

Urban planning approaches to support community-based flood adaptation in North Jakarta Kampung

Disaster
Prevention and
Management: An
International
Journal

383

Adam Madigliani Prana

*Research Center for Sustainable Production System and Life Cycle Assessment,
National Research and Innovation Agency (BRIN), Jakarta, Indonesia;*

Tarumanagara University, Jakarta, Indonesia and

*The Ministry of Agrarian Affairs and Spatial Planning / The National Land Agency,
Jakarta, Indonesia*

Angela Curl

*Department of Population Health, University of Otago Christchurch,
Christchurch, New Zealand*

Maria Rita Dionisio

*Geography Programme, School of Arts, The University of Waikato,
Hamilton, New Zealand and*

*Geospatial Research Institute Toi Hangarau, University of Canterbury,
Christchurch, New Zealand*

Christopher Gomez

Graduate School of Maritime Sciences, Kobe University, Kobe, Japan

Deirdre Hart

*School of Earth and Environment, University of Canterbury,
Christchurch, New Zealand*

Heri Apriyanto

*Research Center for Sustainable Production System and Life Cycle Assessment,
National Research and Innovation Agency (BRIN), Jakarta, Indonesia, and*

Hermawan Prasetya

*Directorate of Economy, Employment, and Regional Development Policy,
National Research and Innovation Agency (BRIN), Jakarta, Indonesia*

Received 22 May 2023
Revised 17 November 2023
18 February 2024
10 March 2024
Accepted 10 May 2024

Funding: This work supported by the postdoctoral program of the National Research and Innovation Agency (BRIN), Indonesia Endowment Fund for Education (LPDP), Ministry of Finance of Republic of Indonesia. This research involves the Rujak Center for Urban Studies as a research collaborator, providing access for researchers to interview communities in the flood affected kampungs in North Jakarta. The funders had no role in the design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript or in the decision to publish the results.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The first author has received research grants from the New Zealand government in the form of the "New Zealand Aid Scholarship Program." All other authors declare no potential conflicts of interest.



Abstract

Purpose – The ineffectiveness of flood control in climate-impacted majority-world cities like Jakarta highlights the need for policies that integrate local knowledge and embrace water harmony rather than resistance. This study explores flood adaptation in North Jakarta's kampungs (urban informal settlements), aiming to enhance the efficacy of current flood disaster management. The outcomes of the participatory planning mechanism simulation that we propose are expected to provide valuable insights for the urban planning approach in that city.

Design/methodology/approach – We employed focus groups and design charrettes with a bottom-up approach to explore how local knowledge can enhance spatial flood management and urban planning policies. In total, 17 diverse participants, covering various ages and professions, engaged in these activities. Our methods aimed to be culturally sensitive and inclusive, embracing indigenous values like *musyawarah* and *gotong royong*. The research methodically examined flood implications and adaptations in informal settlements, progressing through preliminary understanding, data triangulation, and a reflective synthesis of the findings.

Findings – Amid worsening global changes like sea level rise, community-focussed, collaborative planning can help create tailored flood-resilience solutions. The research reveals that partnerships between communities and organisations promote city-wide, flood-adapted environments, aligning policy with the needs and goals of those most affected by flooding. This collaboration enhances flood disaster management and planning policies.

Research limitations/implications – This research focusses on Jakarta's flood adaptation and urban planning, reflecting on historical situations relevant to urbanising majority-world countries. Whilst specific to Jakarta, it offers perspectives on managing global environmental challenges such as sea level rise. Subsequent research should prudently consider each locale's distinct geographic and social milieu and the trust in planning systems in applying these findings, methodologies and approaches.

Originality/value – This study clarifies the relationship between disaster management, policy and flood adaptation, focussing on local knowledge in North Jakarta, pertinent to urbanising majority-world nations. Jakarta's historical and modern dynamics, including globalisation, reveal specific prospects and obstacles to applying vernacular knowledge to planning and disaster response. It highlights crucial points for policymakers in the majority of the world to address growing flood risks and create strategies that integrate local and traditional wisdom.

Keywords Participatory, Collaborative, Local knowledge, Communities, Approaches, Spatial planning

Paper type Research paper

1. Introduction: the case for community-based flood adaptation in majority-world cities

Coastal megacities are increasingly vulnerable to climate-related flooding (IPCC, 2014), with majority-world cities, dense with informal, under-resourced settlements, facing more severe impacts. Often located on floodplains, these areas suffer from regular waterlogging (Araos *et al.*, 2017). Jakarta is a Southeast Asian megacity at high risk, with approximately 3.5 million residents in flood-prone informal settlements (Van Voorst, 2016). This paper examines Jakarta's flooding through the lens of historical institutionalism. Steinmo (2012) describes historical institutionalism as examining historical events' impact on institutional development and socio-political evolution, shaping current policies.

In Jakarta's urban and surrounding areas, there's been an increase in water management infrastructure for flood control, continuing the influence of colonial-era structures on urban development. Yet, these fail to fully address complex flood risks exacerbated by haphazard urban growth and the neglect of local knowledge (Oppusunggu and Tantular, 2015). Despite Indonesia's post-colonial developments, the country's institutions still favour infrastructural solutions, shaped by modernist and global influences (Bott *et al.*, 2020). This research explores modifications to Jakarta's planning framework for integrating local expertise in disaster management and policy. It examines North Jakarta's coastal kampungs for sustainable flood adaptation strategies, aiming to inform policy revision and develop community-centric approaches that utilise local and traditional knowledge.

Indonesian authorities often neglect local and indigenous knowledge in enhancing community resilience (Bott *et al.*, 2020). In Southeast Asia, Austronesian indigenous practices, like stilt houses, not only offer ventilation and pest reduction but also align with water, mitigating flood effects (Evers, 2015). Jakarta's planning favours infrastructural flood management, which overshadows more efficient, traditional methods (Renald *et al.*, 2016).

The city focusses on keeping the old infrastructure and integrating it with flood policies, a practice that may hinder adaptation to global environmental changes and the inclusion of local knowledge (Meulder, 2013).

This study reinforces the connection between disaster management, spatial planning and flood adaptation, underscoring the importance of local knowledge in countering technocratic methods. Globalisation's impact in post-colonial Jakarta has led to the marginalisation of majority-world perspectives. Jakarta's flood policy, historically focussed on infrastructural solutions (Prana *et al.*, 2024; Octavianti and Charles, 2018), provides limited scope for incorporating local insights. Literature on historical institutionalism indicates the enduring influence of colonial-era frameworks (Thelen, 1999), affecting governance. This research explores flood adaptation in North Jakarta's informal settlements, aiming to enhance flood disaster management.

Urgent action is needed for flood adaptation (Bott *et al.*, 2020). Jakarta's rapid urbanisation has overwhelmed its flood control infrastructure, causing groundwater depletion, subsidence and seawater intrusion (Padawangi and Douglass, 2015). By 2050, half of North Jakarta may be underwater (Fakultas Geografi Universitas Gajah Mada, 2007). Floods threaten the city's sustainability, exposing communities to compounded disasters and environmental degradation, such as water pollution and river ecosystem damage (Setiadi *et al.*, 2015), severing ties between local knowledge and place.

2. Background: flood risk management approaches in Jakarta, Indonesia

In climate-affected cities like Jakarta, the inadequacy of infrastructure-centric flood control highlights the urgency of adopting more adaptive disaster risk management strategies (Bergsma, 2016). Present methods, focussed on flood resistance, lack integration of traditional and indigenous knowledge, which aligns with water harmony with local insights often overlooked in official processes (Van Voorst, 2016).

Amidst rapid urbanisation, balancing natural and political ecologies with urban growth is vital, as certain urban development patterns exacerbate flooding issues (Padawangi and Douglass, 2015). This shift is particularly relevant in post-colonial contexts (Fischer, 2021) and aligns with the Ecohealth interdisciplinary approach, linking human well-being with ecosystem health and advocating a comprehensive view for complex health challenges (Charron, 2011).

Local perspectives are crucial for building resilient cities (Bott *et al.*, 2020), yet in Jakarta, community-led flood management faces challenges like river straightening and forced evictions (Neolaka, 2013). Van Voorst (2016) notes the Indonesian authorities' insufficient acknowledgement of informal governance in managing decentralisation and involving communities in ecologically sensitive areas. Utilising local knowledge for development can foster settlements in harmony with water and adapt to floods (Van Voorst, 2016; Liao *et al.*, 2016). However, market- and government-led development remains largely dominant in deliberative systems (Williams *et al.*, 2014), influencing flood management and planning policy.

