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Urban megaprojects and water justice in Southeast Asia: Between global economies and community transitions
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Urban Megaprojects and Water Justice in Southeast Asia: Between Global Economies and Community Transitions

1. Introduction

Urban megaprojects continue to proliferate around the globe, with 8% of global GDP invested in this mode of development (Flyvbjerg, 2014). Within Southeast Asia, the amount of investment varies from 3% to 14% within national budgets (Asian Development Bank, 2017) and urban megaprojects have been a key mode of development since the 1980s (Judd et al., 2007, p.152). These urban initiatives involve billion-dollar investments that are mandated and often financed by governments but most commonly managed by private sector developers or public-private partnerships (Flyvbjerg, 2014; Moulaert et al.,2003; Shatkin, 2011).

Urban megaproject development is diverse but nevertheless shares some common characteristics (Kennedy 2015), including being designed and modelled based on previous projects (Percival & Waley, 2012); usually developed by architects, financiers, engineers, and planners experienced in working on other urban megaprojects (Santamaría, 2013); often developed based on international strategies; targeted as a potential market to foreign companies and individuals for renting or purchasing (Shatkin, 2008) ; and, finally, planned and built to form a global urban 'utopia' for the 21st century with extensive or high-rise buildings that promote a superlative urban imagery (Olds, 1995, 2011)

In Southeast Asia, urban megaprojects have emerged in a context of overall population growth, rural to urban migration and a shift to neoliberal modes of governance (Jones & Douglass, 2008). As Shatkin (2016) notes, the Asian urban boom has resulted in the rapid escalation of urban land values across the region. Many governments have sought to generate

revenue for government from land development or by distributing the profits of land development to powerful private-sector supporters (Shatkin, 2016). Although urban megaprojects rely on economic linkages with existing cities, in many cases they are fully self-contained developments, not only in terms of residential, commercial and industrial space, but also in terms of services such as schools and hospitals (Harms, 2019; Paling, 2012; Shatkin 2016, 2011). In this sense, urban megaprojects have not typically focused on solving existing urban issues but rather created urban enclaves for wealthier residents while dramatically displacing and disrupting existing economics and social relations (Datta & Shaban, 2016; Padawangi, 2019; Seto, 2011).

Entangled with these socio-economic transitions is the parallel radical transformation of the urban physical environment. Urban megaprojects have severe implications for environmental processes, including interruption of urban water flows and waste removal, biodiversity degradation, loss of arable landscapes, increased pollution and changes in riparian deposition and flood regimes. Most major cities in Southeast Asia are located in coastal or riparian environments (Douglass & Miller, 2018) and thus much of their populations are exposed to risks associated with extreme weather events such as floods, erosion, and sediment starvation (Arthurton, 1998; Daniere et al.2019; Douglass, 2010; Niemczynowicz, 1996). As Douglass and Miller (2018, p. 274) observe, “the pattern of rural to urban migration across Asia has led large populations to relocate to environmentally degraded slums and peri-urban areas that are unsafe for human settlement, such as landslide-prone hillsides and denuded riverbanks that experience seasonal flooding […] the vulnerability of slum residents is exacerbated by upstream environmental damage as well as by urban mega-projects that cover cityscapes with non-porous surfaces while further pushing low-income households into high disaster risk areas”. Thus, radical urban transitions have created new geographies of disaster hazards in the region (Miller & Douglass, 2015). This situation is predicted to worsen with the

compounding impacts of climate change (Douglass & Huang, 2007; Plummer et al. 2018a, 2018b; Robinson, 2011).

Water-related hazards, challenges and opportunities emerging from changing urban water geographies are unevenly experienced, with poor socio-economic urban residents disproportionately affected (Heynen et al.,2006; Ranganathan & Balazs, 2015). The outcome of today's changing urban waterscape can become an environmental injustice related to the redistribution of land and wealth both in the centre of cities and on their peripheries (Allen et al.,2017; Chu et al.,2018). According to the Global Water Partnership, a water-secure world "reduces poverty, advances education, and increases living standards" (Ait-Kadi & Arriens, 2012). There is thus a need for more effective strategies and mechanisms for addressing urban water dilemmas and ensuring the accountability of actors involved in the implementation of urban megaprojects. While new approaches for managing or governing urban water are available, they are often not adapted to protecting broader environmental community values and rights (Gleick & Cain, 2004; Melo Zurita et al., 2018).

Despite the recognition of the challenges associated with urban megaprojects (Harris, 2017; Othman & Ahmed, 2013) and water justice (Ernstson, 2013; Joshi, 2015; Zwarteveen & Boelens, 2014), thus far, there has been limited research on the water impacts and related environmental justice repercussions of urban mega-development projects. This lacuna, perhaps, is not happenstance, as the private sector-orientated development approach of urban megaprojects has meant that governance and details surrounding these projects, especially in their early stages, are either deliberately opaque or occur under minimal reporting requirements (Paling, 2012).

In this paper, we address this knowledge gap by developing a critical analysis of three urban megaprojects distributed across the Southeast Asian region (i.e. in Myanmar, Cambodia and Vietnam) and provide recommendations to hold future urban development accountable

against a range of human rights, environmental justice and sustainability measures. These findings and recommendations are relevant to cities situated in semi-aquatic, delta environments and sensitive water catchments around the world. They can guide cities, in the governance and shaping of urban megaprojects, to better engage with communities and their socio-ecological relationships with natural water systems. To inform our analysis and outline our approach, we draw on a critical literature review. We then use case study methodologies informed by available literature, current policy, field visits and earth observation technologies. The case studies are critically examined in terms of their environmental, economic, and social impacts. Finally, the case studies are discussed using the megaproject development cycle as recently defined by the UN Special Rapporteur on Water and Sanitation, Leo Heller (2019a). This paper advances work completed as part of Heller's 2018 expert consultancy process (Hawken et al., 2019). Broad impacts of the current study include a conceptual shift in the way ecosystem and local communities' values are mediated in relation to urban megaprojects. This shift has implications for implementing the various stages of the urban megaproject cycle, from the macroplanning, to licensing, design and visioning through to the short- and long-term management.

While our paper is focused on case studies in South-East Asia, its themes and findings are relevant more broadly for Global South urban dynamics. Similar urban megaproject development trends are occurring across other parts of Asia (Hanakata and Gasco 2018; Rizzo 2019, 2020) and Latin America (Coy 2006; Jones 2007, Strauch et al 2015), as well as an emerging boom of urban megaprojects in major cities across Africa (Watson 2014, 2020; Lawanson and Agunbiade 2018). Building on water justice scholarship, we show how an environmental justice lens offers a salient approach for questioning the current dynamics of urban megaprojects in the Global South. In highlighting the injustices of current approaches, with a specific focus on water issues, we conclude the paper by offering new perspectives on

how such projects should be conceived and implemented. In the current form, urban megaprojects have tended to be the antithesis of good urban planning, operating for example, in contrast to the sentiments of the United Nations (2017, p. 4) New Urban Agenda, which emphasis the need for forms of urban development that "Are participatory, promote civic engagement, engender a sense of belonging and ownership among all their inhabitants." If just and sustainable urban futures are to be realised in the Global South, a critical rethinking of the role of urban megaprojects is needed.

2. Theoretical Framework

In many ways, the rise of urban megaprojects is a symptom of what Graham and Marvin (2002) describe as "splintering urbanism", a disruption of the "modern infrastructure ideal" that initially dominated urban governance in the post-World War II era. During this period, a belief in comprehensive state-managed public infrastructure monopolies designed to achieve a "network city" in which every household was connected to relevant urban utilities (e.g. electricity, water and sewerage). Graham and Marvin (2002) argue this integrated ideal collapsed due to governance reforms occurring since the 1980s that created "secessionary networked spaces" and the removal of infrastructure from the public sphere of democratic governance. Consequently, urban elements such as roads, streets, walkways, open spaces, recreational facilities and parks have increasingly become privatised (Ho & Douglass, 2008, p. 205). The splintering urbanism trend thereby led to the demise of holistic urban planning strategies in favour of new spatial divisions and new urban governance processes shaped by flows of international capital and informal responses by poorer socio-economic groups (Sclar 2015).

While splintering urbanism is a recognisable global trend, it has been most acute in Global South cities (Gandy, 2004; Graham, 2010, Pieterse, 2011). As Lawhon et al (2018, p.723)

note, while the "modern infrastructure ideal" was a widely accepted social and political goal that sought to provide universal, uniform infrastructure in the Global South, "by the 1980s it was clear that budgets could no longer support this vision in part due to global economic trends and, more specifically, the forced adoption of structural adjustment programmes (i.e. loans provided by the International Monetary Fund and the World Bank to countries that experienced economic crises)". The integrated city became an unfinished project (Graham and Marvin 2001) that resulted in a varied and differentiated infrastructural history in Global South cities that now house a mix of internationally financed urban megaprojects, centrally planned infrastructures and small-scale infrastructures initiated locally (Gandy, 2005; Lawhon et al., 2018).

While the benefits of developing megaproject estates equipped with their own water supply, drainage and recreational and aesthetic systems may be a step towards a modernist integrated ideal, the patches of settlements surrounding megaprojects suffer from an increased fragmentation of water networks and systems (Graham & Marvin, 2002). Housing and urban ecological environs are displaced to make way for urban megaproject construction while labour from surrounding areas is drawn upon. This is evident in the three projects considered in this study and also in well-known projects throughout the Global South, such as the Yamuna Riverfront development in Delhi, where megaprojects are created as "zones of exceptions embedded in a calculated urban informality" (Follman 2015, p.213) . Therefore, questions of urban justice are a central concern that surround the emerging geography of urban megaprojects (Swyngedouw & Heynen, 2003).

