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# Infrastructuring coastal futures: Key trajectories in Southeast Asian megacities

**Johannes Herbeck, Michael Flitner**

artec Sustainability Research Center, University of Bremen, Enrique-Schmidt-Str. 7, 28359 Bremen, Germany,  
[herbeck@uni-bremen.de](mailto:herbeck@uni-bremen.de), [flitner@uni-bremen.de](mailto:flitner@uni-bremen.de)

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## Abstract

The search for suitable adaptation pathways to accommodate for rising sea levels resulting from global climate change is an ongoing concern for many megacities in Southeast Asia and beyond. Addressing already existing challenges resulting from land subsidence and increased occurrence of inland flooding, adaptation can take varied forms and cover widely differing concerns, spaces and time spans. Based on research carried out in the cities of Singapore, Jakarta (Indonesia), and Manila (Philippines), this paper looks at some key trajectories of current adaptation planning. We argue that the processes of infrastructuring coastal futures in these cities are characterized by different aims and measures that overlap and converge in their material effects but also compete in articulating diverging new claims to the coast. In this perspective, we describe and analyze three main trends of infrastructuring coastal futures: the securitization of coastal futures by way of transforming disaster risk reduction practices and integrating new policy concerns, the greening of coastal spaces in material and operational terms, and finally, the valorization of coastal areas through reclamation, waterfront development and the creation of high-end real estate. Along these three trajectories, coastal adaptation planning becomes a key force that can influence virtually every sector of urban development and governance, and has strong implications for the futures of coastal cities in social and political terms.

## Zusammenfassung

Vor dem Hintergrund des globalen Klimawandels ist die Suche nach geeigneten Anpassungspfaden an den Meeresspiegelanstieg für viele Megacities in Südostasien und darüber hinaus ein aktuelles Anliegen. Angesichts der bereits bestehenden Herausforderungen, die sich aus Subsidenz und dem vermehrten Auftreten von Überschwemmungen im Binnenland ergeben, kann Anpassung in unterschiedlicher Form erfolgen und sehr unterschiedliche Anliegen, Räume und Zeiträume abdecken. Basierend auf Untersuchungen in den Städten Singapur, Jakarta (Indonesien) und Manila (Philippinen) werden in diesem Beitrag einige wichtige Trajektorien der aktuellen Anpassungsplanung untersucht. Wir argumentieren, dass Prozesse der Infrastrukturierung in diesen Städten durch Ziele und Maßnahmen gekennzeichnet sind, die sich oft überschneiden und in ihren materiellen Auswirkungen konvergieren, aber auch neue, konkurrierende Ansprüche an die Küste artikulieren. In dieser Perspektive beschreiben und analysieren wir drei Haupttrends der Infrastrukturierung von Küsten: die Versicherheitlichung von Küsten durch transformierte Praktiken der Katastrophenvorsorge, das ‚Greening‘ von Küsteninfrastrukturen und schließlich die Inwertsetzung von Küstengebieten durch Landgewinnung und die

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Schaffung von hochpreisigen Quartieren. Auf diesen drei Wegen wird Anpassungsplanung zu einer entscheidenden Kraft, die alle Bereiche der Stadtentwicklung und -verwaltung beeinflussen kann und starke Auswirkungen auf die Zukunft der Küstenstädte in sozialer und politischer Hinsicht hat.

**Keywords** infrastructure, adaptation planning, securitization, greening, waterfront development

## 1. Introduction

Coastal cities all over the world are confronted with the predictions of strongly rising sea levels, and many of the larger cities already have substantial problems with subsidence and coastal flooding (Kraas 2007; Heinrichs et al. 2011). At the same time, economic dynamics and growing connectedness as well as processes of internal and international migration have led to marked growth of coastal settlements over the last decades, additionally increasing the need for protecting the coastal fringes of those cities. In classical approaches of coastal defense, infrastructures in a traditional, material sense tend to play the key role. They involve highly specialized coastal engineering practices and the construction of large-scale, cost-intensive coastal protection structures such as breakwaters, sea walls, and revetments. In recent years, integrated approaches have gained in importance that also consider potential feedback loops of urban hydrological systems with changes along the coast and in its hinterlands. As a corollary, adaptation planning is not confined to the narrow coastal strips of those megacities. It often has broader implications for the maintenance and modernization of the cities' inland water ways, polders and retention systems, as well as freshwater supply, sanitation, solid waste disposal facilities, and housing schemes.