During the New Order in Indonesia (1965–1998), participatory planning was nominal, favouring elite groups (Sjaifudian, 2002). Post-1997 democratic shifts minimally influenced flood and spatial planning. The Spatial Planning Law of 26/2007 revised participatory approaches, but public involvement remains largely consultative (Rukmana, 2015). Fischer (2021) argues for genuinely democratic community involvement in eco-sensitive areas, beyond just policy. In Jakarta, the government's engagement with riverside and coastal communities is often superficial, overlooking poorer groups' contributions to flood management, impacting disaster management and potential collaborative benefits.

Community approaches valuing local and indigenous perspectives provide a human-focussed alternative to material-centric development (Williams *et al.*, 2014). Damayanti and Spek (2015) highlight that participatory planning improves understanding of human-environment dynamics and pinpoints genuine ecological issues. Jakarta requires a holistic

flood management plan incorporating water control, flood anticipation and community engagement. Yet, government strategies often diverge from community knowledge, which struggles amidst globalisation. This study explores community participation in spatial planning for flood response, with methodologies discussed in the next section.

3. Methodology: case study areas and methods

3.1 Study areas

Flooding disproportionately impacts Jakarta's informal and impoverished districts (Texier, 2008), with complexities extending beyond the colonial-era canal system's incompatibility with the city's river geography. Approximately 3.5 million residents inhabit flood-prone informal settlements (Van Voorst, 2016), often targeted for eviction due to perceived exacerbations of floods (Putri, 2018). To facilitate relocation, the government designates riverside and seaside areas as construction-free green zones in spatial planning (Manan, 2015).

The 23.5 km flood canal, protecting the parts of East and North Jakarta (Ramadhayanti, 2015), contrasts with the ongoing urbanisation reducing water infiltration areas (Renald *et al.*, 2016). North Jakarta, home to a significant proportion of the city's lower socio-economic groups and the majority of its indigenous Betawi population (DKI Jakarta Province Central Bureau of Statistics, 2017), faces the highest flood risks. This area's unique cultural composition and resilience in challenging environments draw international tourist attention (Prasetyanti, 2015). Our case study in Northern Jakarta focusses on three kampungs (Figure 1), culturally rich yet often overlooked in planning and disaster management, where local knowledge is key for adaptation. Kartika (2016) notes the harmony between nature and human activity in these Indonesian traditional settings. The selected areas – Kampung Muara Angke (A) and Kampung Muara Baru (B) along the coast and Kampung Kali Apuran (C) by the river – represent diverse geographical characteristics and varying flood exposure.

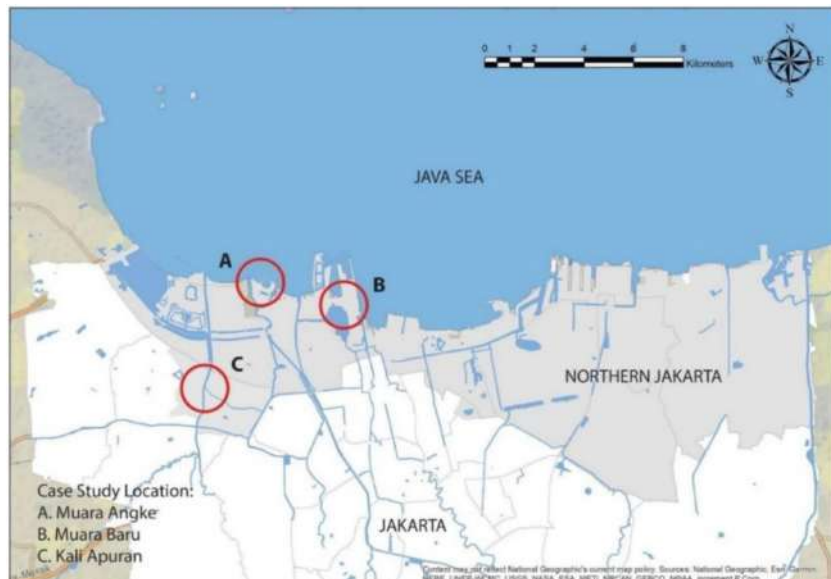


Figure 1.
Study areas: Muara Angke, Muara Baru and Kali Apuran kampungs in North Jakarta

Source(s): The map presented in Figure 1 was created by the author using data obtained from JakartaSatu (2021) [<https://jakartasatu.jakarta.go.id>]

3.2 Methods

This study investigates the integration of local knowledge into spatial planning in Indonesia, critiquing the efficacy of existing public consultation methods. It draws on [Berman \(2016\)](#) to advocate participatory methods that incorporate local perspectives – a stance reinforced by [Margerum \(2011\)](#), who highlights the importance of collaborative and educative participatory environments. Employing focus groups and design charrettes, the research collaborated with the Rujak Centre for Urban Studies to leverage local expertise and networks. This partnership, built on trust, enhanced active participation and knowledge exchange, informing flood strategy development. The 17 participants, from diverse backgrounds, contributed insights on socio-economic issues and community resilience in Jakarta's flood-affected "kampungs".

Our methodology addressed power imbalances by fostering collaboration across stakeholders from Java, Sulawesi and Sumatra, sharing regional and traditional solutions. It embraced the indigenous principles of "musyawarah" and "gotong royong", encouraging open dialogue and trust ([Koentjaraningrat, 1984](#)). Data collection utilised aerial photographs, flood risk maps and policies to prompt localised discussions (see [Clifford et al., 2016](#); [Osa, 2000](#)). The study's specific questions, informed by literature and endorsed by the University of Canterbury's Human Ethics Committee, complemented a case study analysis ([Creswell, 2007](#)), yielding a deep understanding of informal settlement conditions, obstacles and goals.

The analysis, informed by [Yin \(2013\)](#), organised data thematically to identify trends in flood challenges and responses, utilising data triangulation with community drawings and stories for validation. The concluding phase reflected on the research outcomes, underscoring participatory methods' value in incorporating local knowledge within spatial planning for urban Indonesian flood management. Our methodology promotes collaborative innovation in designing flood-adaptive urban settlements, advancing beyond previous approaches that recorded community flood responses through interviews ([Simarmata and Krishnan, 2018](#)) or literature ([Wannewitz and Garschagen, 2021](#)). Unlike studies limited to current adaptation factors via focus groups ([Surtiari et al., 2017](#)), our work includes both verbal and visual elements to explore future flood adaptation strategies.

4. Results

This study uncovered a range of opinions on flood mitigation solutions amongst residents in the studied areas. Active debates and design charrettes ([Figure 2](#)) showed community engagement, with an initial focus on specific kampung activities, leading to a consensus-driven hybrid solution benefiting the entire community. This understanding emerges from a three-part analysis of the research findings: first, the outcomes of collaborative planning in seaside Kampung Muara Angke, then in Kampung Muara Baru, and finally, the findings from riverside Kampung Kali Apuran.

The design charrettes and focus groups revealed inconsistent government allocation of riverbanks and coastal areas for conservation. Despite calls for more green spaces in North Jakarta (see [Renald et al., 2016](#)), a riverside kampung faced a planned road development, limiting green space with water-absorbing features. This aligns with [Caljouw et al. \(2005\)](#), noting authority inattention to North Jakarta's flood issues. Additionally, evictions loom for communities in the three kampungs, classified as non-residential in land-use plans. The findings in each study area are detailed in the following sections.

4.1 Kampung Muara Angke

Kampung Muara Angke is in Kelurahan Pluit, Kecamatan Penjaringan, North Jakarta Municipality, sitting on the northwest corner of Kelurahan Pluit at the edge of Java Island. This kampung has direct access to the Java Sea and is situated on the *muara* or estuary. [Figure 3](#) illustrates the location of Kelurahan Pluit and Kampung Muara Angke in Jakarta.