Thus, while the "modern infrastructural ideal" remains a potent objective in Global South urban visions (Coutard and Rutherford 2015; Monstadt and Schramm 2017; Lawhon et al 2018; Munro 2020), in material praxis it has become a secessionary project; being implemented *within* urban projects, while excluding poorer socio-economic groups that

surround those same projects. With this fragmented (or splintered) implementation of urban development, critical questions of environmental justice arise (for whom, when and to what end?) (Miller et al 2020). As Miller (2020) notes environment justice considerations are relevant "to the equity of outcomes (distribution), and the fairness (procedure) and inclusiveness (recognition) of a process". Urban megaprojects, as we show in the paper, are problematic across all of these tenets - the goods and ills that result from the projects are unevenly *distributed* socio-economically, the *procedures* that govern their proposal and development are often opaque, and the visions are limited to (often transnational) elites, rather than local residents, whose voices shape the dynamics of the projects (i.e., problems with *recognition*).

The analytical focus for our paper is the environmental justice sub-field of "water justice" (Sultana et al., 2019). We are particularly concerned with how the distribution of water rights access and water-related decision-making is extremely biased within urban areas (Crow et al., 2018, Ernstson et al., 2013). Because of this imbalance, water-based livelihoods and rights in "the Global South are often threatened by bureaucratic administrations, market-driven policies, and top-down project intervention practices" (Boelens et al 2018, p. 1). The socio-ecological dynamics of urbanism in much of Southeast Asia make water (in)justice issues acute. The Bahasa Indonesian term *desakota* ("village-town") describes the dynamic migration between country and city and the formation of extended urban systems consisting of urban and rural villages and industrial systems linked through a dynamic seasonal economy (Kelly, 2007; McGee, 1989, 2007). The term *desakota* captures the two-fold process of splintered urbanisation; on the one hand the rise of urban villages for poorer groups and on the other the implementation of large industrial complexes and urban residential or recreational megaprojects for the middle classes. This intensive mixing of formal-informal and urban-rural economies has affected environmental management and

ecosystem service delivery, often leading to the degradation of vernacular socio-ecological systems (Gurnell, A et al 2008, Desakota Study, 2008). Research on the political ecology of these rapidly changing areas is limited (Cairns 2018; Hawken et al., 2014) despite the reliance of local populations on urban water ecosystems for wellbeing, livelihoods, food and water security (Hawken, 2017).

The monsoonal character of Southeast Asia presents further challenges for water access and quality. Despite rainfall being plentiful at certain times of the year, Southeast Asia's urban, agricultural, and industrial landscapes face intermittent water shortages (Datta & Shaban, 2016; Pink, 2016). Climate change is creating more variability and uncertainty within these landscapes plus interacting with the effects of urbanisation (Roth et al., 2019). Thus, a key issue in Southeast Asia is the close relationship between urban water supply and sanitation, climates, and ecosystems. Further, global neoliberalism has assured a shift from "government to governance" in relation to water, whereby actors beyond the state, most notably nondemocratic multilateral financial institutions, are increasingly involved in shaping water outcomes (Boelens et al 2018). Thus, questions of the equity of outcomes (water distribution), questions of procedural fairness (water governance) and inclusiveness (identified water rights and concerns) are a critical concern process" are of critical concern in Southeast Asian urban megaprojects.

This paper argues for a greater awareness of such water justice of urban megaproject development within the development community and a greater accountability for actors responsible for megaprojects and increased access to knowledge and information and reporting avenues for local actors affected by such projects. Heller (2019b) reports that accountability and human rights are about "balancing power in order to protect the most marginalised and those living in the most vulnerable situations." The citizens of Southeast Asian *desakota* landscapes require both specific and generic governance and political

198 mechanisms that bring water related rights and services to the fore. Such mechanisms can
199 help address the asymmetrical power balances and water injustices involved in the
200 implementation of megaprojects. While there is a burgeoning academic scholarship on
201 environmental and water justice, the frame is yet to be explicitly used to evaluate urban
202 megaprojects, and the language of justice is conspicuously absent to professional practice in
203 the urban megaproject sector. This paper**,** therefore**,** offers new vocabularies, epistemologies
204 and empirical data to add new critical dimensions to urban megaproject debates as well as
205 concluding with recommendations for practice and policy.

206 ## 3. Research Approach and Methods

207 This paper adopts a multiple case study approach which is useful to establish an in-depth, and
208 multi-faceted understanding of a complex problem (Crowe et al 2011). Our research design is
209 set out in figure 1. and involves a five-step process involving theory development and
210 contextualisation (1); Research design and selection of cases (2); preparation and collection
211 of case study information including documentation, archival records, direct observation, and
212 analysis of physical artifacts and processes (3); development of case study narratives and
213 reportage (4) and finally (5) the cross-case-study analysis, theory and policy development
214 using Heller's (2019) framework.

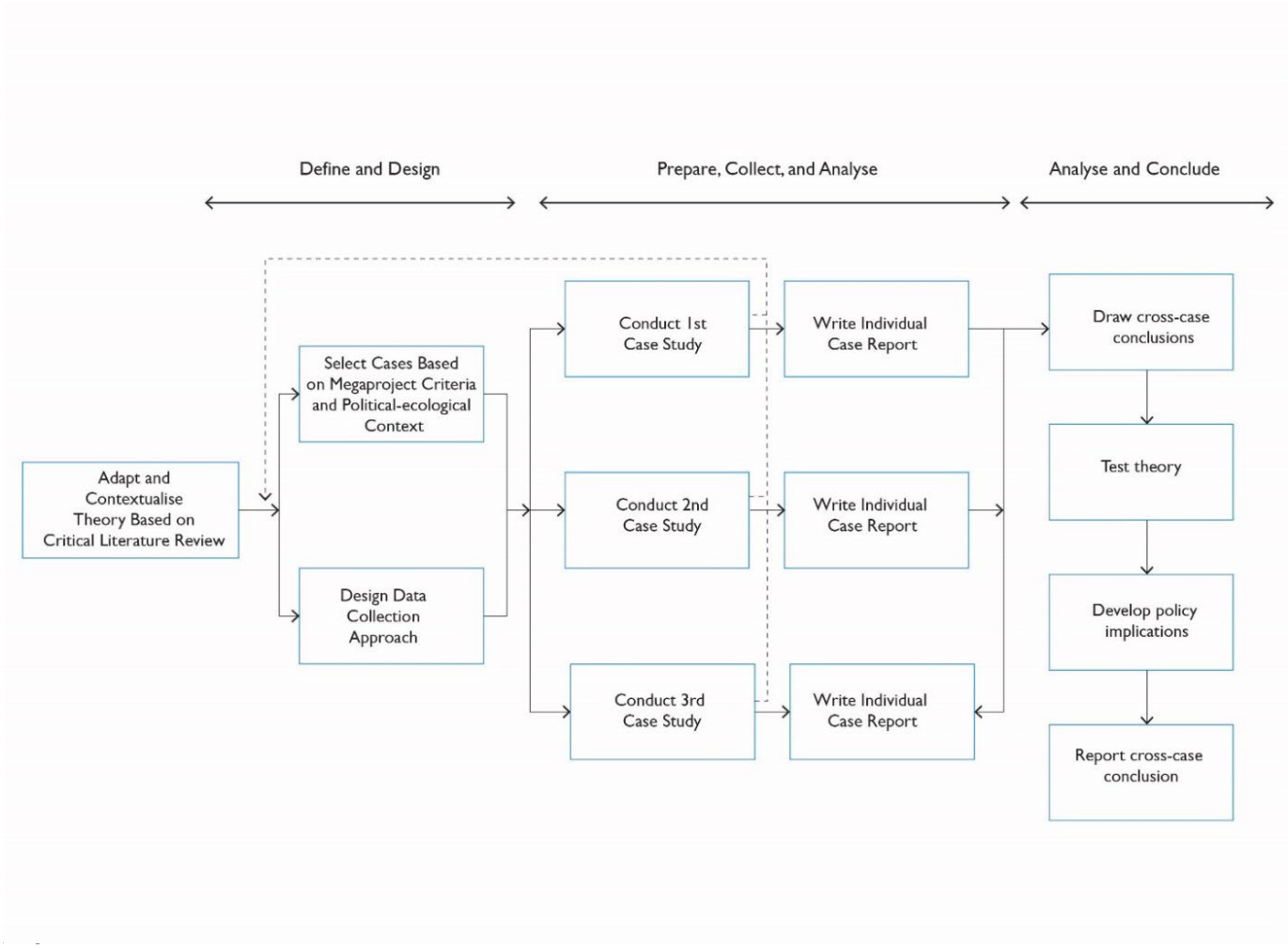

Figure 1. The research design used in this paper employing a multiple-case study approach. The workflow is adapted from Yin (2017).

In our adopted process each individual case becomes the focus of a whole case study and these were written-up in a summary report indicating how and why water and communities were affected by megaproject development. Following from focused, separate case studies, we assembled convergent evidence generated using an analytic framework (Heller 2019b) applied across all three case studies. Finally, we developed theoretical propositions and policy recommendations.

