

Invisible Waters in a Sinking City

Exploring Jakarta's Complex and Uncertain Future Relationship with Water



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1. Problem statement

Jakarta is sinking, not due to rising sea levels but a lack of water access - specifically clean piped water (Goh, 2019). The colonial history of Jakarta has led to a poor and unfairly distributed water infrastructure and the rapid growth of the population and city has worsened it (Colven, 2020). The government has decided to create a new capital city , leaving those behind who cannot afford to move, in a sinking city (Widodo, 2017)(Siriwardane-de Zoysa et al., 2021). Jakarta has an uncertain future ahead (Erkens et al., 2015).

“Jakarta will continue to sink until groundwater stops being pumped. And groundwater will continue to be pumped until the government provides an alternative.”

- VOX (2021)

2. Research questions

The goal of this research is to formulate a speculative scenario of Jakarta's future in the face of land subsidence and the change of the capital. The research will start off with background information on why Jakarta is sinking by diving into the historical context of the city. Some of the measures taken by the government will be shortly introduced in the background information and problem statement but will later be expanded on in the first sub-research question. Based off of the problem statement, the following research question has been formulated to lead the research:

What design strategies might support part of Jakarta's urban landscape and community in a speculative future to adapt to the results of the pressures of capital relocation and ongoing land subsidence?

The answer to the main research question will be found through several sub questions that follow different themes. The first theme is 'Current and Historical Adaptive Strategies' in which current and historic strategies are explored. The second theme is 'Impact'. This theme will dive deep into the impact of capital relocation and land subsidence on Jakarta's economic, social, and infrastructural dynamics and its most affected communities. The third theme 'Similar Cities' is about how other cities have experienced and approached similar issues of sinking or capital relocation. The fourth and last theme 'Speculative urban scenario development' serves as the first step towards the design phase. Before coming up with a design, a scenario of Jakarta's future must be speculated in which the design could serve (part of) Jakarta's community. The future can of course not be perfectly predicted, therefore this research will solely speculate based on the findings of the previous research questions. The last research question will finally determine for which community I will make a design and what their needs are now and in the chosen speculative future.

Current and Historical Adaptive Strategies

1. What are the current adaptive strategies employed by the city and its communities to address land subsidence and flooding, and how effective are they?
2. What historical strategies have Jakarta's communities used to manage water-related challenges, and how can these inform speculative future responses?

Impact

3. How will the relocation of the capital to Nusantara likely impact Jakarta's economic, social, and infrastructural dynamics, especially in areas most affected by land subsidence?
4. Which communities or neighbourhoods are expected to experience the greatest challenges due to land subsidence, flooding, and the capital shift, and what are the key vulnerabilities within these areas?

Similar Cities

5. What design and policy approaches from other sinking or post-capital cities could inform adaptive and resilient strategies for Jakarta?

Speculative Urban Scenario Development

6. What speculative futures could arise for Jakarta's neighbourhoods under worsening land subsidence and shifting socio-political dynamics?

3. Methodological framework

As mentioned in the ‘Research questions’, this research aims to formulate a speculative scenario of Jakarta’s future in the face of land subsidence and the change of the capital. This type of research aligns with the concept referred by Leitner and Sheppard (2023) and Fields (2022) as ‘speculative urbanism’ or ‘urban speculation’ as referred by the Centre for Digital Cultures (2024). These conceptual frameworks allow researchers to examine hypothetical future developments in urban landscapes and social systems based on current trajectories and emerging challenges.

The first three themes ‘Current and Historical Adaptive Strategies’, ‘Impact’, and ‘Comparisons’ serve to create the foundation of the ‘Speculative urban scenario development’ that will lead to the design phase. This structured approach ensures that the speculative urban scenario development is grounded in realistic understandings of Jakarta’s socio-environmental landscape, historical adaptation patterns, and comparative global case studies.

The methods and tools used in this research will be listed under each research question’s theme to have a clear overview and guideline of the methodological framework.

Current and Historical Adaptive Strategies

To explore Jakarta’s existing adaptive strategies for land subsidence and flooding, this research will analyse policy documents and urban development plans to understand the government’s current approaches. Media analysis will be conducted to capture public perspectives on these strategies and to identify any concerns from the community regarding their effectiveness. Community responses to land subsidence or the results of it will also be found through media analysis. Additionally, Geographic Information System (GIS) mapping - if available - will help visualize where adaptive measures have been implemented, offering spatial insights into the effectiveness of these initiatives. Finally, a review of academic publications and reports will provide a deeper understanding of the strengths and limitations of Jakarta’s current adaptation efforts.