This trend towards a broad understanding and practice of adaptation planning is also visible in coastal megacities in Southeast (SE) Asia. Since many years, measures take the form of cost-intensive infrastructure programs that include the construction of levees and dikes, of sea walls and revetments. At the same time those programs do not stop at the coastline itself, but usually extend far in-land, often due to the complex relations between the hydrology of the cities, the level of the sea, the changes in precipitation and runoff water that often exceeds the retention capacities etc. Yet, projects dealing with these relations are often aiming beyond the issues of runoff management, flood prevention and coastal protection. They are taken as opportunities to present and develop coastal futures

by integrating aspects of real estate development, road and transport facilities, drinking water supply and waste water management as well as general questions of economic development and welfare.

SE Asian cities are hot spots of global attention with regard to coastal infrastructuring: they are depicted as places that are highly vulnerable to regional and global sea level rise and at the same time featuring vast differences in the provisioning of basic services along socio-spatial gradients. Rapid urbanization over the past decades has led to widely differing degrees of infrastructure availability, and mosaic-like patterns of high-end living areas with the cramped living conditions of irregular settlements. In many places, this uneven development has exacerbated differences in the vulnerabilities towards flooding and changing sea levels, where low-income areas with limited tenurial security are most hit by flooding events (cf. Furlong 2014).

This situation has led to a plethora of initiatives to improve coastal protection and enhance the resilience of coastal cities over the last years. Based on an analysis of documents and interview materials from our field work, this paper will look at some key trajectories of current adaptation planning in the cities of Singapore, Jakarta (Indonesia), and Manila (Philippines). In particular, we will highlight the role of infrastructures, and more precisely, the processes and trajectories of infrastructuring coastal futures in these cities. To develop our argument, we will first look into recent debates around infrastructures as they are inspired by a renewed interest in the subject in human geography, anthropology as well as science and technology studies (STS). The processes of infrastructure (re-) development are characterized by different aims and measures that often overlap and converge in their material effects but also compete in articulating diverging, new claims to the coast. In the following sections, we describe and analyze main trends of infrastructuring coastal futures. These trends document how coastal adaptation planning becomes a key force that has strong implications for the futures of coastal cities in social and political terms.

### 2. Theoretical background and methods

We analyze coastal adaptation planning in the light of recent thinking about infrastructure development and the related processes of infrastructuring. Infrastructures are traditionally seen as the basic material and immaterial framework on which the practices and processes of society play out. Conventional definitions are thus largely oriented towards the functionality of infrastructures, and in particular their economic utility (Frey 2005). Accordingly, the financing and planning of infrastructure projects by states and their effects on 'the economy' as an abstract whole have often been the main analytical focus (Müller et al. 2017: 5-6).

In recent years, however, new perspectives have broadened and challenged economic and functionalist readings of infrastructure development. On the one hand, several authors have highlighted the power effects and the inequalities that are (re-)produced in and by infrastructures, including their symbolic dimension (e.g. Swyngedouw 2015; Marquardt 2017). This has renewed interest in failing infrastructures that leave people without basic services in times of crisis (Graham 2010). On the other hand, a broad interest in the material-cum-semiotic side of social practices has (re-)emerged that takes up the insights of science and technology studies (Star 1999; Larkin 2013). This literature has underlined the relational and procedural character of infrastructure which is being constantly re-organized, re-built and taken care for in an "ongoing interweaving of embodied social and political choices, moral orders, and technical networks" (Niewöhner 2015: 119). The digital infrastructures that are emerging since the turn of the century illustrate the dynamics of these extended socio-technical networks, when software installed on laptops or smartphones provides information about other infrastructures, while at the same time changing the data flows and algorithms on which this information is based. In the context of coastal protection infrastructures, authors like Flitner et al. (2017) or Siriwardane-de Zoysa (in press) show that groyne or dike infrastructures also entail symbolic and relational dimensions, controlling and legitimizing not only water flows, but also interfering with wider questions like access to the sea and fishing grounds, as well as land tenure and relocation practices. In the following sections, we start from a relational view on infrastructures that highlights their becoming and their effects in a political context.