Although there are no shortages of urban megaprojects to evaluate, scholarly literature is currently limited to well-established projects that have generated controversy in the media and development communities (e.g. Phu My Hung and Boueng Kak Lake). Case studies were

selected based on two primary criteria – definition of urban megaprojects and political ecological contexts in rapidly urbanising, semi-aquatic environments of South East Asia (Figure 2). In making this selection we aimed to test the validity of the 'splintering urbanism' theory vis a vis urban water justice. Secondary criteria included the identification of case studies at different points in their development to understand how, when and why certain water-related human rights concerns arise (Meyer, 2001). Tertiary selection criteria include the availability of media coverage, scholarly literature review and archival GIS documentation on urban hydrology.

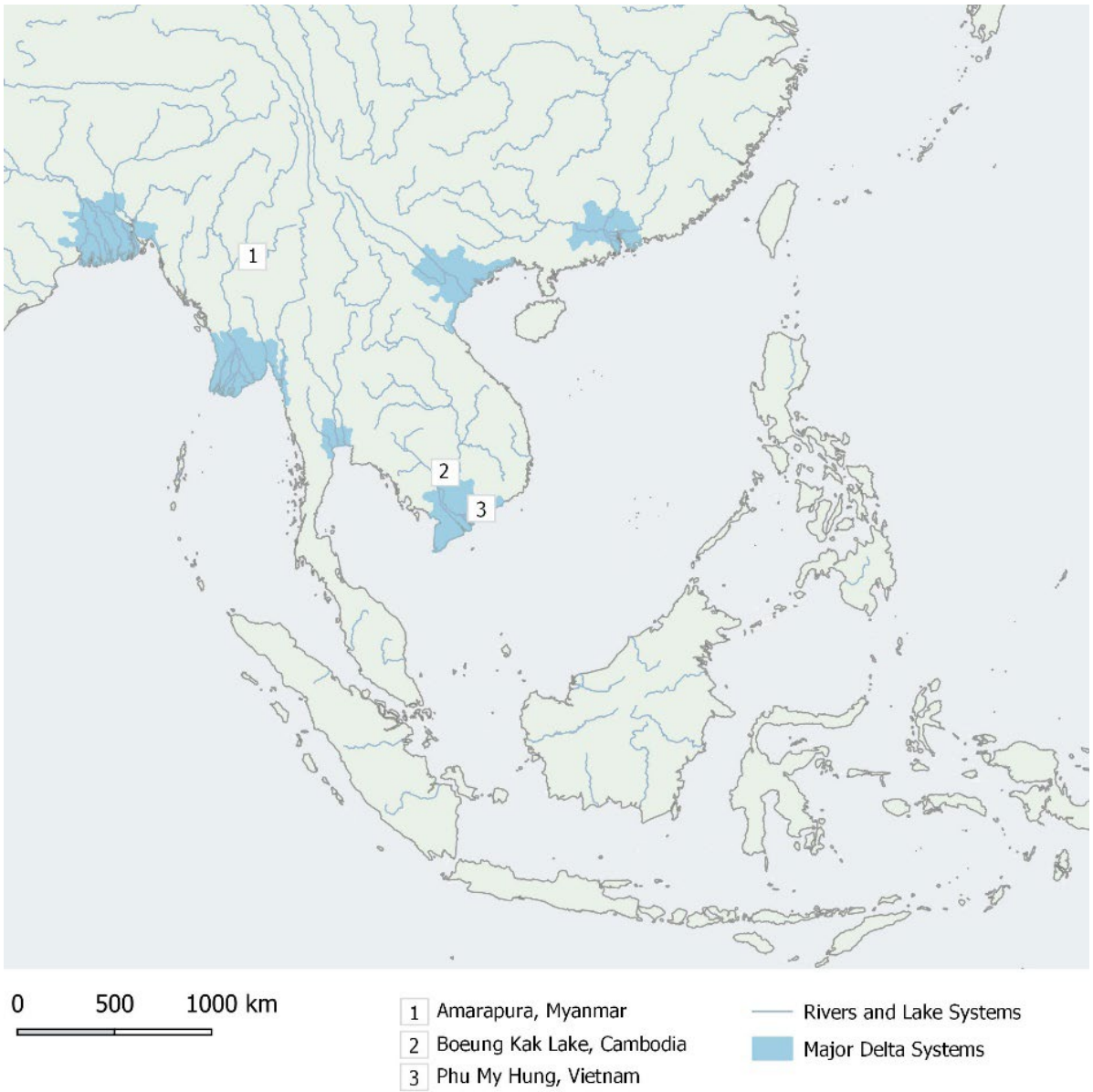

Figure 2. Geographical location of the three urban megaprojects investigated in Southeast Asia (Amarapura, Myanmar; Boeung Kak Lake, Cambodia; and Phu My Hung, Vietnam). Data source: Nature Earth. https://www.naturalearthdata.com.

To assemble data on the individual case studies we carried out a critical literature review using the major scholarly databases such as scopus and web of science along with a detailed review of local and international media outlets. This research was supplemented through spatial observations carried out using remote sensing and field visits. Available open data was used to map urban megaproject sites over time. A series of global datasets were used within a Geographical Information System and the Google Earth Engine (https://earthengine.google.com/). The temporal analysis of Pekel et al. (2016) was used and contextualised in relation to urban datasets accessed from Open Street Map (https://www.openstreetmap.org/). Pekel et al. (2016) generated their data from more than 3 million scenes from Landsat 5, 7, and 8 acquired between 16 March 1984 and 31 December 2018. Each pixel was classified as water or non-water using an expert system to create the Joint Research Centre's Global Surface Water Dataset (JRC Global Surface Water) (Pekel et al. 2016). Annual surface water layers were used along with the "transitions" layers from the JRC Global Surface Water Dataset, to identify lost "seasonal surface water" and lost "permanent surface water". The resulting visualisations provide insight into the current and future impacts of the three megaproject case studies (Figures 3-5).

The cross-case-study analysis was completed and discussed using Heller's (2019b) multi-stage cycle that characterises the impacts of megaprojects on water and sanitation-related human rights and breaks down critical themes and pressure points. The cycle includes: *macro-planning* (i.e. how megaprojects are integrated into national development agendas); *planning and designing* (i.e. defining the practical and technical aspects of megaprojects); *licensing and approval* (i.e. the validation of megaprojects by public authorities);

261 *construction* (i.e. building megaprojects); *short-term operation* (i.e. operation and monitoring
262 when projects start to fulfil their purpose); and *long-term operation* (i.e. socio-economic and
263 ecological outcomes).

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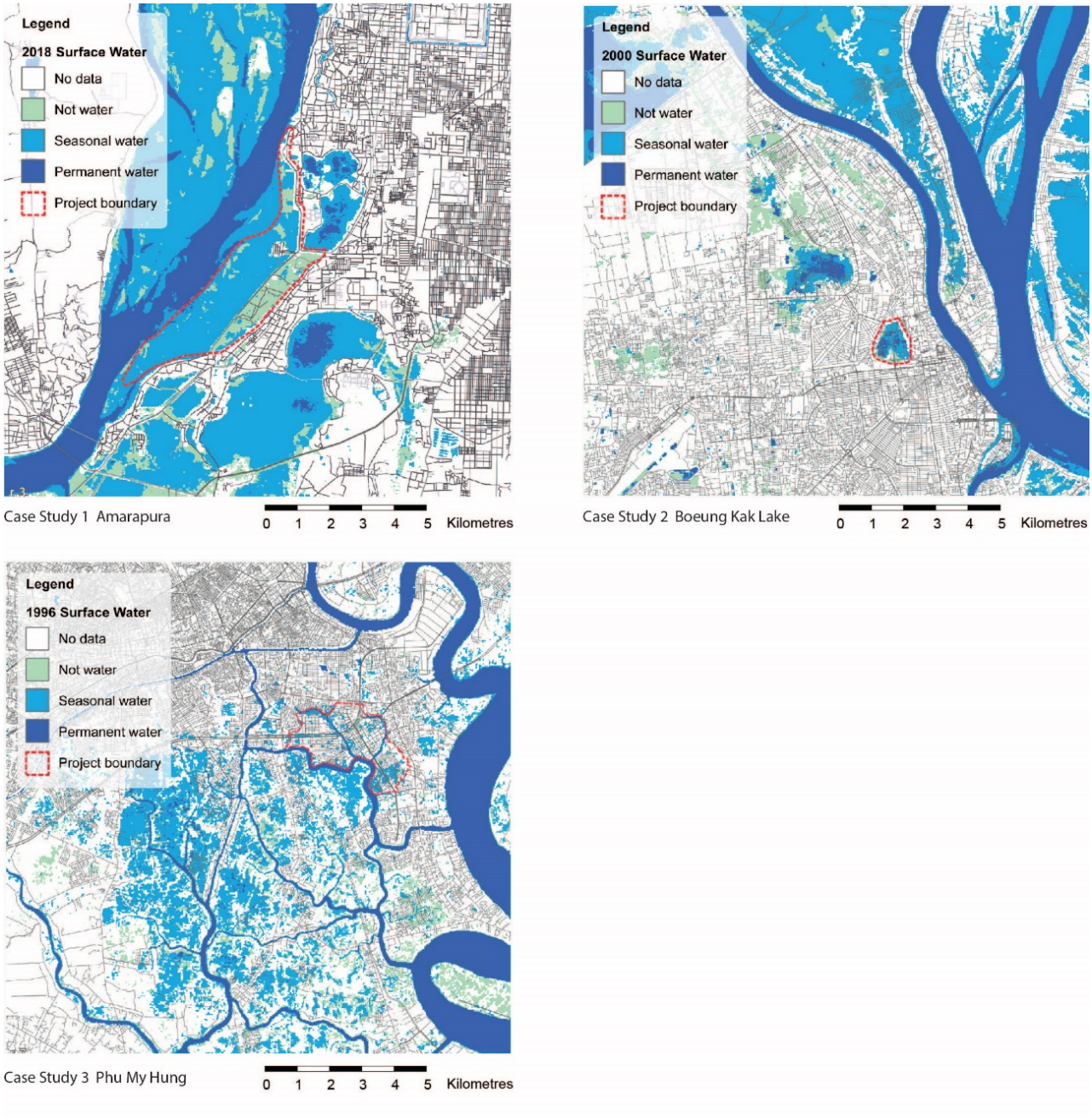

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266 **Figure 3. Permanent and seasonal surface waters prior to urban megaproject**
267 **development in Amarapura (Myanmar), Boeung Kak Lake (Cambodia) and Phu My**

Hung (Vietnam). The megaproject site boundaries are outlined with a dashed red line. (Data sources: Open Street Map and the JRC Global Surface Water Dataset.).