Understanding historical approaches to water management in Jakarta might be able to give insight on how traditional and indigenous practices could help respond to current and future challenges. Such practices will most likely be found in documented oral histories, documentaries, and other historic literature and will therefore be reviewed. Furthermore, finding maps of Jakarta’s urban landscape through the years will help trace changes in water infrastructure.

Impact of Capital Relocation

To assess the anticipated socio-economic and infrastructural impacts of relocating Indonesia’s capital to Nusantara, this research will look back on the findings about the current adaptive strategies employed in an analysis of policy documents and government development plans but will delve deeper in the outlined expected changes in Jakarta’s economy and infrastructure. Media analysis will capture public opinion on the capital relocation and anticipated social or economic challenges. When on-site data collection is

not feasible, data from government reports or academic papers will serve as a substitute for providing perspectives on which communities may experience significant disruptions and what support measures might be necessary.

Impact on Vulnerability of Communities

Identifying the communities most vulnerable to land subsidence, flooding, and the potential impact of capital relocation will involve GIS mapping and a vulnerability analysis. This approach will highlight high-risk neighborhoods based on environmental and socio-economic factors, including flood-prone areas, socio-economic status, and access to clean water resources. The study will also use secondary data, such as analytical maps, to assess socio-economic indicators and population density, helping to locate communities at heightened risk. In addition, the historical background of Jakarta's infrastructure changes and the findings from the research questions on current and historical adaptive strategies will offer context for understanding current vulnerabilities, particularly in neighborhoods that have previously adapted to environmental pressures.

Comparative Case Studies of Similar Cities

A case study analysis of several cities worldwide that face similar challenges to Jakarta, such as land subsidence, flooding, or the capital relocation will be done in this research. Each city will be organized through their current or already solved challenges, their strategies for these challenges, and the lessons they may offer to Jakarta. This serves to become somewhat of a guide to what Jakarta could do to approach these challenges or what could happen to the city.

Cities that face land subsidence and flooding like Venice, Bangkok, Thailand, Manila, Mexico City, Dhaka will be analysed. Other cities such as Shanghai, Tokyo, and Taipei have successfully mitigated severe land subsidence and will therefore also be briefly mentioned.

The former and new capital cities of Brazil, Malaysia and Egypt will be taken as case studies on capital relocation.

Policy documents, planning frameworks, and architectural projects from these case study cities will be analysed to understand what adaptive and resilient strategies they employed. Attention must especially be paid to community-involved initiatives, government policy shifts, and urban infrastructure projects to inform the speculative scenario development later on in the research. By examining these cases, Jakarta can identify strategies that best suit its unique social, economic, and environmental context.