For doing so, we draw on different types of documents and on interviews that we carried out during our research in SE Asia in 2017 and 2018. The three cities Jakarta, Singapore and Manila were selected due to similarities with regards to potential exposure to changes in sea level, and to their status as megacities with high relevance for their countries and the region. At the same time, differences with regard to adaptive capacities, as well as to already existing experiences with relative sea level rise (with coastal Northern Jakarta being a prime example for the prevalent subsidence crisis in the region, cf. Siriwardane-de Zoysa et al., forthcoming) make them an interesting and diverse sample. As a result of their potential affectedness, all cities have in recent years taken measures to reinforce and strengthen existing coastal protection infrastructures, and to close down gaps in the line of defense against rising sea levels and storm surges.

For our document analysis, materials were collected during an extensive desk study of planning documents, press releases, corporate reports, etc., as well as printed grey literature that we retrieved during our research stays. The materials included in the analysis stem from inter- and transnational organizations (World Bank, UN agencies), national jurisdictional and governmental bodies, local newspapers, as well as online resources of project developers and coastal engineering companies.

The first author (J.H.) carried out 23 semi-structured interviews with representatives of government and international institutions in Jakarta, Singapore and Manila, with consultants, civil society organizations, as well as academics and journalists. In addition, a large number of less formal conversations were carried out by both authors, often jointly, during their visits to different organizations and on academic meetings. The research draws on transcripts, recordings and notes from the meetings.

In our content analysis of the materials, we focused strongly on the different forms of adaptation planning in the three cities and aimed at identifying common lines of reasoning, trajectories and material arrangements into which the broader imperative of coastal adaptation is translated. As we started our analysis with an open and relational understanding of infrastructures, this could include traditional construction works for coastal defense structures but also more subtle arrangements and social forces that were mobilized in the context of climate adaptation. Thus, our

questions were directed at practical planning issues and their (intended and perceived) material effects as well as on the broader interpretations and imageries of social processes regarding the future of the three cities. As a general structure, our qualitative research identifies three broader trajectories that characterize current large-scale adaptation projects: the *securitization*, the *greening* and the *valorization* of coastal areas. We interpret these different lines of political, symbolic and technical intervention as an infrastructuring of coastal futures with a high long-term impact on the social-ecological relations in the three SE Asian cities.

### 3. Results: Coastal adaptation in Southeast Asian megacities

The three cities Manila, Jakarta and Singapore all have taken measures to reinforce and strengthen existing coastal protection infrastructures in recent years. In line with what has been observed in different settings (e.g. *Heinrichs et al. 2011*) adaptation planning is a fragmented and dispersed process that crosses administrative and spatial boundaries. Rather than being a single, integrated strategy, adaptation takes the form of a multitude of measures and projects over a longer time and at different scales and levels. Thus, the three cities have had their specific mix of measures, due not only to political circumstances but also reacting to specific situations and building on historic development paths.

In *Manila*, adaptation to climate change is mainly focused on questions of Disaster Risk Reduction (DRR) strategies and flood management, whereas the question of sea level rise and coastal protection is currently rather neglected in public and policy discourses:

“It’s just that the people here, if they prioritize their problems, sea level rise is very low. Right now, it’s livelihood, housing, maybe floodings” (interview *J.H. 2017*, local NGO, Manila).

Since the 1980s, the creation of safer living environments for Manila’s disaster-ridden population has concentrated on the establishment of DRR units and departments on the level of Metro Manila’s 17 city governments. More recently, the World Bank-funded Metro Manila Flood Management Master Plan has combined structural and non-structural measures with the aim to “provide sustainable flood manage-

ment up to a designated safety level” (*World Bank 2015: 2*), also linking flood management to potentially rising incidents of water logging due to relative sea level rise (interview *J.H. 2017*, World Bank, Manila). This measure is currently complemented by a broader master plan for Manila Bay (Manila Bay Sustainable Development Master Plan, MBSDMP) planned to be finalized mid-2019 that also has a strong climate adaptation component. Its stated goal to “make use of solicited private sector investments to achieve strategic management and development goals” (*NEDA 2018a: 7*) is thereby in line with a recent increase of coastal “private sector-led development, attracting global capital” (*Meerow 2017: 2651*).