4. Case Study Results

4.1 Case Study 1: Amarapura Urban Development Project, Mandalay, Myanmar

The first of the case studies is the Amarapura urban development project which is an 809-ha mixed-use megaproject for Shankalay Kyun Island on the Irrawaddy River, planned as an urban extension of the city of Mandalay, the second largest city in Myanmar. The project fits within the national development agenda of Myanmar and is being delivered as a public-private partnership by Mandalay Business Capital City Development Ltd. (MBCCD) and the Mandalay City Development Committee (MCDC), an administrative body of the city of Mandalay with city planning, land administration, tax collection, and urban development responsibilities.

The project was launched in 2016 and is reported to involve investments of US$375 million; the memorandum of understanding between MBCCD and MCDC reports a split of 75% for the private sector and 25% public (Ko, 2017). The megaproject will involve the transformation of agricultural and village landscapes into a mixed-use urban centre and a new port to increase shipping capacity on the Irrawaddy River. The development is proposed to contain apartment buildings, shopping centres, hotels, hospitals, schools, gardens and jetties (EJOLT, 2019). The 2016 master plan prepared by a local urban planning consultancy claims the project will create an “environmentally friendly system for the first time in Mandalay” (Spiral Architects & Planners, 2016). The urban planning, design and environmental strategies that might achieve this target are not specified.

The first 8-ha phase of the development was initiated in 2017 by MBCCD and is to include apartments, retail, private and government offices and schools. This phase is continuing despite resistance from locals and environmentalists who argue experts have advised MBCCD the project would significantly affect river flow during the monsoon season, resulting in potential increased flooding of nearby areas (Mann, 2017). The development is located within the Irrawaddy River floodplain, presenting serious environmental risks with direct implications for sanitation and water supply for existing and proposed settlements (Mann, 2017).

To protect the new development from flooding during the monsoon season, as well as to provide a stable foundation for the buildings, 6 m of fill is planned to be deposited across the semi-aquatic island; this process has already started (pink area in Figure 4). Many environmentalists argue this large-scale land reclamation in an alluvial flood plain will reduce the ability of the river system to cope with seasonal flooding by increasing the strength of the current during the monsoon season, resulting in the flooding of neighbouring lakes and creeks as well as riverbank locations downstream (Mann, 2017). Furthermore, high-cost engineering-based interventions for flood management in this area are delivered without reference to existing low-cost, community-based strategies, undermining those in turn (Reeder, 2019).

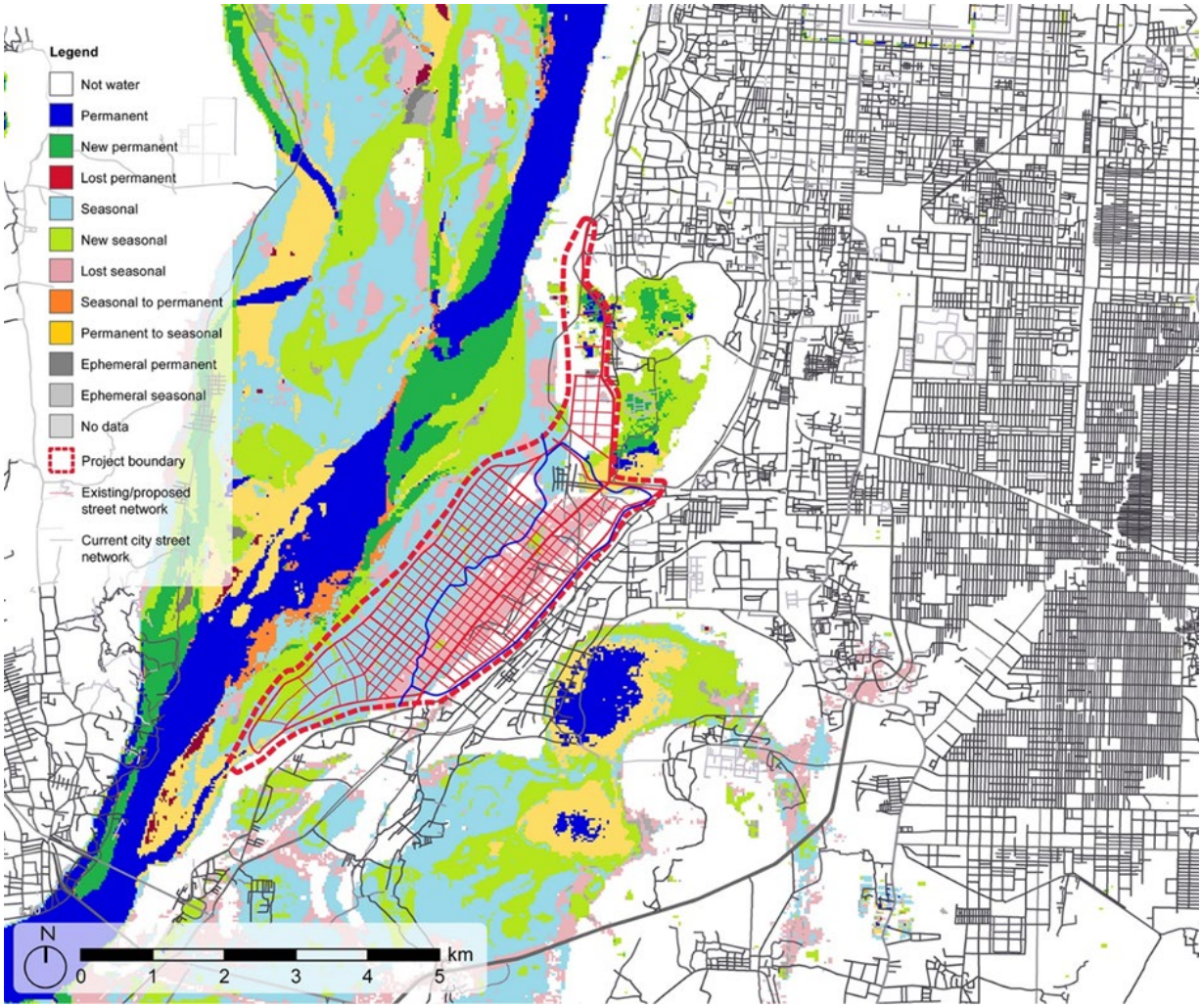

Figure 4. Lost seasonal surface waters (pink) and current seasonal surface waters (light blue) that will be lost should the Amarapura urban development project (Mandalay, Myanmar) be built. The project footprint is indicated with the red dotted line (Data sources: Open Street Map and the JRC Global Surface Water Dataset.)

MBCCD submitted a social and environmental impact report to the government but this report is not publicly available. A new large-scale urban extension has the potential to exacerbate existing and create new water-based conflicts and risks. Based on past experiences, local groups are not confident these risks will be taken into consideration in the planning and delivery phases (Mann, 2017). Previous river dredging and construction along

the river has increased erosion as well as narrowed the river (Grzybowski, Lenczewski, & Oo, 2019; Pink, 2016).

The project proposes to create ~10,000 jobs (Ko, 2017) but is likely to disrupt current livelihoods. As with most villages in Myanmar, the economic bases of urban villages on Shankalay Khun Island are fishing and agriculture (Ko, 2017). Villages are to be removed from Shankalay Khun Island to make way for the development. The villagers have been opposing the proposed compensation and the project in general. According to the Environmental Justice Atlas, some local conflict and resistance is present (EJOLT, 2019).

As part of a larger plan to modernise Mandalay, the new port is intended to become the primary shipping facility on the Irrawaddy River. Construction is due to commence in 2019 with a completion timeframe of 10 years under financing from the Japan International Cooperation Agency (Yin, 2008). This capturing of foreign investment for shipping infrastructure underscores the belief that economic growth can be driven by large-scale, export-oriented industrialisation (Athukorala & Waglé, 2011). Under this industrialisation, sources of local livelihoods may shift from traditional fishing and agricultural practices to port-related jobs. However, how this transition will occur is not described in the project documentation. The 2016 master plan claims the development will "lift the inhabitant's living standards to the required international level" (Spiral Architects & Planners, 2016). This international narrative is typical of mixed-use megaprojects around the world and is received with uncertainty by locals. Often, the promise of wealth generation via megaprojects, while clearly benefiting project proponents, does not materialise for local communities in the global south (Siemiatycki, 2013; Turok, 1992). This can be seen in Muang Thong Thani in Thailand and Lippo Karawaci in Indonesia, which are vast urban projects created for the middle class but that exclude lower socio-economic classes (Shatkin 2008).