Figure 2.
Focus group and
design charrettes,
conducted in the Ruang
Pameran Rujak Centre
for Urban Studies,
Jakarta, 8th
August, 2018

Source(s): Figure by authors

Kampung Muara Angke comprises three neighbourhoods: Kerang Ijo, Blok Empang and Tembok Bolong. It is named after the nearby port and fish market, Muara Angke. Each neighbourhood's name reflects local activities: Kerang Ijo (green clam in Bahasa) is home to fishers and clam farmers, *Tembok Bolong* (perforated wall in Bahasa) refers to a wall hole for fish market access and Blok *Empang* (ponds in Bahasa) denotes the neighbourhood's former location above ponds. These names signify the people's connection to the land.

Figure 4 shows Kampung Muara Angke's map and satellite imagery, highlighting diverse land-use areas. Some parts are on the sea (blue) with stilt houses, and others reclaimed using clamshells, designated as office zones (purple) or conservation/open-space zones (green). The settlement violates spatial planning regulations, as it is not in a housing zone (yellow). Jakarta's rules prohibit unsuitable development in designated zones, especially near water bodies or conservation areas. As they lack legal land tenure or building permits, residents risk eviction at any time.

Research participants noted that the kampung's illegal status hinders access to government-funded infrastructure such as roads, gutters and sewage systems. The community built these with limited funds, making them prone to flooding. After Jakarta's 2013 flood, the government built a road with drainage in Kampung Muara Angke, but this, instead of mitigating, worsened flooding by connecting to the sea.

After the last great flood, the government built a big road in the middle of our kampung. The government built not only the road to accommodate cars but also complementary facilities like the drainage pipe system connected to the sea, pedestrian walkways, and a 75 cm high embankment along both edges of the road. Unfortunately, instead of channelling floodwater into the sea, the drainage hole streams seawater into our kampung. (Quote 6, CM 12, 33 y male and seaside kampung dweller).



Source(s): Figure by authors

Figure 3.
Map of Kelurahan Pluit
and Kampung Muara
Angke in Jakarta

The community tried to mitigate flooding by elevating the road with clamshells, but this disrupted contour levels and channelled water onto neighbouring properties, leading to inundation. A participant commented:

Eventually, we covered this road with clamshell sacks, but the piled-up road made flooding in our kampung worsen. The pile-up on the road disrupts the ground contour level in our kampung and traps the water in kampung area with a lower elevation. (Quote 7, CM15, 22 y female and seaside kampung dweller).

Kampung Muara Angke residents critiqued the government's infrastructure planning for neglecting local environmental conditions. Focus group discussions shifted from development to flood adaptation strategies. During design discussions, a consensus emerged between fishers and non-fishers on a sea access-friendly barrier with sea views, access points, walkways and docks (Figure 5), rejecting the government's extensive seawall proposal due to environmental and developmental reservations. This example underscores the effectiveness of collaborative participatory processes in generating context-specific, innovative flood solutions for the kampung.

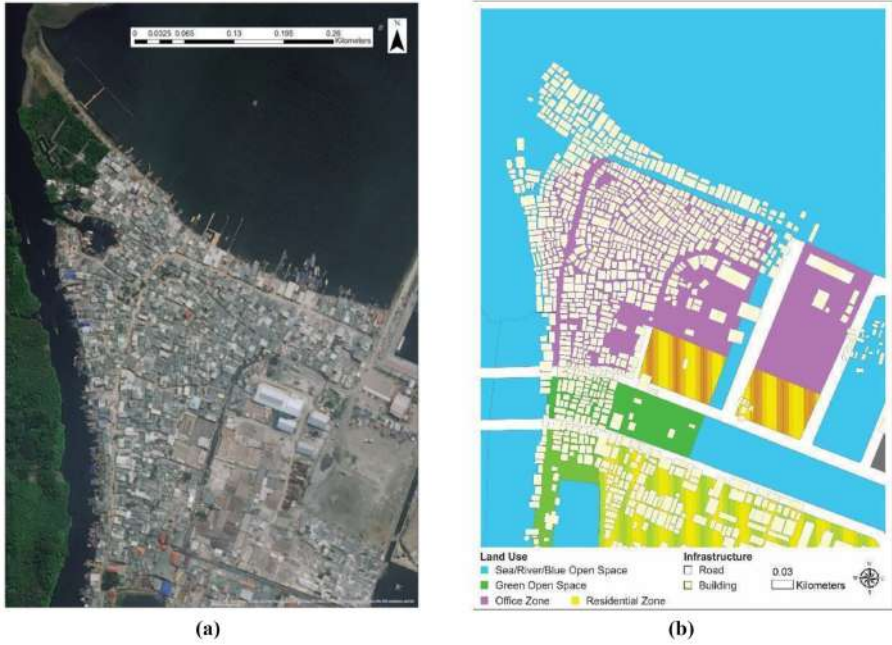


Figure 4. Comparison of (a) satellite imagery of Kampung Muara Angke and (b) map overlaying the spatial planning regulation, with current buildings in the settlement

Source(s): Google Earth

Source(s): Figure by authors

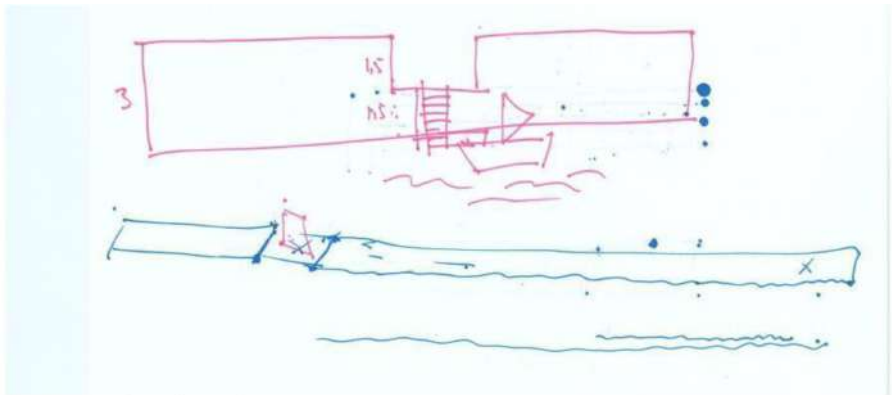


Figure 5. Sketch of a possible seawall solution, proposed by Kampung Muara Angke research participants

Source(s): Figure by authors

Despite participants being informed about spatial planning and the significance of flood adaptation, there is a chance they may still propose flood-control solutions. Flood control and adaptation methods can coexist, but technical feasibility is a concern, as with the seawall with large holes suggested by Kampung Muara Angke’s participants (depicted in Figure 5). Seawalls, as a sea defence infrastructure, can fail because of a scour hole at the “toe” of the structure (Salauddin and Pearson, 2019). Additionally, building seawalls in fishery communities entails socio-technical complexities. For example, post-Tohoku 2011

Tsunami, communities with nearby seawalls had excessive confidence in this technology, sometimes increasing their vulnerability to tsunami impacts.

Kampung residents, including fishers, concurred on keeping stilt houses with clamshell bases for flood resilience. They suggested two stilt house types (Figure 6): taller ones for fishers, considering high tides and equipment storage and lower ones for non-fishers further from the sea, ensuring sufficient flood protection.

4.2 Kampung Muara Baru

Kampung Muara Baru is situated in the centre of Kelurahan Penjarangan, North Jakarta Municipality (Figure 7). It indirectly connects to the Java Sea and the Pluit Reservoir. Figure 8(a) displays Gedung Pompa on a spatial planning map, located in areas for roads (white), green open spaces/conservation (green), commercial land (purple) and water infrastructure (blue). Figure 8(b) shows Elektro and Marlina neighbourhoods' spatial planning maps, situated in green open space and office zones according to regulations.

Kampung Muara Baru's illegal status exposes residents to eviction risks. Government relocation offers to social housing were declined because of the distance between workplaces and steep transport costs. Social housing's rental agreements disadvantage residents who currently live rent-free or without mortgages in the kampung. The following example illustrates the proposed collaborative participatory process's ability to spark community innovation, enabling contextual solutions to the kampung's flood problem, as per the participants.

Community members in Northern Jakarta attribute flooding to heavy rainfall, rising sea levels and land subsidence, acknowledging that merely channelling water into canals is insufficient. They recognise the importance of ground absorption to reduce subsidence and flood risks and see their traditional stilt houses and sandy grounds as better suited to their environmental conditions.