In *Jakarta*, planning for adapting to urban flooding goes back to colonial times and has seen various approaches and phases, recently triggered by catastrophic flooding events in 2007 and 2013. Various policies and strategies have been developed successively, mainly through the provincial government of Jakarta Capital Region (DKI) that has continuously created and re-shaped institutional arrangements for climate change adaptation and flood mitigation. Among the relevant local planning documents are a general spatial plan, as well as a climate change adaptation action plan and a disaster management plan (cf. *Simarmata 2018: 44ff.*). In recent years, adaptation planning dealing with the occurrence of urban floods has broadened to include coastal developments, especially regarding the chronic subsidence crisis that aggravates water logging situations (*Octavianti and Charles 2018*). The focus of adaptation planning has therefore shifted “from the land-based defense of rivers, canals, water pumps, and lakes to sea- and land-based protection, including reclamation, pond retention upstream and downstream, and the sea wall” (*Simarmata 2018: 51*). The gigantic National Capital Integrated Coastal Development Plan (NCICD) is the most recent turn towards large-scale coastal infrastructure development, with a similar business model like Manila, trying to include strategic partnerships with private investors and revenue for the city budget (cf. *Coordinating Ministry for Economy and Development 2014*).

*Singapore* has long been acknowledged as a regional forerunner for climate change planning, also due to its “long-standing commitment to detailed urban planning and precise (if sometimes authoritarian) implementation” (*Whittington 2017: 415*). Yet, for a long time, coastal development has remained relatively

untouched from the prospect of sea level rise and increasing storm surges. Coastal planning in Singapore has been mainly associated with the question of land reclamation and related waterfront development projects such as the Marina Bay Waterfront or the East Coast Park, with sea level change entering the policy debates and institutional discourses on coastal development only in recent years. The 2011 raising of minimum platform levels for reclaimed land has often been cited as the first wide-ranging coastal adaptation policy (interview *J.H.* 2017, Resilience Working Group, Singapore). Still, the broader adaptation processes initiated and controlled by Singapore's Climate Change Secretariat continue to gain momentum in the administrative system. The most important processes have been the 2012 National Climate Change Strategy (*NCCS* 2012) and the Climate Change Action Plan of 2016 (*MEWR* 2016), with a volume on mitigation and (a much shorter) on adaptation. In those more general climate change strategies and policies, coastal adaptation tends to play a minor role, compared for example to questions of securing freshwater access, mitigating urban flooding during heavy rainfall events, or avoiding heat stress to Singaporean citizens. The publication of a long-announced and conflict-ridden coastal adaptation study by the Urban Redevelopment Authority (URA) has been postponed since more than two years (interview *J.H.* 2017, international consultant, Singapore).

Thus, the three megacities have quite distinct pathways with regard to the general direction of their climate adaptation strategies. Despite the differences, the closer analysis based on our field research and analysis reveals similar trajectories and trends to which the large-scale projects relate.

### 3.1 Safety and securitization

Unsurprisingly, the question of safety is one that is frequently addressed in coastal adaptation planning. The consideration of an increased safety for the inhabitants of the coastal regions, especially regarding the protection from flooding either directly or indirectly linked to climate change, can be found in all the examined examples. In Manila, coastal adaptation is argued to be designed to ensure that "coastal areas are protected" (*Pernia* 2018: s.p.) and that large-scale, integrated planning can "develop strategies in order to preserve and protect the natural assets that enhances the attractiveness of Manila Bay (...) and reduce the

effects of disaster risks" (*NEDA* 2017: 6). In Singapore, the government maintains that it has "strengthened our defenses against coastal erosion and flooding" (*MEWR* 2016: 12), i.e. through the construction of protective rock slopes or revetments along the coast. Similarly, the master plan for the NCICD in Jakarta "contains a vision and practical recommendations aimed at guaranteeing the safety of Jakarta's 4 to 5 million inhabitants in 2025" (*MIE* 2014: s.p.).

In all three cases, the references to safety, protection and security are recurring and legitimate the basic rationales of the projects. Accordingly, the main infrastructural adjustments are a strengthening of existing or first-time construction of lacking coastal protection structures. The NCICD project in Jakarta, for example, in a first phase reinforces existing sea walls and other protective structures all along the coastline as well as along canals in Northern Jakarta and, depending on the exact location, replaces them by a concrete wall of up to four meters height (cf. *Coordinating Ministry for Economy and Development* 2014: 74f.). In a next step, NCICD plans to complement the reinforcement of the coastline with integrated development of Jakarta Bay, and to construct an offshore sea wall with large-scale reclamation activities allowing for development of housing, business parks, and transportation infrastructures (*ibid.*).