MBCCD have promised to return land and homes to villagers on completion of the project. They claim to have offered residents 1–6 million Kyats (US$660–3,965) for each 100-$m^2$ land parcel. The local population is apprehensive about this offer (Mann, 2017). Many would prefer to remain in their village and are worried about being forcibly removed, arguing there have been examples of similar projects in Myanmar where villagers did not receive compensation following displacement (Mann, 2017). Government trust remains a significant challenge in Myanmar. The General Administration Department under the Ministry of Home Affairs is still controlled by the military and is widely perceived to be corrupt and involved in land grabs (Reeder, 2019). It is unclear how the developer will be held accountable for their promises of returned land and homes.

4.2 Case Study 2: Boeung Kak Lake development, Phnom Penh, Cambodia

Boeung Kak Lake urban megaproject, now known as Phnom Penh City Centre, is a 133-ha development situated in the north of Phnom Penh's original colonial district (Kry, 2014). The development's website suggests it will "transform Phnom Penh's city landscape into a modern, sustainable commercial hub with facilities purpose-built for both local and overseas businesses and investors" (PPCC 2019). The joint venture involves Shukaku Inc., a private Phnom Penh-based real estate developer headed by Senator Lao Meng Khin of Cambodia's People Party (with a 51% stake), and the Singapore developer Kingsland Ventures (with a 49% stake) (The Urban Developer, 2017). The value of the project is unknown although the land was leased by the government to private developer Shukaku Inc. for the token sum of US$97 million in 2008 (Baliga & Chakrya, 2017). Alternative estimates suggest the site was worth 25 times the asking price, ~US$2.5 billion based on calculations from land value rates (Vireak, 2019). Few local residents are likely to live in the project. New developments of condos in Phnom Penh, are almost exclusively bought up by the Cambodian upper class and Chinese tourists and businessmen (Ea, 2018). The development economics are not

transparent. Despite the land being purchased very cheaply, a prominent local architect, Van Molyvann, suggested that the high establishment costs involved in filling the lake would be uneconomical (Welsh, 2008).

Throughout the 20th century, large wetland systems remained within Phnom Penh's inner-city and periphery. The wetlands are the legacy of a colonial vision that transformed the vernacular wetland city into a modern and dry colonial city based on principles of European planning envisioned by the French town planner, Ernest Hebard, who was also responsible for the planning of Saigon (Ho Chi Minh City). The late 19th- and early 20th-century colonial plans were constructed on the semi-aquatic landscapes of the Mekong Delta, styled in the image of European capitals (Wright, 1987, 1991). During this time, Boeung Kak Lake was formally closed off from the dynamic river elbows and channels of the Tonle Sap River. A park was laid out on the shores of the urban lake according to the aesthetics of the day (Nam, 2011).

Within Phnom Penh and throughout Cambodia, large-scale settlements have usually been built along levees or dykes where they could be protected from floodwaters in the low-lying monsoon landscape (Delvert 1994). However, in the colonial period, Phnom Penh's vernacular system of ponds and canals was transformed to accommodate the urban vision of European blocks and streets. A system of successive dykes was built on the wetland and backfilled to provide a dry platform. The system was severely damaged in the 1970s when the capital was evacuated by the Khmer Rouge and became more vulnerable to flooding (Mialhe et al., 2019; Pierdet, 2012; Schneider, 2011). In the 1980s and 1990s, the aquatic landscape of Boeng Kak Lake landscape served as a transitional space between the countryside and the city for rural migrants and returning refugees. Due to the urban context of the lake and damaged hydraulic systems, water pollution created health risks for this vulnerable population (Pierdet, 2012, p. 270). In the 2000s, as development speculation

gained pace, Phnom Penh aspired to attract global capital. Beautification schemes for the city involved a parkland vision for the lake, with echoes of Hebard's early 20th-century designs. This vision was short-lived and public land was leased privately in 2008 for a development that initially involved minimising surface water and infilling with sand dredged from the Tonle Sap and Mekong Rivers . The developers commenced dredging without environmental impact assessments on the two rivers (Anderson, 2017).

The drainage and hydrological systems of Phnom Penh have been dramatically transformed by megaprojects and urban development in the last few decades. Between 1900 and 2015, 6,000 ha of aquatic environments have been converted to urban development projects (Mialhe et al., 2019, p. 9). The pumping of sand and sediment to infill Boeung Kak Lake submerged existing lakeside homes in mud in dramatic scenes captured by media around the world (The Economist, 2009; Anderson, 2017; Jackson, 2017; Baliga & Chakrya, 2017; Phnom Penh Post, 2008).

The infilling of Boeng Kok and the many wetlands within and fringing Phnom Penh have damaged three important socio-ecological functions. First, the infilling has destroyed the homes of urban villagers, who form the majority of Phnom Penh's population (World Food Program, 2019). Second, the infilling has destroyed sources of sustenance and sanitation for urban villagers including fishing, harvesting vegetables and bathing. Finally, it has exacerbated existing waste-disposal and drainage challenges for Phnom Penh (Eco-Business, 2019; Kum, Sharp, & Harnpornchai, 2005) as Phnom Penh relies on its low-lying wetlands to regulate flood waters and process waste. With Boeung Kak and so many lakes now gone, the city is frequently inundated by polluted flash floods (Jackson, 2017; South China Morning Post, 2019). Although the immediate and drastic effect on Phnom Penh's vulnerable population is clear, the long-term ecological consequences of the megaproject are not well understood (Mialhe et al., 2019; Pierdet, 2012).

Human-rights agencies have described the Boeung Kak Lake project as the single largest urban displacement in Cambodia since the forced evacuation of Phnom Penh in 1975 (Inclusive Development International, 2016). The project has displaced 4,000 households to relocate to the periphery of the city, far from their traditional sources of income. Residents have not been compensated adequately despite many households having demonstrated their legal rights to the land. The Boeung Kak community was excluded from the titling system when land was formalised in 2006. The Cambodian Government then granted a lease to Shukaku Inc. with the 4,000 households classified as illegal squatters on state-owned land (Inclusive Development International, 2016).

The World Bank's social safeguards have an established process for the resettlement and compensation of people residing on state land. This process, known as the Resettlement Policy Framework, was circumvented (Inclusive Development International, 2016; Springer, 2015). Within Cambodia, lakes and wetlands are state land so a reclassification is necessary to develop them. Foreign investors often use local elites as fronts for this legal process (MacInnes, 2015; Witness, 2016). The typical outcome is large projects that address commercial real-estate imperatives and bypass the needs of the urban poor (Springer, 2015).

Recourse to mediation by the residents has occurred through a range of methods, including petitions to global organisations such as the World Bank. This has awarded them some concessions, with new loans to Cambodia frozen in 2011 due to global media attention on this human-rights scandal. In 2016, the moratorium was lifted and funding for megaprojects resumed (Pye, 2016).

4.3 Case Study 3: Phu My Hung, Ho Chi Minh City, Vietnam

The Phu My Hung urban megaproject is situated along the Saigon River in the periphery of Ho Chi Minh City and contains a range of residential, commercial, recreation and business

facilities (Douglass & Huang, 2007; Huynh, 2015). The megaproject is part of a larger vision to expand the city to the south constituting one section of a larger development plan called Saigon South (Harms, 2016; Huynh, 2015). The project has been developed by the Phu My Hung Corporation, a joint venture between the Taiwanese Central Trading & Development Group (contributing 70% legal capital) and the Vietnamese Tan Thuan Industrial Promotion Corporation (contributing 30% legal capital) (Waibel, 2004). The project commenced in May 1993, the same year that Vietnam's revised 1992 Land Law went into effect, allowing for new forms of land transfer and ultimately leading to a wildly profitable real estate market (Harms, 2016). Given the price of its residential offerings, Phu My Hung is built for elites and its target market is alluded to within its Sino-Vietnamese name that translates to "wealthy" (*Phú*), "beautiful" (*Mỹ*) and "prosperous" (*Hưng*) (Harms, 2016). The project is in the short-term operation phase as defined by Heller (2019b).