The community recognises that settling in green open spaces could exacerbate area-wide flooding by impeding water absorption in conservation areas and causing nearby floodplains to flood. They contend that eviction isn't the sole solution, as it might lead to encroaching on other absorption areas. Instead, they suggest modifying the built environment for flood adaptation, as depicted in the forthcoming quote and Figure 9, showcasing their proposed modern flood adaptation method in the kampung.



Source(s): Figure by authors

Figure 6.
Sketch of possible stilt
house solutions,
proposed by Kampung
Muara Angke research
participants



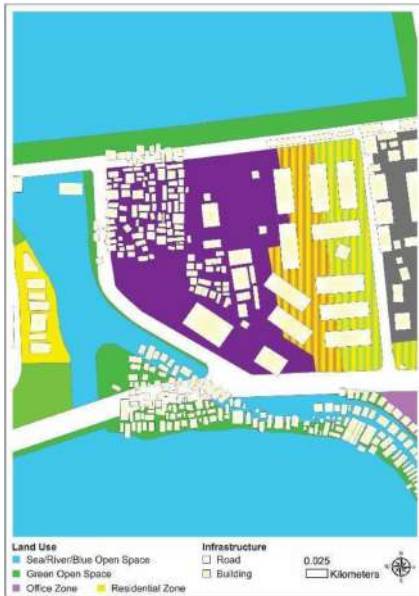
Source(s): Figure by authors

Figure 7.
Jakarta maps showing
the Kelurahan
Penjaringan and
Kampung Muara Baru
and surroundings

I think the ideal would be if we could transform our neighbourhood into stilt houses on natural ground like the old days. However, the current overly dense population with complicated settlement arrangements make this unfeasible. But it doesn't mean that we cannot make an effort to improve our kampung and make it more environmentally friendly . . . If the main aim is for the water to permeate, we can make biopore wells that can let the water permeate more. We can place such wells in many spots, including alleyways, house terraces, roads, and the remaining open spaces . . . We can also convert our concrete road into paving blocks that absorb water better. (Quote 8, CM 18, 50 y female and seaside kampung dweller).

The community's discussion focussed on prospective flood adaptation strategies for future development, emphasising the applicability of community-driven efforts. Participants explored whether any effective water management techniques could be scaled up. One member mentioned a water treatment method capable of providing freshwater:

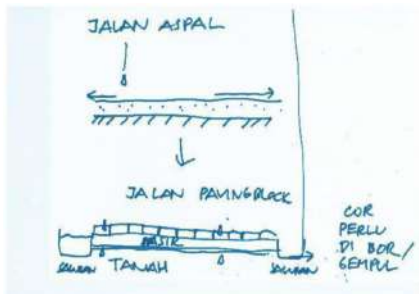
Since we live in a coastal area where the groundwater is saltwater and freshwater is a precious commodity, we try to conserve water. In many houses, there are three wells: grey water wells, black water wells, and drinking water wells. We dug those three wells into the ground to a maximum depth of two metres. For the drinking water wells, we mainly fill them with rainwater. The black water wells are our toilet water waste and the grey water wells are for our wastewater from our kitchen. (Quote 9, CM 20, 38 y female and seaside kampung dweller).



Source(s): Figure by authors



Figure 8.
Map overlaying the
current built
settlement, with the
spatial planning
regulation (a) Gedung
Pompa and (b) Marlina
and Elektro in
Kampung Muara Baru



Source(s): Figure by authors

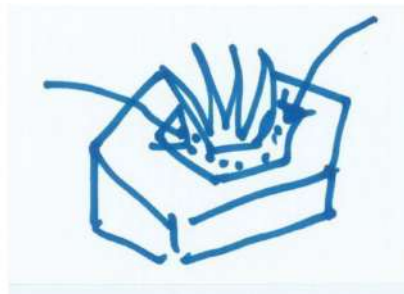


Figure 9.
Drawings showing the
communities' idea to
transform their
concrete road surfaces
into paving blocks that
are more permeable

Black water wells were positioned next to grey water wells, using hollow bricks for filtration before entering the grey water system. The water, subsequently filtered and absorbed into the ground, replenished drinking water wells. This cycle negates the need for costly purchased drinking water. The community asserts that their current system's water, once boiled, is safe for drinking and cooking (Figure 10).

To counter issues like prolonged stagnation of contaminated water, the community explored water infiltration methods, aiming to extend household-level efforts across the kampung. They envisioned a large-scale green-blue network integrating biopore wells, water treatment systems and permeable road surfaces for a substantial impact (Figure 11).

Research participants understood their kampung's present issues and solutions, whilst also considering future scenarios. Acknowledging inevitable population growth and land scarcity, they anticipated the need for expanding into floating houses (Figure 12):

There is no more space available in the city, and so [in the future] if we want to stay here, we have to consider living in floating houses. A floating house is suitable for us as fishers—one of our neighbours already made one and lives in it. He used house material that is easy to find in our kampung: drums for the base and bamboo for the house's body . . . Maybe we can also use second-hand wood from old ships that is waterproof for the house walls, and for the roof, we can use a cheap material like asbestos. (Quote 10, CM 21, 48 y male and seaside kampung dweller)

4.3 Kampung Kali Apuran

Kampung Kali Apuran, situated in Kelurahan Kedaung Kali Angke of Kecamatan Cengkareng in West Jakarta, has direct access to the Apuran River (“kali” in Bahasa means river). Figure 13 shows Kelurahan Kedaung Kali Angke’s location in Jakarta and Kampung Kali Apuran’s position within it. Kampung Kali Apuran, or Kampung Kedaung Kali Angke, is a small urban village located on the Apuran Riverbank. It’s the smallest of the three discussed kampungs, sharing its name with a single neighbourhood. Kali Apuran and Kedaung Kali Angke are rivers near the kampung.

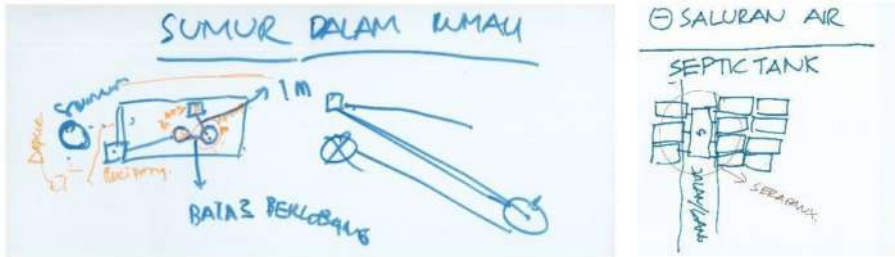


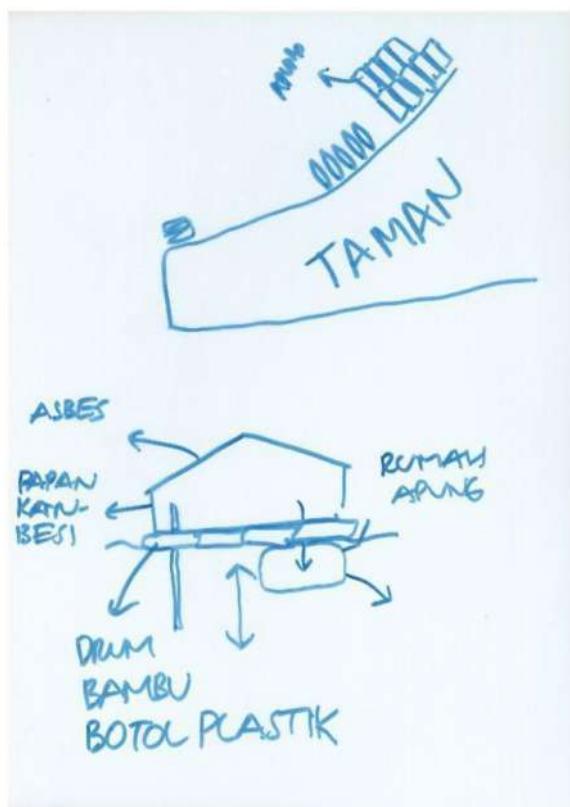
Figure 10. Drawing showing the community’s water treatment system applied in an individual house

Source(s): Figure by authors



Figure 11. Proposed green-blue network in (a) Gedung Pompa neighbourhood and (b) Elektro-Marlina neighbourhood, Kampung Muara Baru

Source(s): Figure by authors



Source(s): Figure by authors

Figure 12. Sketch illustrating an actual floating house in a kampung (bottom picture) and the prospective location for further development of floating houses (upper picture)