In Singapore, the threat of rising sea levels to the coastal areas of the country has been the central concern and driver behind a long-term process of developing an all-encompassing coastal protection study under the Building and Construction Authority to counteract sea level rise as "most immediate climate change threat to Singapore. [...] the authorities have been preparing early to safeguard Singapore" (*Xi* 2017: s.p.). Or, as a representative of the inter-agency Resilience Working Group put it: "For us, the safety of the Singaporean citizen is at the core" (interview *J.H.*, 2017, Resilience Working Group, Singapore).

In a similar rhetoric, Manila's World Bank sponsored Integrated Flood Control and Highway project foresees the offshore "construction and operations of a City Flood Barrier that will protect about 250,000 people in Navotas City from storm surges and wave attacks" (*PPPC* 2017: s.p.). The project is connected to the larger, ongoing master planning exercise of MBSDMP that is the most recent of a long line of projects designed and implemented in order to reduce the prevalent flood risks in Metro Manila. Similar to

the Jakarta project, the project is divided in different phases, with the latter stages complementing the protective focus of the project with island reclamation in order to create new areas for infrastructure developments (NEDA 2018a).

While safety and security in a rather narrow, technical understanding do play a vital role in legitimizing coastal adaptation measures, many flood protection projects have introduced or carried along wider security concerns as they are discussed under the term *securitization* (Buzan et al. 1998). This concept highlights the effects of shifting policy concerns into a discursive arena where the construction of immediate threats undermines the spaces of democratic deliberation – and some authors maintain that climate change could become such a concern (cf. Herbeck and Flitner 2010). One pattern pointing into this direction in all three cities (albeit at different moments in time) is the discursive connection established between flood control and the question of irregular settlements. According to Loh and Pante (2015), governing flood control has always been connected with disciplining coastal dwellers and settlers in urban waterways. In Manila, the “high modernist flood control measures also sought to master human nature in addition to mastering nature. Philippine government officials blamed informal dwellers for the floods and took action against them” (ibid.: 49). At least since the early 1950s, flood management in Manila has been connected to evictions and clearance of irregular settlements (ibid.). Similarly, the city government of Jakarta has frequently justified evictions of ten thousands of people living in irregular settlements along riverbanks and coastal strips with the need for minimizing potential effects of floods (cf. Photo 1; Charmila 2017). The Jakarta Urgent Flood Mitigation Project, for example, had the aim of ‘normalizing’ urban waterways and retention ponds, also through the relocation of an estimated 200,000 people (DKI Jakarta Province 2010). More recently, the Jakarta city government under former governor Basuki ‘Ahok’ Tjahaja Purnama has frequently involved the police unit SatPol P.P. for carrying out evictions, at times forcefully and against the resistance of *kampung* dwellers (cf. van Voorst and Padawangi 2015; Colven 2017; Siriwardane-de Zoysa et al. 2018).

Such *securitizing moves* by city governments are couched in terms of adaptation and justify the reorganization of urban settlement structures, and they sometimes involve militarized and violent interven-

tions. They are complemented by other forms of securitizing climate change adaptation, flood control and coastal protection that are more subtle. *Islam* and *An* (2014) for example show the discursive connections established between climate change and national security by the Singaporean government potentially reinforces militarized way of dealing with perceived threats: “The framing of resilience in the language of war and national security is reminiscent of the ‘siege mentality’ approach adopted by Singapore government since its independence informing its strategy against real or perceived threats to its sovereignty” (ibid.: 211). In Manila, the city-wide installation of sophisticated DRR units was accompanied by an expansion of surveillance technologies (interviews J.H. 2017, different DRR offices in Manila). The installation of CCTV systems as part of flood early warning systems feeds into a stronger securitization of flood management by providing interlinkages to the control of unwanted forms of use and ‘irregular’ settlements (Siriwardane-de Zoysa et al. 2018: 113) as targeted at within MBSDMP that is trying to “stop the further expansion of informal settlements in highly exposed coastal areas and to implement a program [...] for relocation to safer areas” (NEDA 2018b: 30).