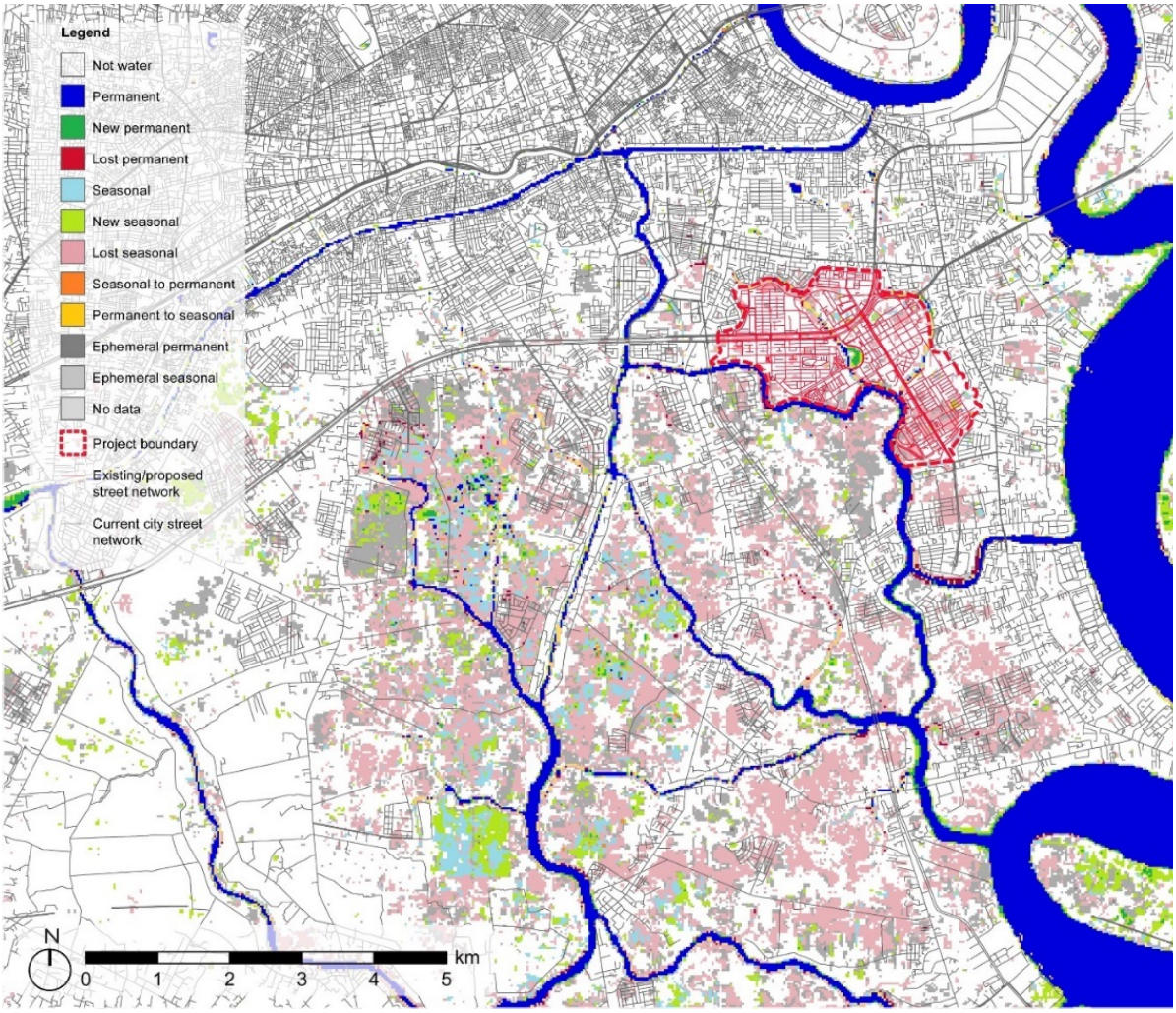

Figure 5. Phu My Hung, Ho Chi Minh City, Vietnam. The lost seasonal wetlands within and surrounding Phu My Hung are apparent in this figure and highlighted in pink within the legend. Megaprojects such as Phu My Hung displace vernacular ecosystems within their boundaries stimulating informal development surrounding the megaprojects. Such landscapes often house the construction workers who build and maintain the middle class megaprojects in a classic desakota pattern.

454 The development was constructed on wetland environments of interlacing rivers and canals
455 (Douglass & Huang, 2007). The development filled in the canals and the seasonal wetland
456 systems while maintaining a central canal and ornamental lake (Figure 5). The canal is an
457 economic asset for advertising and selling waterfront properties (Duy et al. 2013). Beyond

458 the celebrated “before and after” narrative (Harms, 2016), there are many concerns associated
459 with the radical transformation of the area. As Douglass and Huang (2007, p. 27) note, “the
460 longer term ecological impacts of building a massive city on swampland have not been
461 assessed.” A recent opinion piece in *Mekong Eye* summed up this quandary: “They’ve
462 allowed development to be led by investors seeking to profit from cheap, low-lying land that
463 instead should be left open for flood reserves. They’ve been remiss in maintaining and
464 expanding the city’s drainage infrastructure and even allowed development to fill in existing
465 canals” (Quynh, 2018).

466 The Phy Mu Hung District was already at high risk of flooding owing to its low-lying
467 topography (Duy et al. 2018). The infilling of swamplands to make way for development has
468 only exacerbated the situation (Duy et al., 2017; Huynh, 2015). The development is thus
469 considered to be “both the culprit and bearer of [the flooding] problem” (Huynh, 2015, p.
470 133). The Phu My Hung development acts as a barrier to the efficient drainage of the more
471 established parts of the city and further rapid urban expansion and climate change are
472 projected to accelerate the flooding problem for Ho Chi Minh City as a whole (Bangalore et
473 al. 2019; Duy et al., 2017; Lasage et al. 2014; Leitold & Diez, 2019).

474 The Phu My Hung development is a quintessential example of privatisation of public space
475 and governance. Day-to-day governance is administered by the Phu My Hung Customer
476 Service Center (CSC). The CSC is the one-stop-shop to help residents deal with “problems
477 that happen in the neighbourhood such as electricity or water interruption, disturbing noise,
478 security-related events” (Le & Le, 2018). The space is policed by a 600-strong private urban
479 force (Kim, 2016). Residents have more interactions with private corporate management that
480 they do with government authorities (Le & Le, 2018). Corporate management is not only
481 focused on internal governance but also exclusion. As Douglass and Huang (2007, p. 23)
482 note, “Managed by a corporate entity with state support, one of [the] principal intentions of

PMH [Phu My Hung] is to keep the teeming city of eight million people — most of whom are classified as low-income — held back by hired guards, surveillance, gates within gates and all manner of rules about what residents can and cannot do." This exclusion approach is problematic on a number of levels. For one, the narrative that the development emerged from an empty "wasteland" or "swampland" is a false one. The development ultimately relied on displacing "cash-poor but culturally rich" urban agricultural communities (Harms, 2016). The outskirts of Phu My Hung have also been transformed from a rural to urban landscape with an influx of thousands of residents into its surrounds over the past few years.

5. Discussion: Linking Water Related Human Rights to the Urban Megaproject Development Cycle

Urban megaprojects are global infrastructures that reconfigure local environments as products suited for global capitalist investment (Sassen, 2018a, 2018b) but true project costs are concealed behind promotional visions (Flyvbjerg, 2014; Hirschman et al., 2015). The three Southeast Asian cases examined here all demonstrate the theory of splintering urbanism as put forward by Graham and Marvin (2002) whereby projects network global elites while isolating local communities through environmental degradation and exclusion from resources (Wiig & Silver, 2019).

Across all three projects, it is apparent that water features as an abstract infrastructure or obstacle: providing global export opportunities for the port of the future Amarapura development; a "vacant" open space for a high-rise development in Boeung Kak; and an aestheticized middle-class backdrop to condominiums for Phu My Hung. The present functions of the water systems on the sites are not considered and neither are cross-boundary impacts on surrounding areas (Table 1). Project impacts occur at multiple spatial and temporal scales and it is therefore essential that project stakeholders and observers are

507 engaged with the human and environmental costs of all phases of these projects (Table 1).
508 Although spectacular and tragic moments have captured the attention of the global media, a
509 working knowledge of such case studies is essential if future urban megaprojects are to be
510 implemented to generate prosperity and wellbeing for local communities. This long-term
511 perspective is joined by an equally expansive spatial dimension. As is evident from the three
512 case studies, urban megaprojects are a particularly severe form of "self-induced shock",
513 transforming river systems, displacing communities and causing wide-ranging hydrological
514 repercussions through flooding, degradation of sanitary conditions in local wetlands, reduced
515 biodiversity and increased pollution loads on fragile ecological systems (Douglass 2007.
516 2010). Urban megaprojects can be understood to be symptomatic of broader structural and
517 political issues of urban development, such as opaque international financial flows, neoliberal
518 policy agendas, and splintered urban process. We nevertheless offer potential alternatives for
519 these projects to better integrated into broader sustainable and just city visions, avoiding the
520 segregation, exclusive splintering and mass displacement that often characterises their
521 implementation. We also emphasise that large community-based initiatives do exist in
522 relation to megaprojects, even at the scale of whole river and delta systems (Bruijn et al
523 2015). Whether these can be viewed as 'next generation' megaprojects, or, 'alternative modes
524 of development', is worthy of further research (Bornstein 2010).
525

526 **Table 1**. Analysis of megaproject stages for the three Southeast Asian case studies according to Heller's (2019a) typology, including: description

527 of each stage, potential limitations, impacts on water security, strategies for improving water security, and proposed accountabilities measures.

Megaproject stage	Stage characteristics and potential limitations	Impacts on water security	Strategies for improving water security	Accountability measures based on Heller (2019a) and Othman and Ahmed (2013)
Macroplanning	–Integration of megaprojects in the national development agenda –Determination of the legal and policy frameworks applicable to megaprojects –Limited stakeholder involvement	–Water and human rights agendas are typically not part of the urban national development agenda –Inadequate communication with and coordination and inclusion of community stakeholders	–Valuing water, social and ecological targets in initial project costing and feasibility analysis –Development of clear economic, sustainability and social targets –Broader consultation process –Selection of financial instruments that value water security –Consideration of alternatives to megaprojects –SDGS and NUA to be used as visioning tools to generate new multi-dimensional value.	–Use of Sustainable Development Goals as a guiding framework for megaprojects (CPH City & Port Development, 2019, (Sterling et al., 2020). ––Explicit incorporation of impact assessments that integrate water security (Klijn, Bruin, Hoog, Jansen, & Sijmons, 2013; Lee & Tan, 2016). –Funders and sponsors of the megaprojects to establish a reasoned enabling environment for accountability (Karlsson-Vinkhuyzen et al.,2018, Dang et al., 2020) .
Licensing and approval	–Approval of megaprojects by public authorities –Authorization for actors involved to undertake the next phases	Degradation of communities begins through evictions and land-banking	–Global licensing procedures requires water security measures –Regional and global databases on urban megaprojects	–License predicated on achieving water security targets (Overduin et al., 2017, Erfani et al.,2015) –License periodically reassessed and renewed
Planning and designing	–Practical and technical aspects defined –Designation of roles and responsibilities for actors involved –Ex-ante assessment and participatory processes	–Exclusion of community diversity –Lack of provision for maintenance of current alternative hydrological systems	–Consideration of alternative development models –Long- and short-term scenario planning	–Oversight from community and environmental stakeholders (Lien & Hou, 2019, Maher et al., 2019). –Impact mitigation a requirement in planning and design (Klijn, Bruin, Hoog, Jansen, & Sijmons, 2013).