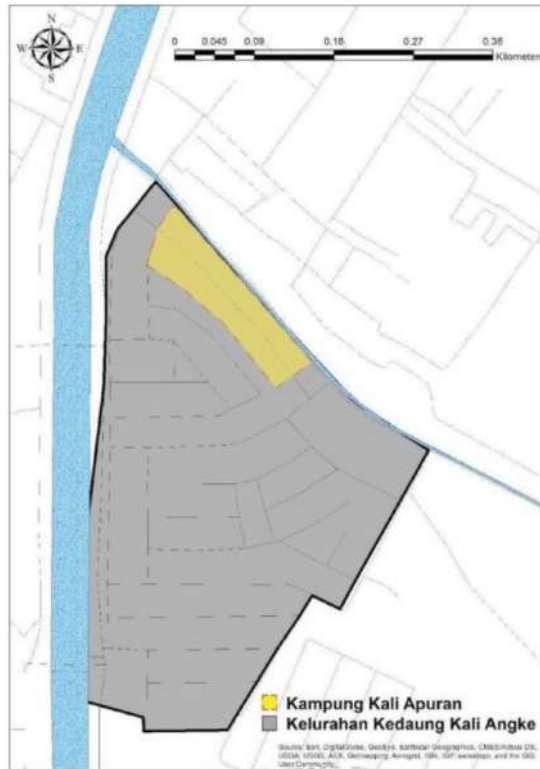
As per spatial plan regulations (Figure 14b), kampung buildings occupy areas meant for roads (white) and water (blue), making Kampung Kali Apuran an illegal settlement.

Participants reported annual flooding since 1997, peaking at 120 cm. The cause is a small neighbouring river's inability to manage flows from two larger rivers. Figure 15 presents their comprehension of the area's flood circumstances and physical conditions. Purple and blue lines indicate flooded areas with an annual flood duration of two to three weeks. Evacuation routes (pink arrows) and areas (orange boxes) are also depicted.

Research participants indicated that residents have adopted various responses to frequent flooding, from altering their activities to physically modifying their houses, as shown in a resident's statement and Figure 16:

We have a solution for flooding in our kampung—we are adapting to floods by creating an attic system in our houses. We made a house from a wooden panel with an attic in it, and whenever flooding comes, we put our important items in our attic. If we can afford to build a two-storey house, usually we build the first floor using brick as the building material and wood for the second floor due to our budget constraints. (Quote 11, CM 24, 24 y male and riverside kampung dweller).

Residents observed changes in their kampung settlements due to population growth and the kampung's illegal status. Figure 14a presents satellite imagery of Kampung Kali Apuran as of October 2018, accompanied by a quote detailing the settlement's historical transformation.



Source(s): Figure by authors

Figure 13.
Maps showing the
positions of Kelurahan
Kedaung Kali Angke
and Kampung Kali
Apuran in Jakarta

In the 1980s, the Kali Apuran river width was around five metres with a few houses around it. The increase in population that started from the 1990s led to not only densification in our kampung but also river constriction to only two metres. In 2014, the government evicted half of our kampung's population, destroyed houses above and beside the river, widened the river to 10 metres, and built five-metre-wide roads along both sides of the river. (Quote 12, CM 23, 19 y male and riverside kampung dweller).

Research participants created a sketch map showing the river and settlement's changes over time (Figure 17). Government plans for a 15-m road expansion threaten evictions for settlers. Residents find this excessive, given the river's current width and the road's size being unnecessary for traffic. They assert that their longstanding residence gives them the right to stay. The effective pumping system's role in flood reduction further questions the need for eviction.

Participants proposed enhancing the existing river water pumping system instead of widening the road. Whilst it lessens flooding, it also disturbs the river's natural flow. The river water in their area, cut off from adjacent rivers, accumulates wastewater, leading to pollution and odour. The subsequent quote and Figure 18 suggest solutions for government implementation.

I hope the government will enhance the quality of the river water pumping system in our kampung. This would be realised if the pumping system not only drained the river when it is overloaded but



(a)

Source(s): Google Earth



(b)

Source(s): Figure by authors

Figure 14.
(a) Satellite imagery of
Kampung Kali Apuran
and (b) map overlaying
the spatial planning
regulation map and the
existing settlement
building map in
Kampung Kali Apuran

also channels and circulates the river water to the Cengkareng drain and Kali Pesing river, like it used to be. (Quote 13, CM 28, 23 y female and riverside kampung dweller).

The community acknowledges its role in river water pollution. The focus group aimed to identify solutions they could offer, especially in waste treatment, to improve their environment.

Initially, since water over capacity leads to local flooding when the rains come, we must improve the drainage network in our kampung by adding more pipes and straightening bent pipes. Beyond that, we can think about wastewater treatment. Because we live in a high-density settlement, instead of individual treatment we propose communal wastewater treatment points. From those points, the cleaned water can go into the river. Wastewater treatment can use a similar system to a biopore hole that does not use mechanical equipment. In this kind of system, dirty water is absorbed into the engineered soil and refined water can go to the river. (Quote 14, CM 26, 31 y female and riverside kampung dweller)

This quote shows that research participants were aware of the possibility of applying modern water management methods to their proposal of a biopore hole.

5. Discussion

Jakarta's significant economic and population expansion has increased its susceptibility to flooding, necessitating a substantial transformation in metropolitan planning and risk management (Sagala *et al.*, 2013). We posit that such transformation can be spurred by participatory planning, a process that will be elaborated upon herein. The insights from this study are likely transferrable to other flood-prone Indonesian cities, especially those along Java's northern coast, such as Semarang and Surabaya, given their shared flood management challenges, spatial planning, geographic characteristics and rapid urbanisation (see Rahardjo, 2014).



Figure 15. Research participants' sketch over of the settlement map of the flood situation in Kampung Kali Apuran

Source(s): Figure by authors

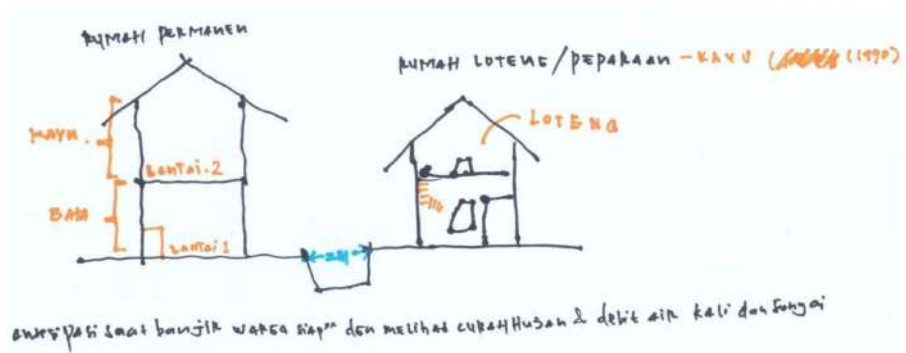
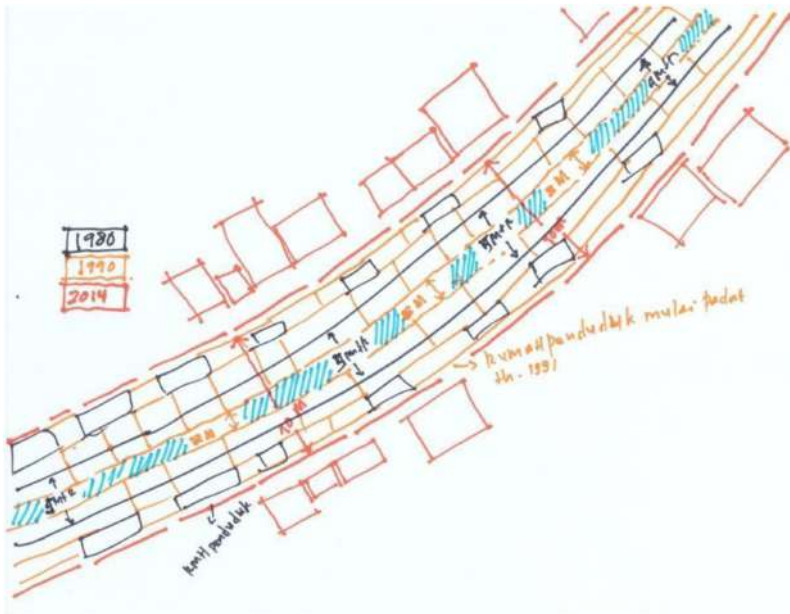