Photo 1 Debris remnants of evictions in the coastal *Kampung Aquarium*, North Jakarta. Photo credit: J. Herbeck, 2018

### 3.2 Greening protection

Globally, a turn towards adaptive strategies, no-regret and more flexible measures in coastal protection and flood management can be observed (Sutton-Grier et al. 2015), often complemented by ‘softer’ or ‘greener’ forms of coastal engineering that aim at ‘working with nature’ (Gesing 2016, 2019). These include approaches that refer to ecological engineering and ecosystem-based adaptation strategies for designing

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coastal protection measures and pathways (cf. *Jansen et al. 2017*), as well as growing recognition for the protective value of conserving or restoring 'natural' coastal habitats like coral reefs or mangrove forests (cf. *World Bank 2016*). At first sight, the capital intensive, large scale technological fixes that dominate the responses of SE Asian megacities to flooding and regional sea level rise seem to contradict the observable turn towards those softer coastal engineering practices. Yet, some elements or traces of respective engineering philosophies and technologies can be found in all three cities. Most prominently, Singapore has in recent years turned to some of the greening ideas in its coastal protection strategy (cf. *Photo 2*) and displays them prominently in public relation campaigns that accompany the Singaporean protection approach. The idea of soft engineering already featured prominently in the 2012 national climate change strategy that stated: "There is also growing interest in 'soft' coastal protection practices including the use of plants (such as mangroves and sea grasses) for coastal protection, as well as beach and dune nourishment. Research and collaboration with local institutions will be embarked upon to advance these areas and other approaches which are relatively new to Singapore." (*NCCS 2012: 79*).



*Photo 2 Coastal engineering at Pulau Kusu, Singapore, with public picnic table. Photo credit: J. Herbeck, 2017*

In more recent publications, the government of Singapore underlines the advances that coastal protection in the city state has made with the introduction of green forms of coastal engineering by presenting examples of geo bag sea walls and multi-functional composite stepped sea walls (*MEWR 2016*). Additionally, Singapore is exploring more cost-effective and environmentally sensitive techniques for land reclamation, as one additional pillar for coastal adaptation in times of sea level rise. In 2016, it started a presti-

gious joint venture with the Dutch consultant Royal Haskoning at Pulau Tekong, in which land reclamation will be carried out by adopting Dutch poldering technologies to the Singaporean context (*HDB 2016*).

The references to greener or softer forms of coastal engineering are less pronounced in the other examples. To be true, there are some signs of an uptake of respective practices also in the Philippines, e.g. in a pilot public-private partnership (PPP) project in Iloilo province that promotes 'green-grey' coastal infrastructure to "demonstrate the potential for natural systems to adapt to the consequences of changes in climate and extreme weather events" (*Toth 2018: s.p.*). Also, the Metro Manila Flood Management Plan of 2013 has incorporated 'softer' forms of hydrological engineering like (re)forestation, explicitly relating to a "new approach' to flood management [...] [that] does not focus on building dikes and engineering interventions" (*Senate Committee on Public Works 2014: 8*). Still, as *Yarina (2018)* argues, this 'making room for the river'-inspired approach has led to a re-definition of areas as uninhabitable and is closely linked to forced evictions and relocations of urban poor as discussed in the previous section. More fundamentally, regarding climate change adaptation in Manila, the references to green infrastructure are few and weak, partly due to spatial constraints:

"Here, green infrastructure like Singapore has..., you know the city, where is the space for that? If you have 3 million informal settlers, every space is occupied." (interview *J.H. 2017*, World Bank, Manila).

The idea of more comprehensive or multidimensional approaches, like integrated coastal zone management (ICZM) has visibly inspired the design of recent infrastructure programs, but the focus on hard-type infrastructure remains strong, especially when integrated flood management programs are concerned that extend inland: "It's mainly a combined program of pumping technology modernization and new pumps", as the responsible World Bank program leader describes the biggest ongoing adaptation project (interview *J.H. 2017*, World Bank, Manila). The underlying project rationale has been determined by a master planning process, building upon a hydrological model of the city:

"We basically try to prepare for 100-year flooding events. And you find out, ok, if you have such an event, through the model, ok, what is needed to prepare. You

may need some dike, some raising of embankment. [...] So, you see all that sheet piling and the concrete walls" (interview *J.H.* 2017, World Bank, Manila).

In Jakarta, approaches of 'greening' coastal protection have received attention mainly as a counter image to the large-scale engineering solutions, in particular the attempt to seal off Jakarta with a huge sea-wall. Starting from grassroots concerns on the environmental impacts of land reclamation and integrated water management, differences within governmental institutions responsible for setting up coastal adaptation strategies became clearly visible. Similar to recent developments in Singapore, reference is made to traditional approaches to land reclamation. As a Dutch-trained expert from the national planning office put it:

"We propose a very cheap solution, called poldering. We let nature do the job. And we have all the expertise, we don't need the Dutch" (interview *J.H.* 2018, National Planning Agency, Jakarta).