Construction	–Initiation of major landfill operations and construction of projects on platforms –Transformation from wetland systems to dry plateaus –Construction of new housing and built environment	–Displacement or disruption of communities and social networks –Disruption of ecosystem services –Depletion or removal of water resources –Reduced access to water for agriculture –Disruption of aquatic food sources	–Mitigation measures implemented to limit damage in natural and social systems –Careful project phasing to ensure sustainability and maintenance of social and ecological systems	–Monitoring of physical impacts on lands and natural resources (Lee & Tan, 2016). –Monitoring of social conflicts and updating of global database (Sheng & Thuzar, 2012).
Short-term operation	–Operation of the project after construction	–Impacts of pollution or flooding –Sanitation dysfunction with overflowing sewers –Exclusion of local populations from the built project	–Presence of a contingency plan for water security risks and adverse outcomes	–Monitoring of onsite and offsite impacts (Lee & Tan, 2016). –Assessment of possible gaps between expectations and outcomes (Silva et al. 2019)
Long-term operation	–Operation of the project after an extended period –Potential deterioration of infrastructure	–Long-term negative environmental degradation –Shocks to water security through changed or deteriorating conditions –Increase in poverty through disruption of livelihoods and community exclusion –Increase in the value of land and properties, continual displacement through gentrification	–Adaptation of project requirements at later stages of the project life cycle due to the evolving needs of stakeholders –Adaptation of project to improve environmental performance –Financial mechanisms implemented for the long-term maintenance of environmental infrastructure	–Consideration of alternative development models (Hawken 2017, Orueta et al., 2008, Hodson et al 2009, La Loggia et al 2020, Schuetze eta al., 2013). –Reporting on project success against national and global benchmarks (Bulkeley 2005, Choi et al 2016). –Environmental monitoring (Lee & Tan, 2016). –Monitoring of social conflict (Sheng & Thuzar, 2012, Temper et al. 2018b).

528

One definition of megaprojects is that they are "trait making" rather than "trait taking" (Hirschman et al. 2015). In regard to this definition, we can ask what human rights and water justice issues are set in motion by different project development stages. Heller's megaproject cycle (2019a) presents an important set of milestones for fostering accountability as projects unfold. In some instances, megaprojects form part of a broad geopolitical strategy such as the Amarapura's links to China's "One Belt One Road" transnational infrastructure. In others, they form part of an *ad hoc* development strategy (e.g. Boeung Kak) or conform to a clear plan that is later modified (eg Phu My Hung). However, all three projects did not integrate broad concepts of water security as part of the strategic decision-making process, nor were there efforts to engage with affected publics. Questions of public participation are critical here, as urban megaprojects are exemplars changing "spaces of government" (Chilvers and Kearnes 2015a). There is ultimately a need to shift megaproject focus from targeting specific (wealthy) socio-economic *markets* as their driving concern, towards a greater engagement with publics that are living in or near proposed urban megaprojects sites. As Selin and Sadowski (2015, p. 221) note "humans design values into city structures and through them forge social orders". Therefore, there is a clear need for these projects to engage with meaningful forms of public engagement (cf. Chilver and Kearnes 2015b; Cook and Melo Zurita 2019) to ensure they are responding to needs and aspirations of urban residents.

We argue that given the inertia of the megaproject mode of development it is essential that they be addressed through a multi-stakeholder approach engaging those "within" and "outside" the project ambit. In doing this we reference the research of Maddaloni et al. (2017) who place megaproject stakeholders in two categories: primary and secondary. Primary stakeholders include those who sponsor, work on, or formally buy into the project. Secondary stakeholders include those who compete with the project, are affected by, or are involved in the communicative infrastructure that implicitly validates or challenges the project. The

empowerment of secondary stakeholders, far from de-politicizing the projects, stimulates action from such communities. Such secondary stakeholder actions can make megaproject injustices visible through either their transgression or compliance, highlighting social, political, or ecological standards and expectations. Through building secondary stakeholder linkages and community coalitions, megaprojects can be halted, realigned, or comprehensively transformed (Temper et al., 2018).

Community building programs in Taiwan offer an example of nationwide, neighbourhood scale initiatives in which residents are enabled so as to contribute ideas and participate in processes of urban change. Beginning in Taipei in the 1990s, under a Mayor elected on a platform of 'Citizen-ism', the programs provided grants as well as support and knowledge building services, for local residents to improve their neighbourhood environment and strengthen neighbourhood identities (Lien & Hou, 2019). In contrast the emergence of community based urban development and more inclusive state and civil society partnerships in other Asian cities has been a long and patchy process, involving development focussed states who have traditionally held little regard for environmental or social consequences of megaprojects (Cho & Kriznik, 2017).

In order to achieve stability in megaproject delivery over long timeframes, coalition building and deal making between different sides and levels of government is required (Daamen & Vries, 2013; Stone, 1993). Community involvement in megaproject decision making is however extremely rare and when devolution occurs, large corporations are most often the beneficiary, leading to conflict between communities and government agencies (Harris, 2018; Hesse, 2018). Community partnership agreements that are embedded in and accountable to megaproject governance structures can provide communities with a role in decision making. They offer some alternative to intractable, uneven, power conflicts, operating under superficial urban growth engine positions, in which poorer residents are invariably either

forcibly displaced, unable to transition financially, or exposed to environmental hazards (Cain, 2014; Carr, 2019; Janssen-Jansen & Veen, 2017).

Current megaprojects, which are viewed as successful from a financial and economic perspective, are used as models for future developments and this is clear in the macroplanning stage when a range of international examples and planning and finance approaches are identified for the future development. The narrow visioning of projects by states in developing regions such as Southeast Asia, is at once the result of a lack of critical research, and the result of a lack of available information on megaprojects. Although there is a wealth of information on master-planned enclaves, there is little information on alternative modes of investment available. Global neoliberal funding bodies such as the Asian Development Bank and World Bank have an obligation to go beyond positive, high-level reports to present systematic evidence of the benefit of varying models of development and, more fundamentally, foreign direct investment. Foreign direct investment brings wealth to developing Southeast Asian cities, but this wealth is concentrated and not evenly distributed (Huang and Dennis 2016). Inclusive models of wealth creation and urban service distribution can be envisioned at the macroplanning stage (Hawken, 2017). The choice of financial instruments is critical to the success of the project in integrating surrounding areas and generating inclusive dividends. Land value capture and development charges (Merk et al 2012) are two such instruments that can help finance infrastructure and ensure public investments and private wealth generation are equitable. It is in the macroplanning stage that alternative financial development models can be identified, and the legislative frameworks instituted for their implementation.

Following the macroplanning stage and project vision development urban megaprojects enter the licensing stage when critical permissions are granted from local authorities. There may also be accreditation and licensing from international finance organisations such as the Asian

Development Bank. This stage is complex and despite, or perhaps because of the establishment of standalone public-private partnerships, there is frequently an opaque licensing process. Furthermore, the licensing process often bypasses local communities. This has consequences for the psychological health of local communities. All three case studies reviewed in this paper have involved public-private partnerships and created uncertainty for local communities regarding their households, livelihoods and broader environment. Some, such as the Boeung Kak development, have transgressed state and international law during the licensing and approval stage. Licensing of all three projects involved conversion of public land to private land and the appropriation of small landholders. Water and sanitation are two rights linked to a broader set of human rights (such as land title and access to housing) and what can be called "the environmental commons". The establishment of megaprojects is often reliant on bypassing such rights. Therefore, the appraisal and consideration of human rights to water and sanitation must be a precondition for granting license or approval (Heller, 2019b).

Regional and global databases on urban megaprojects operating beyond the levels of the investor and the state can be developed to engage with a broader range of human rights and environmentally focused stakeholders (Temper et al. 2018a). The burgeoning open data movement could support such transnational infrastructure for licensing and approval (Hawken et al., 2020a, 2020b). Open data can be used to foster greater accountability and to promote projects to potential investors, assuring them of due process and economic safeguards and sources of marketing potential. Such access to information facilitates participation and access to remedy downstream impacts should problems occur.

Following the licensing stage, the planning and designing stage is critical for the ongoing sustainability of urban megaprojects. A growing range of planning and design approaches exist, but these tend to approach urban development from singular perspectives (e.g. human

rights, environmental, or engineering and risk perspectives; Hoekstra, Buurman, & van Ginkel, 2018). The conceptual and applied knowledge links between these sources of knowledge need to be strengthened. A range of approaches such as sponge cities, water-sensitive cities and low-impact development hold promise for the planning and design of semi-aquatic and floodable environments. Within Asia planning concepts such as “Sponge Cities” integrate the natural water cycle into urban developments through constructed ecologies, green infrastructure and porous development materials and elements (Jiang, Zevenbergen, & Ma, 2018; Palazzo, 2019; Radhakrishnan, Pathirana, Ashley, Gersonius, & Zevenbergen, 2018). This primarily decentralised engineering approaches needs to be better integrated with social concerns and could be expanded in scope and ambition so that they are able to better deliver at the scale of megaprojects.

