGO activist (head)	Biodiversity and community engagement
26	NG2	NGO activist	Biodiversity and community engagement
27	NG3	NGO activist (head)	Flood measures and community engagement
28	NG4	NGO activist	Adaptation and urban development
29	NG5	NGO activist	Urban development
30	NG6	NGO activist (head)	Normalisation and community engagement
31	NG7	NGO activist (head)	Urban development
32	KI1	Individual expert	History of Jakarta
33	KI2	Individual expert (director)	Urban development
34	KI3	Individual expert	Development assistance
35	KI4	Individual expert	Urban development
36	KI5	Consultant (head)	NCICD – policy making process
37	KI6	Consultant, former Central Government official (vice deputy)	NCICD – policy making process
38	KI7	Industry representatives	Private water supply company