Hence, the related trajectories in the three cities show differences in how far they embrace the greening of coastal infrastructures, what elements are contained in this strategy, and how it is linked to broader issues like watershed management or urban development strategies. Nevertheless, we can observe a convergence in the discursive as well as in the material relations that are built in this mode of infrastructuring. As we have seen, the arguments around greening refer not just to the novelty and sustainability of such approaches, but also to its cost-effectiveness and its potential for enhancing self-regulation – arguments that resonate well with the economic policies of all three countries over recent years. At the same time, new material relations are established from coastal protection to other dimensions of water management, to settlement patterns off the coast, and to new areas of valorization along the coast, be it just as public recreation areas, as high-end housing sites, or as elements of city branding.

### 3.3 Valorization of waterfronts

In recent years, many coastal cities around the globe have turned their attention towards (re)developing their urban waterfronts. Technological and procedural advances in port operations since the 1970s have liberated (and devalued) spaces in many port cities, leading to increased opportunities for the revalua-

tion and renewed valorization of waterfront spaces (*Malone* 1996; *Hoyle* 2000; *Desfor* and *Laidley* 2011). Not being limited to former port areas, this trend has also been part of the infrastructuring of coastal fringes in SE Asian megacities. The basic design visions and technologies that are proposed from (and to) those cities share conspicuous similarities: the imaginaries mobilized by planners, developers, consultants, and city officials promise high-end city quarters to be built from scratch, often featuring ideas from smart and or green city discourses, in which different functions (high-end living, commercial uses, tourist attractions) are combined. The 'double exposure' (*O'Brien* and *Leichenko* 2000) of cities to processes of (neoliberal) economic globalization and climate change then offer the perfect breeding ground for adaptation projects that are connected to varying forms of economic valorization. In Jakarta and Manila, following the developments Singapore has been exemplifying since the early 1960s, those projects involve the creation of new land from the sea through large-scale dredging and reclamation activities; this can be seen as a very basic, first order infrastructuring, whose critical side effects in terms of regional geopolitics (cf. *Sparke* et al. 2004) and impacts on livelihoods and ecosystems (cf. *Lamb* et al. 2019) have been described extensively. Jakarta city governments, for example, have considered large-scale re-developments of urban coastal areas in Northern Jakarta since the early 1990s, including constructions on reclaimed land, a potential solution for a number of problems of the city, like uncontrolled urban sprawl, shortage of housing and, more general, increasing scarcity of land (cf. *Kusno* 2000; *Silver* 2018). The latest mega-project, the NCICD master plan, shows an ambitious attempt to combine the aim of adapting the coastal areas of Jakarta to climate change and sea level rise, and at the same time contributing substantially to developing the city into a world city: "As an 'integrated' coastal defence and urban development project, the [NCICD, the authors] 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" (*Colven* 2017: 257f., emphasis in original).

At the same time, the plans are also appealing to external investors that can potentially participate in (and profit from) settling an ongoing crisis of relative



sea level rise in ways that others have called ‘disaster capitalism’ (Octavianti and Charles 2018). Similarly, recent plans for Manila Bay include the development of a 400-hectare mixed-use area on a reclaimed island that will largely contain commercial spaces and tourist attractions (Aberia 2017). Built upon a Memorandum of Understanding between the Philippine’s Reclamation Authority and the UAA Kinming Group Development Corporation, the master plan foresees an archipelagic ‘City within the City’ whose design is largely following a Smart City philosophy and includes vast opportunities for high-end waterfront developments (cf. Fig. 1). On the official website, the development for the ‘City of Pearl’ is praised for its ‘value maximization approach’ that places special emphasis on unobstructed seafront views from locations on the newly-built island. The question of safety from environmental hazards, specifically rising sea levels, and of coastal protection is left unaddressed (cf. UAA Kinming Group, no date).