Figure 16. Sketch by research participants showing flood-adapted house types in Kampung Kali Apuran: two-storey houses called *rumah permanen* (left) and attic houses called *rumah loteng/peperaan* (right)

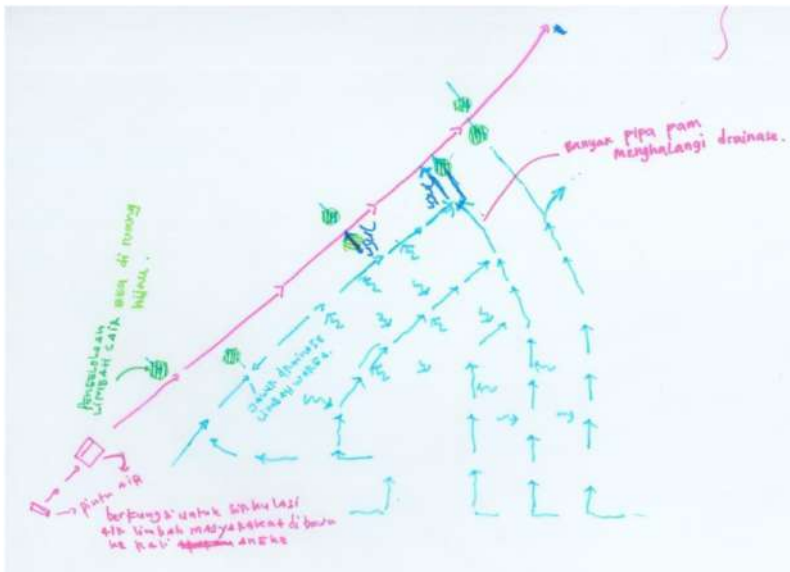
Source(s): Figure by authors

Jakarta relies on infrastructural flood management, influenced by colonial and Western practices (Octavianti and Charles, 2018). This approach, aligned with short political cycles, is critiqued for inadequately addressing flood risks and exacerbating spatial injustices (Padawangi and Douglass, 2015). Scholars argue for a broader perspective beyond



Source(s): Figure by authors

Figure 17.
Sketch by research
participants
illustrating the
transformation of the
form of their settlement
over time



Source(s): Figure by authors

Figure 18.
Sketch by research
participants of a
possible water
management solution
in Kampung Kali
Apuran

infrastructure to effectively manage environmental and land-use challenges intensified by global changes (Neolaka, 2013). This study shows that collaborative approaches, integrating local knowledge, foster innovative flood adaptation strategies beyond infrastructure reliance. This shift is vital yet challenging within Jakarta's participatory planning, often limited to symbolic public consultations.

We recommend transitioning from formal consultation to, bottom-up approaches like focus groups and design charrettes during the planning and design stages, embodying collaborative planning with a focus on design learning environments. A knowledge co-production space can be designed to support improved urban environmental governance and achieve city sustainability (Frantzeskaki and Kabisch, 2016). Berman (2016) state that collaborative planning provides opportunities for communities to contribute to the development of spatial plans alongside planners. Such a participatory approach encourages cooperative dialogues between all stakeholders and can incorporate local knowledge into planning policies (Berman, 2016). Our findings align with and further elucidate the argument of Al-Kodmany (2001) that community-based planning can be realised through the use of media or materials with effective visualisation. Diverse communities may have different languages, which could complicate their collective communication about ideas, concerns and visions (Al-Kodmany, 2001).

Communities often struggle to partake in collaborative planning due to eviction risks, as their homes may hinder water flow near rivers and oceans. We advocate for the Jakarta administration to boost community involvement in urban planning for better flood defences. Tyler *et al.* (2019) suggest achieving flood resilience by retaining open areas and wetlands, supporting water cycles and reducing flood impacts. Additionally, engaging communities in flood strategy and recovery helps them manage flood dangers (Tyler *et al.*, 2019). Our focus groups and design workshops reveal that active community participants can devise tactics for developing open spaces, conserving wetlands and constructing flood-resistant housing.

In our study, the familiarity amongst neighbours during collaborative sessions reflected indigenous values of "*musyawarah*" and "*gotong royong*", fostering a unified and inclusive dialogue. Yet, participatory planning is geographically constrained; distinct local expectations and challenges may reduce its efficacy on a larger scale (Pissourios, 2014). To harness local knowledge for planning, we advise honing community-based, collaborative planning to develop flood adaptations at the neighbourhood level. Our findings contribute to research on community-based planning that empowers local bodies to combat climate change, aiming to increase citizen engagement and democratic governance at the local level (see Fischer, 2021). We argue for the involvement of neighbourhood-level institutions, which are more effective than broader entities like cities or districts.

Refining collaborative planning is essential for its practicality and expansion. Community-led methods face issues like inappropriate strategies due to diverse preferences and kampung constraints. For example, whilst floating houses align with amphibious urbanism and flood adaptation, they may increase tsunami risk and must avoid carcinogenic materials like asbestos (see Ladou, 2004). Enhancing expert participation is vital to ensuring community-led flood responses are viable and safe. However, it might limit genuine community engagement, impacting collaboration. Thus, balancing stakeholder integration is vital for effective planning (see Ansell and Gash, 2018).

Similar to most former colonial countries in the majority world, Indonesia adheres to a regulatory and master planning system (Hudalah and Woltjer, 2007) that provides space for bottom-up processes through public consultation processes, which inadequately accommodate community participation. Our proposed collaborative planning method, aimed at replacing traditional consultations, can be seamlessly integrated into Indonesia's planning framework. We acknowledge the importance of refining this approach further, guided by insights from existing research. The Asian Cities Climate Change Resilience Network (ACCCRN) has been instrumental in conducting vulnerability evaluations, strategic

planning, capacity enhancement and knowledge sharing. ACCCRN's initiatives across India, Indonesia, Thailand and Vietnam have pioneered participatory flood resilience solutions. It is clear from these experiences that localised adaptation of participatory processes is essential, factoring in geographical, resource-based and urban-specific requirements. Data availability and quality present challenges, ranging from computerised to manual management systems. Moreover, whilst some regions prefer data-driven quantitative assessments, others benefit from qualitative, participatory approaches (Sharma *et al.*, 2014).

Jakarta's floods are often attributed to excessive use of water control methods (Meulder, 2013; Octavianti and Charles, 2018). Echoing post-colonial research (Williams *et al.*, 2014), our study explores how globalisation might deter policymakers from utilising locally informed solutions. We suggest developing flood-adaptive areas collaboratively with disenfranchised communities, thereby aligning with research (Padawangi and Douglass, 2015, Bott *et al.*, 2020) that recognises these communities' capacity for effective grassroots development.

Jakarta's flooding results from a mix of natural and anthropogenic causes, originating both within the city and its upstream areas (Renald *et al.*, 2016). Addressing these floods necessitates a community-focussed strategy, supported by broader efforts. Rukmana and Indraprahasta (2020) point out that riverbank dwellers, often the most affected and marginalised, display a distrust of the government, thereby underscoring the need for non-governmental organisations (NGOs) to facilitate their involvement in flood management. Our research shows NGOs' critical role in engaging indifferent communities in policy development simulations for spatial planning. Additionally, Asdak *et al.* (2018) state that successful flood mitigation depends on upstream councils' dedication to maintaining water catchments to manage the flow into Jakarta during peak rainfall.

6. Conclusions

This research suggests that place-based planning policies can be developed in cities, like Jakarta, through collaborative planning processes at neighbourhood scales. Bottom-up initiatives can help integrate community perspectives into the planning policies focussed on flooding adaptation in Jakarta. Such approaches are well suited to address the social and cultural contexts of kampungs, due to the existence of *gotong royong* or collective culture values. Participatory approaches in planning, which emphasise citizen leadership and partnerships with stakeholders, could share the responsibility of shaping city developments not only with social elites but also with local communities. This can be implemented through focus groups and design charrettes to enable collective sessions guided by multi-sectoral experts. The contribution we aim for is for local citizens to have the space and time to rewrite North Jakarta. Supporting informal settlement dwellers to write over the official maps is a step that recognises the existence of knowledge systems constructed beyond the official discourse and the heritage of colonialism. It is Indonesian people letting the Indonesians of North Jakarta lead their own space and time. The findings of this study are applicable to other major cities in Indonesia such as Semarang and Surabaya, which share similarities in geography, informal urban conditions and spatial planning approaches. On a broader scale, considering geographical, resource-based and urban-specific requirements, these findings could also be adopted by other major cities across Asia.