The national scale 2.2 billion Euro ‘Room for the River’ program in the Netherlands was established to protect urban areas from floods, now and into the future, by restoring floodplains. However, in parallel, it seeks to achieve other benefits such as increased ecological and aesthetic values as well as improving urban access, development and recreational opportunities. The program was delivered in partnership with local, regional, and national government agencies along with the private sector and local community involvement. There is a long history of organisational partnerships and water engineering in the Netherlands for this program to lean on. Such a programs allowed testing and innovation with a mixed centralized–decentralized governance approach to achieve wide ranging environmental, social and economic benefits. Now these lessons are being applied to subsequent programs (Rijke, Herk, Zevenbergen, & Ashley, 2012).

The “Room for the River” water infrastructure megaproject achieves the stated goals of the case studies of raising international standing, improving quality of life and attracting investment. Further the “Room for the River” project is linked to, or supports, the evolution

654 of multiple large-scale urban developments. The program seeks to protect, adapt and shape
655 urban areas so they can confidently grow. It has received numerous international accolades
656 and contributed to the country's skills exports. This example complements the development
657 of more integrated, cooperative and stable governance settings (Bruijn, Bruijne, &
658 Heuvelhof, 2015) and thus a safer and more attractive investment environment. If viewed
659 strategically from a governance perspective, megaprojects can provide the opportunity for
660 testing and implementing more inclusive, multi-level approaches to dealing with
661 environmental challenges and urban development. Equally, in the case an urban megaproject
662 in Hong Kong, Kumaraswamy, Wong, & Chung (2017) find a similar need to expand the
663 strategic scope beyond immediate project sponsors. By identifying and incorporating multi-
664 stakeholder value within short-term and long-term aspirations, megaprojects can achieve
665 more meaningful and sustainable outcomes.

666 Prior the commencement of megaproject construction, sites are typically cleared of existing
667 communities. Urban geographer and chronicler of urban megaprojects in Ho Chi Minh City,
668 Erik Harms, has said of Phu My Hung and development in Ho Chi Minh City that "The basic
669 story is that people don't want to be evicted from their homes" (Tatarski, 2017). Staging of
670 projects needs to occur so that alternative housing is provided to minimise disruption to
671 livelihoods and communities. These processes can be modelled on development practices in
672 large housing estates in places such as Berlin, where residents are progressively transitioned
673 to new housing on-site (van and Karien, 2005). Occasionally, megaproject tactics are
674 designed to maximise disruption and construction may be brought forward prior to licensing
675 and approval. This is the case of Beoung Kak, the most violent of the three cases analysed,
676 but this also applies to Phu My Hung, where construction remains a violent expropriation of
677 space with established urban systems catering to a narrow economic segment of society. A
678 more inclusive and people-centred approach to construction must invert the linear, end-of-

679 pipeline development sequence of such projects (Sanderson, 2019, p. 150) where housing and
680 compensation for local populations are considered after project design. Rather than starting
681 with a final, master-planned vision, a preferred approach is to incrementally link the
682 development with the financial means of local populations and wider sustainability goals,
683 human rights and ecological resilience (Hawken 2017). A remaking of how the public
684 engages with these projects is needed (Chilvers and Kearnes 2015b). The benefits and
685 potential for including secondary stakeholders or indirect stakeholders such as community
686 groups, NGOs, professional bodies, trade associations and media has been documented by
687 Maddalonie et al. (2017) and Kuraswamy et al. (2017). Such approaches need to be clearly
688 advocated for, and further documented. The Environmental Justice Atlas (2020) has
689 documented 3251 global socio-environmental conflicts between large, often 'mega' projects
690 and communities. As Temper et al. (2018a, 2018b) suggests, the socio-ecological cost of such
691 projects is staggering.

692 As observed in the three case studies presented in this paper, typical megaproject
693 shortcomings such as a lack of measurable targets, lack of accountability mechanisms and
694 lack of resources allow the original development agenda to change and diverge from intended
695 project outcomes, thereby affecting quality and safety. Megaprojects are well known to be
696 "over budget, over time, under benefits, over and over again" (Flyvbjerg 2011, p.1, 2017) but
697 more significantly guidelines regarding public benefits are often absent or vague at the
698 project commencement. If clear targets relating to water quality, environmental performance
699 and ecosystem balance are not established, they cannot be measured effectively and are
700 therefore unachievable (Barnett and Parnell 2015). Issues with water access and quality may
701 become apparent at the short-term operation stage of the megaproject cycle and perhaps as
702 early as the construction stage. Pollution of drinking water, dysfunctional sanitation systems
703 and upstream or downstream flooding or water shortage may become apparent such as in Phu

My Hung and Boeung Kak. Access to remedy becomes even more important at this stage as the human and ecological health impacts of a megaproject development are realised.

Moving from the short-term operation to long term operation reveals ongoing structural changes within urban areas beyond urban megaproject boundaries. Megaprojects, as opposed to smaller and more conventional projects, are designed to change the structure of society (Hirschman et al, 1995). The first and potentially most severe long-term impact of megaprojects is for them to serve as models for further projects. Harms (2016) suggests this was the case for Phu My Hung, which was ostensibly the model for Thu Thiem, which resulted in 14,600 households being evicted from their homes. Ongoing monitoring of projects and the long-term accessibility and affordability of urban megaprojects and associated ecosystem services are critical for the human rights success of such projects. Access to remedy must be available for locals transitioning to other areas or to new lives within megaprojects (Heller, 2019b).

Finally, dynamic challenges such as climate change make the future impacts of megaprojects difficult to model and predict. Recent modelling of the Mekong River Delta shows that flooding will become more extensive with larger areas of the city inundated (Kulp & Strauss, 2018, 2019; Lu & Flavelle, 2019). Megaprojects may remain as bastions of privilege in the compromised mother city or they may be exposed to increased risks and disasters. If this eventuates, developers of megaprojects have a responsibility for the safe and just decommissioning of projects (Cook & Bakker, 2012; Romero-Lankao & Gnatz, 2016; Storch & Downes, 2011).

6. Conclusion

Urban megaprojects are often publicly positioned as economic benefactors for cities with governments and developers framing them as delivering wealth and new technologies to urban regions (Harms, 2016; Roy & Ong, 2011). The reality of these projects is often quite different, with large-scale development approaches destabilising local populations rather than addressing their needs (Padawangi, 2019). The costs and benefits of such projects are difficult to ascertain according to leading experts such as Flyvbjerg (2007), who states that the cloud of misinformation generated can mask the true value of such projects. Megaprojects require vast amounts of land and resources (e.g. water) and often involve insufficient environmental assessments (Altshuler & Luberoff, 2004; Flyvbjerg, 2014). Megaprojects often limit or interrupt supply and access to such resources for vulnerable people, even as they produce new economic opportunities for some in a pattern of splintering urbanism.

Urban megaprojects are on the increase and remain an attractive option for developers, investors and an emerging middle class within Southeast Asia and globally. Considering the prominence of this development model, it is unacceptable that there is so little information or recourse when these projects do not deliver on their promises. This paper has mapped the patterns and distinctive features of water related urban megaprojects in Southeast Asia with the aim of improving future projects through each stage of the development cycle, with a particular focus on human rights and water justice. The theoretical approaches and practical insights set out in this study demonstrate a range of methods for improving the delivery of such projects and managing long-term impacts within a social-ecological context.

We offer five points derived from the discussion above, as useful takeaways for those concerned with policymaking on water justice and megaprojects. Firstly, those involved need to be aware of their responsibilities and accountability at each stage of the urban megaproject

development process as clearly defined by Heller (2019a) and elaborated in this paper. This includes educating other stakeholders on the various water justice risks involved at each stage of the process. Secondly, water needs to be considered in the foreground rather than being relegated to an invisible background. Frequently the liquid margins and interstices of cities are seen as sites to fill and annex without mapping their ecological or social values. Most pertinently this includes identifying the stakeholder communities reliant on water-based ecosystem services, such as drinking, sanitation, and vulnerable to possible future megaproject related disservices, such as flooding. Thirdly megaproject reporting and monitoring needs to clearly establish and link globally relevant urban development mechanisms and frameworks, such as the SDGs and NUA, making special reference to the water focused targets and aims embedded within the mechanisms. Fourth, policymakers and stakeholders need to consider and identify the relevant authorities for recourse should the project not go ahead as planned. These may include regional or civic authorities that can exert soft diplomatic pressure. Finally, the dangers and dynamic nature of megaproject development in semi-aquatic environments makes consideration of the risk of future failure a necessity. With sea-level rise, urban subsidence and climate related disasters intensifying in coastal and low-lying areas around the world, strategies for adaptation, resilience and modification are vital considerations.

We do not see these recommendations as a panacea to the many social and environmental problems that urban megaprojects present. Rather we view them as a starting point whereby questions of, and discussions around, environmental justice and water justice can become integral considerations that shape urban megaproject praxis. In their current form, urban megaprojects are by and large, major drivers of social-economic segregation and ecological destruction. There is ultimately a need to re-orientate their implementation logic to catalyse city improvements for *all* urban residents. Here it is worth referencing the “paradigm shift”

advocated by the United Nations (2017, p.5) New Urban Agenda, which argues for "just, safe, healthy, accessible, affordable, resilient and sustainable cities and human settlements to foster prosperity and quality of life for all."

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