Fig. 1 Urban design vision for Manila’s ‘City of Pearl’. Source: illustration by Ho & Partners Architects Engineers & Development Consultants Limited (with kind permission of Ho & Partners)

An important second similarity between the region’s waterfront valorization projects is the way in which city governments, in alliance with international consultants, venture capital companies and dredging enterprises, have been proposing new forms of organizing such large-scale coastal (re)developments in financial terms. As an outstanding feature of the NCICD planning, the consortium has been proposing to refinance the investments needed for protecting both, the current coastline in the first phase of the project and the larger structures through the multi-functional sea wall in the second phase, through revenues

from selling reclaimed land and from toll roads and port operations (Bakker et al. 2017). At closer look, it also gets clear that the NCICD, in line with other examples in the region, is not (only) a story of successful mutual learning and altruistic technology transfer, but the outcome of “economic diplomacy in service of enhancing the market share for the Dutch Water sector” (Thompson 2018: 162). The political economy of coastal futuring exercises is thereby connected to a global ‘consultocracy’ (McCann 2011) of international experts that propose their ideas, softwares and blueprints to city governments in the region, as for example in different joint ventures of Singaporean state agencies with European-based consultancies:

“It’s quite relevant for us to think about mobility. If I’m blunt, we’re very interested that the ideas we’ve developed are propagated to other cities and other regions because that means that we can sell” (interview J.H. 2017, international consultant, Singapore).

At the same time, the objections to those large-scale planning processes (here at the example of Manila) and especially the involved reclamation activities are telling and show the strong linkages to relocation and displacement as depicted above: “[T]housands of fisherfolk and coastal people have been ejected from different coasts of Manila Bay because of reclamation projects paving the way for commercial and business infrastructures at the expense of lives and livelihood of the fisherfolk” (Pamalakaya 2017: s.p.) In light of the high investments and the focus on revenues for city governments, it is not surprising that valorization of coastal spaces is often in direct conflict with the livelihoods and living spaces of less affluent parts of the urban society.

#### 4. Conclusion: Infrastructuring coastal futures

All three trends in coastal adaptation of SE Asian megacities show that adaptation projects cannot be reduced to the material infrastructural outcomes that are put in place for the well-defined purpose of protecting the coastal fringes of these cities. Rather, the dominant, seemingly outdated, capital-intensive and highly technocratic projects that are carried out in the cities of Manila, Jakarta and Singapore, are part of larger efforts of re-evaluating urban coasts and waterfronts. These efforts and the ensuing material constellations are contested. They can serve as entry

points for an enhancement of existing mechanisms of control, for a re-branding of city images in the age of smart and green cities, as well as for timely solutions for creating new housing or business districts on newly developed land. At the same time, the genesis of those projects shows the deep interweaving of policy development in existing and transforming cultures and pathways of coastal adaptation, that are heavily influenced by institutionalized routines and expectations with regard to the shape and function of protective measures. In the cases we have studied, the new infrastructure projects are also instrumental in opening up various other sectors of urban development for external influences and different types of public-private partnerships.

Studying those materialized outcomes of the context-specific politics of infrastructuring then is also about tracing “how technical devices are assembled and re-assembled in relation to particular ethical regimes and political projects” (Schnitzler 2013: 672). At the same time, the materialization of those decision-making processes in the form of sea walls, levees, polders or revetments itself entails an infrastructuring of social and political futures in those coastal cities. Thus, the analysis how coastal adaptation projects are rooted in persistent regimes of established engineering paradigms leads us to a focus on infrastructuring, i.e. the pre-structuring of future coastal economic and social trajectories. This infrastructuring entails both, the direct effects of material infrastructures on place-making processes in urban coastal settings, as well as the broader currents of urban governance that infrastructure decisions promote. Infrastructures preconfigure the practices of tomorrow, not just the more or less safe operating spaces along the coast, the spaces of surveillance and flooding, but also the toll roads we will pay and take (or not), the housing rents, the needs of maintenance and repair, etc., and finally the opportunities for democratic access and control of further developments.

The three trajectories of infrastructuring that we have discussed can be understood as socio-technical configurations that embody social and political choices (cf. Niewöhner 2015). They relate issues of coastal protection to securitized forms of exclusion and relocation, and to neoliberal forms of state retreat. By favoring certain interests and prioritizing financially rewarding solutions, locally developed, situated ways of dealing with coastal risks are marginalized, and coastal dwellers are displaced from their settlements.

Based on such experiences, *Yarina* (2018: s.p.) argues that in many instances, “the rhetoric of climate adaptation is doublespeak for the displacement of poor, informal communities, and an alibi for unsustainable growth.” In focusing on the trajectories and entanglements of infrastructuring, we can get a new view on the issue of climate justice, and the multiple social and political effects of infrastructures on coastal futures.

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