References

- Al-Kodmany, K. (2001), "Bridging the gap between technical and local knowledge: tools for promoting community-based planning and design", *Journal of Architectural and Planning Research*, Vol. 8 No. 2, pp. 110-130.

- Ansell, C. and Gash, A. (2018), "Collaborative platforms as a governance strategy", *Journal of Public Administration Research and Theory*, Vol. 28 No. 1, pp. 16-32, doi: [10.1093/jopart/mux030](https://doi.org/10.1093/jopart/mux030).
- Araos, M., Ford, J., Berrang-Ford, L., Biesbroek, R. and Moser, S. (2017), "Climate change adaptation planning for Global South megacities: the case of Dhaka", *Journal of Environmental Policy and Planning*, Vol. 19 No. 6, pp. 682-696, doi: [10.1080/1523908x.2016.1264873](https://doi.org/10.1080/1523908x.2016.1264873).
- Asdak, C., Supian, S. and Subiyanto (2018), "Watershed management strategies for flood mitigation: a case study of Jakarta's flooding", *Weather and Climate Extremes*, Vol. 21, pp. 117-122, doi: [10.1016/j.wace.2018.08.002](https://doi.org/10.1016/j.wace.2018.08.002).
- Bergsma, E. (2016), "Changed knowledge requirements for spatial flood governance", *Ecology and Society*, Vol. 21 No. 4, art40, doi: [10.5751/es-08952-210440](https://doi.org/10.5751/es-08952-210440).
- Berman, T. (2016), *Public Participation as a Tool for Integrating Local Knowledge into Spatial Planning: Planning, Participation, and Knowledge*, Springer, Cham.
- Bott, L.-M., Pritchard, B. and Braun, B. (2020), "Translocal social capital as a resource for community-based responses to coastal flooding—Evidence from urban and rural areas on Java, Indonesia", *Geoforum*, Vol. 117, pp. 1-12, doi: [10.1016/j.geoforum.2020.08.012](https://doi.org/10.1016/j.geoforum.2020.08.012).
- Caljouw, M., Nas, P.J. and Pratiwo, M. (2005), "Flooding in Jakarta: towards a blue city with improved water management", *Bijdragen tot de taal-land-en volkenkunde/Journal of the Humanities and Social Sciences of Southeast Asia*, Vol. 161 No. 4, pp. 454-484, doi: [10.1163/22134379-90003704](https://doi.org/10.1163/22134379-90003704).
- Charron, D.F. (2011), "Ecohealth: origins and approach", in *Ecohealth Research in Practice: Innovative Applications of an Ecosystem Approach to Health*, Springer.
- Clifford, N., Cope, M., Gillespie, T. and French, S. (2016), *Key Methods in Geography*, Sage, Los Angeles.
- Creswell, J.W. (2007), *Qualitative Inquiry and Research Design Choosing Among Five Approaches*, Sage Publications, Thousand Oaks, CA.
- Damayanti, V. and Spek, T. (2015), "The cultural biography of landscape as an interdisciplinary tool for landscape planning at banjarmasin city, South Kalimantan Province, Indonesia", *World Congress of the International Federation of Landscape Architects*, pp. 437-444 (In press).
- Dki Jakarta Province Central Bureau of Statistics (2017), *North Jakarta in Figures*, BPS, Jakarta (ID).
- Evers, H.-D. (2015), "Kampung air: water settlements on the Island of Borneo", *Journal of the Malaysian Branch of the Royal Asiatic Society*, Vol. 88 No. 1, pp. 79-85, doi: [10.1353/ras.2015.0004](https://doi.org/10.1353/ras.2015.0004).
- Fakultas Geografi Universitas Gajah Mada (2007), "Pemanasan global", available at: <http://www.korantempo.com/korantempo/koran/2009/02/28/Metro/krn.20090228.158222.id.html> (accessed 25 Mei 2009).
- Fischer, H.W. (2021), "Decentralization and the governance of climate adaptation: situating community-based planning within broader trajectories of political transformation", *World Development*, Vol. 140, 105335, doi: [10.1016/j.worlddev.2020.105335](https://doi.org/10.1016/j.worlddev.2020.105335).
- Frantzeskaki, N. and Kabisch, N. (2016), "Designing a knowledge co-production operating space for urban environmental governance—lessons from Rotterdam, Netherlands and Berlin, Germany", *Environmental Science and Policy*, Vol. 62, pp. 90-98, doi: [10.1016/j.envsci.2016.01.010](https://doi.org/10.1016/j.envsci.2016.01.010).
- Hudalah, D. and Woltjer, J. (2007), "Spatial planning system in transitional Indonesia", *International Planning Studies*, Vol. 12 No. 3, pp. 291-303, doi: [10.1080/13563470701640176](https://doi.org/10.1080/13563470701640176).
- IPCC (2014), *Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Intergovernmental Panel on Climate Change, Geneva, p. 151.
- Kartika, T. (2016), "Verbal communication culture and local wisdom: the value civilization of Indonesia nation", *Lingua Cultura*, Vol. 10 No. 2, pp. 89-93, doi: [10.21512/lc.v10i2.1424](https://doi.org/10.21512/lc.v10i2.1424).
- Koentjaraningrat, K.J. (1984), *Kebudayaan Jawa*, Balai Pustaka, Jakarta.

- Ladou, J. (2004), "The asbestos cancer epidemic", *Environmental Health Perspectives*, Vol. 112 No. 3, pp. 285-290, doi: [10.1289/ehp.6704](https://doi.org/10.1289/ehp.6704).
- Liao, K.-H., Le, T.A. and Van Nguyen, K. (2016), "Urban design principles for flood resilience: learning from the ecological wisdom of living with floods in the Vietnamese Mekong Delta", *Landscape and Urban Planning*, Vol. 155, pp. 69-78, doi: [10.1016/j.landurbplan.2016.01.014](https://doi.org/10.1016/j.landurbplan.2016.01.014).
- Manan, R.H. (2015), "Effective management of green spaces Jakarta City", *International Journal of Engineering Research and Technology (IJERT)*, Vol. 4, pp. 2278-0181.
- Margerum, R.D. (2011), *Beyond Consensus: Improving Collaborative Planning and Management*, MIT Press.
- Meulder, B.D. (2013), "Batavia, Simon Stevin in the tropics", in Shannon, K. and de Meulder, B. (Eds), *Water Urbanisms. East*, Park Books.
- Neolaka, A. (2013), "Stakeholder participation in flood control of Ciliwung river, Jakarta, Indonesia", *7th International Conference on Sustainable Water Resources Management, WRM 2013*, Vol. 171, pp. 275-285.
- Octavianti, T. and Charles, K. (2018), "The evolution of Jakarta's flood policy over the past 400 years: the lock-in of infrastructural solutions", *Environment and Planning C: Politics and Space*, Vol. 37 No. 6, 2399654418813578.
- Oppusunggu, R.E. and Tantular, R. (2015), "Creating people's awareness and pushing active contribution. Case: wider public engagement on flood and land use problems in Jakarta and surroundings", *Procedia-Social and Behavioral Sciences*, Vol. 184, pp. 240-244, doi: [10.1016/j.sbspro.2015.05.085](https://doi.org/10.1016/j.sbspro.2015.05.085).
- Osa, N.P. (2000), "The use of aerial photographs in soil survey in West Gharraf Project", *Iraqi Journal of Agricultural Research*, Vol. 5 No. 2, pp. 174-181.
- Padawangi, R. and Douglass, M. (2015), "Water, water everywhere: toward participatory solutions to chronic urban flooding in Jakarta", *Pacific Affairs*, Vol. 88 No. 3, pp. 517-550, doi: [10.5509/2015883517](https://doi.org/10.5509/2015883517).
- Pissouris, I. (2014), "Top-down and bottom-up urban and regional planning: towards a framework for the use of planning standards", *European Spatial Research and Policy*, Vol. 21 No. 1, pp. 83-99, doi: [10.2478/esrp-2014-0007](https://doi.org/10.2478/esrp-2014-0007).
- Prana, A.M., Dionisio, R., Curl, A., Hart, D., Gomez, C., Apriyanto, H. and Prasetya, H. (2024), "Informal adaptation to flooding in North Jakarta, Indonesia", *Progress in Planning*, Vol. 165, 100851, doi: [10.1016/j.progress.2024.100851](https://doi.org/10.1016/j.progress.2024.100851) (In press).
- Prasetyanti, R. (2015), "Slum Kampong tourism "Jakarta hidden tour": designing eco-cultural based pro-poor tourism", *European Journal of Interdisciplinary Studies*, Vol. 1 No. 3, pp. 111-121, doi: [10.26417/ejis.v1i3.p111-122](https://doi.org/10.26417/ejis.v1i3.p111-122).
- Putri, P.W. (2018), "Sanitizing Jakarta: decolonizing planning and kampung imaginary", *Planning Perspectives*, Vol. 33 No. 4, pp. 1-21.
- Rahardjo, P.N. (2014), "7 Penyebab Banjir Di Wilayah Perkotaan Yang Padat Penduduknya", *Jurnal Air Indonesia*, Vol. 7 No. 2, doi: [10.29122/jai.v7i2.2421](https://doi.org/10.29122/jai.v7i2.2421).
- Ramadhayanti, Z. (2015), "Implementasi Kebijakan Pengendalian Banjir Provinsi DKI Jakarta melalui Proyek Kanal Banjir Timur", *Journal of Politic and Government Studies*, Vol. 4, pp. 121-130.
- Renald, A., Tjiptoherijanto, P., Suganda, E. and Djakapermana, R.D. (2016), "Toward resilient and sustainable city adaptation model for flood disaster prone city: case study of Jakarta capital region", *Procedia-Social and Behavioral Sciences*, Vol. 227, pp. 334-340, doi: [10.1016/j.sbspro.2016.06.079](https://doi.org/10.1016/j.sbspro.2016.06.079).
- Rukmana, D. (2015), "The change and transformation of Indonesian spatial planning after Suharto's New order regime: the case of the Jakarta metropolitan area", *International Planning Studies*, Vol. 20 No. 4, pp. 350-370, doi: [10.1080/13563475.2015.1008723](https://doi.org/10.1080/13563475.2015.1008723).
- Rukmana, D. and Indraprahasta, G.S. (2020), "Participatory governance in mitigating annual floods in Jakarta", in *The Routledge Handbook of Planning Megacities in the Global South*, Routledge.

- Sagala, S., Lassa, J., Yasaditama, H. and Hudalah, D. (2013), "The evolution of risk and vulnerability in Greater Jakarta: contesting government policy in dealing with a megacity's exposure to flooding", The Institute of Resource Governance and Social Change.
- Salaududin, M. and Pearson, J. (2019), "Experimental study on toe scouring at sloping walls with gravel foreshores", *Journal of Marine Science and Engineering*, Vol. 7, p. 198, doi: [10.3390/jmse7070198](https://doi.org/10.3390/jmse7070198).
- Setiadi, R., Sutanto, A. and Suroso, D.S. (2015), "Flood vulnerability assessment in the city of Jakarta", *Procedia Earth and Planetary Science*, Vol. 14, pp. 46-54.
- Sharma, D., Singh, R. and Singh, R. (2014), "Building urban climate resilience: learning from the ACCCRN experience in India", *International Journal of Urban Sustainable Development*, Vol. 6 No. 2, pp. 133-153, doi: [10.1080/19463138.2014.937720](https://doi.org/10.1080/19463138.2014.937720).
- Simarmata, H.A. and Krishnan (2018), *Phenomenology in Adaptation Planning*, Springer, Cham.
- Sjaifudian, H. (2002), "Encouraging citizen participation through partnership approach: the experience of IPGI", *Logolink International Workshop on Participatory Planning Approach for Local Governance*, Bandung, Indonesia, pp. 20-27.
- Steinmo, S. (2012), "Historical institutionalism", in Della Porta, D. and Keating, M. (Eds), *Approaches and Methodologies in the Social Sciences: A Pluralist Perspective*, Cambridge University Press.
- Surtiari, G.a. K., Djalante, R., Setiadi, N.J. and Garschagen, M. (2017), "Culture and community resilience to flooding: case study of the urban coastal community in Jakarta", in *Disaster Risk Reduction in Indonesia: Progress, Challenges, and Issues*, pp. 469-493.
- Texier, P. (2008), "Floods in Jakarta: when the extreme reveals daily structural constraints and mismanagement", *Disaster Prevention and Management*, Vol. 17 No. 3, pp. 358-372, doi: [10.1108/09653560810887284](https://doi.org/10.1108/09653560810887284).
- Thelen, K. (1999), "Historical institutionalism in comparative politics", *Annual Review of Political Science*, Vol. 2 No. 1, pp. 369-404, doi: [10.1146/annurev.polisci.2.1.369](https://doi.org/10.1146/annurev.polisci.2.1.369).
- Tyler, J., Sadiq, A.-A. and Noonan, D.S. (2019), "A review of the community flood risk management literature in the USA: lessons for improving community resilience to floods", *Natural Hazards*, Vol. 96 No. 3, pp. 1223-1248, doi: [10.1007/s11069-019-03606-3](https://doi.org/10.1007/s11069-019-03606-3).
- Van Voorst, R. (2016), "Formal and informal flood governance in Jakarta, Indonesia", *Habitat International*, Vol. 52, pp. 5-10, doi: [10.1016/j.habitatint.2015.08.023](https://doi.org/10.1016/j.habitatint.2015.08.023).
- Wannewitz, M. and Garschagen, M. (2021), "Mapping the adaptation solution space—lessons from Jakarta", *Natural Hazards and Earth System Sciences*, Vol. 21 No. 11, pp. 3285-3322, doi: [10.5194/nhess-21-3285-2021](https://doi.org/10.5194/nhess-21-3285-2021).
- Williams, G., Meth, P. and Willis, K. (2014), *Geographies of Developing Areas: The Global South in a Changing World*, Routledge, London.
- Yin, R.K. (2013), *Case Study Research: Design and Methods*, Sage Publications, Thousand Oaks.

About the authors

Adam Madigliani Prana is Postdoctoral Fellow at the Research Center for Sustainable Production System and Life Cycle Assessment, National Research and Innovation Agency (BRIN), Republic of Indonesia. Additionally, he lectures in the master's program for Urban and Regional Planning at Tarumanagara University, Indonesia. He has also served for over 14 years as Civil Servant in the Ministry of Spatial Planning and Agrarian Affairs/National Land Agency, Republic of Indonesia. This background propels Adam to conduct research not only from an academic perspective but also as a government practitioner in the fields of urban planning, geography, urban design and environmental science. Adam Madigliani Prana is the corresponding author and can be contacted at: adam.prana@gmail.com

Angela Curl is Social Scientist interested in the relationships between urban environments, transport and health. She is particularly interested in how public policies, particularly in transport, urban planning and housing, can address health inequalities and transport disadvantage.

Maria Rita Dionisio is Senior Lecturer in Geography at the University of Waikato. Her research focuses on the connections between urban communities and sustainable urban regeneration. With a background in architecture and urbanism, her research is interdisciplinary and centers on culturally led,

socio-ecological approaches to collaborative planning to address systemic challenges at crossings with urban land, policy and socio-cultural wellbeing.

Christopher Gomez's research deals with the chain of environmental processes that act at the landscape scales, integrating hydrology, sediments, vegetation and human activities, with an emphasis on hazardous earth processes.

Deirdre Hart researches the physical, biological and human processes and interactions of coastal environments via a multi-disciplinary approach. Her research interests span temperate and tropical coastal and river-mouth science, with an emphasis on tides, sea levels and multi-hazards.

Heri Apriyanto is Senior Researcher and Coordinator at the Research Group for the Low-Carbon Area Development System, BRIN. His research interests include environmental and natural resources management modeling and low-carbon area development planning.

Hermawan Prasetya is Senior Researcher and Unit Coordinator of SMEs, Tourism Industry, and Creative Economy Policies, BRIN, actively writing journal and seminar papers on sustainable bioenergy, industry and modeling.