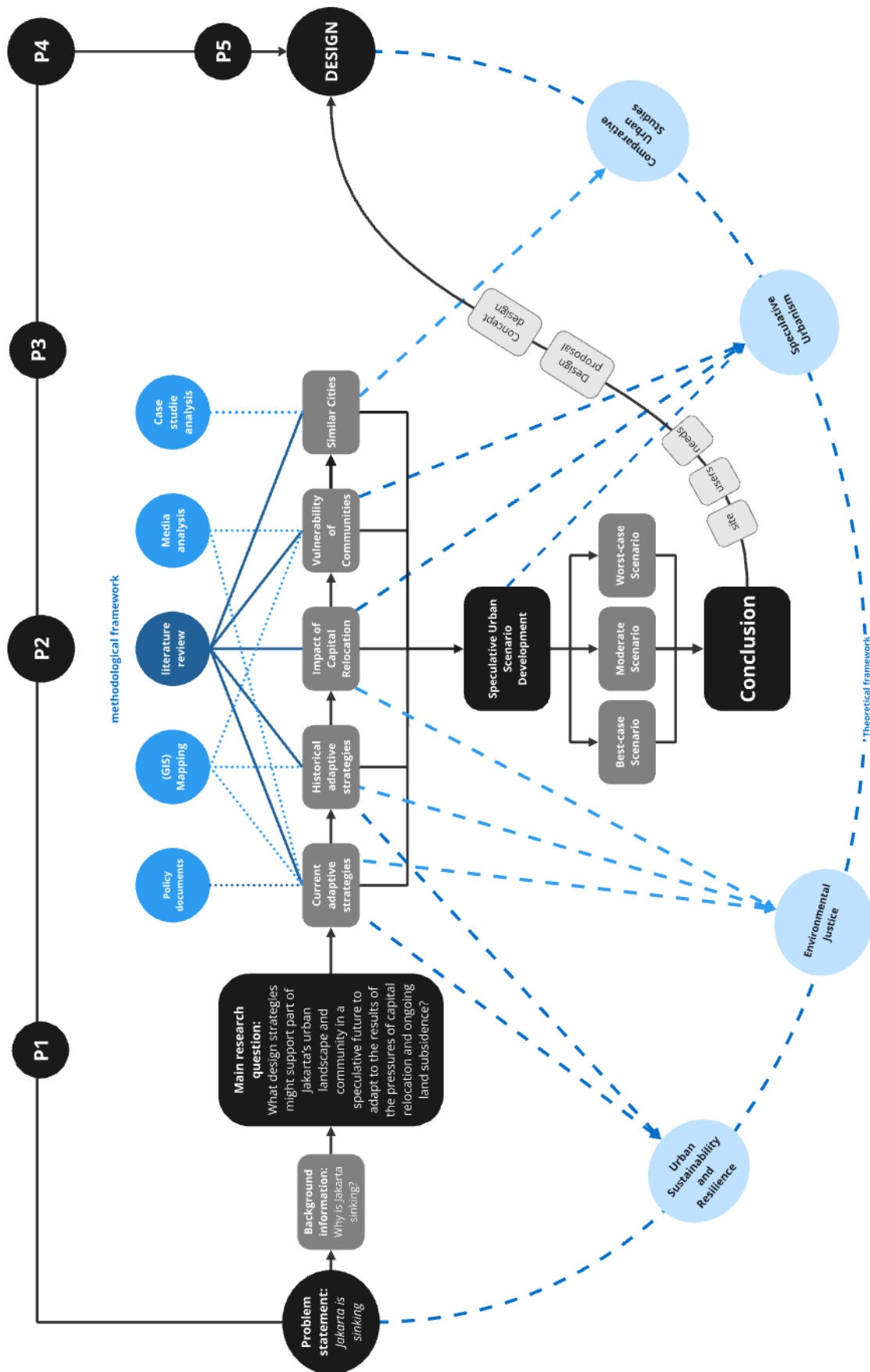
Speculative Urban Scenario Development

The core of this research lies in speculative urban scenario development, which will synthesize findings from the literature, media, expert perspectives, and spatial analysis of the previous research questions. This stage will develop detailed scenarios, including best-case, moderate, and worst-case outcomes that consider social, economic, and infrastructural changes likely to impact Jakarta's neighbourhoods. For example, a scenario where all upper socio-economic groups will leave Jakarta and no measures are

taken anymore to stop land subsidence resulting in the coastal area to be flooded for 95% in 2050 which will displace a big portion of the population.

Visual and spatial modelling through maps (made with GIS if possible) and drawings will produce visual representations of each scenario, helping to illustrate potential spatial impacts and adaptive infrastructure solutions. A thematic analysis of these scenario narratives will identify recurring themes and potential design implications, and finally a documentation will be compiled to have a clear overview of the speculative scenarios, visualizations, and thematic insights, so a comprehensive framework for imagining Jakarta's future urban resilience can be formed. This will make it easier to choose a scenario for the design phase.

4. Research Diagram



5. Theoretical framework

The theoretical framework for this research combines speculative urbanism, urban resilience theory, environmental justice, and comparative urban studies to explore Jakarta's future amid land subsidence and capital relocation. Together, these themes provide a framework for imagining Jakarta's speculative future, and may become a guide to the development of adaptive, equitable design strategies that align with Jakarta's unique socio-environmental landscape and challenges.

Speculative Urbanism

Fields (2022) describes speculative urbanism as the intersection of real estate speculation and urban development, often leading to social and spatial changes that may displace vulnerable communities. This perspective is essential for examining how speculative forces could reshape Jakarta's neighbourhoods, particularly under pressures of capital relocation and environmental challenges. Additionally, Leitner and Sheppard (2023) discuss speculative urbanism's dual impact—while it can drive urban growth, it may also exacerbate inequalities, affecting community resilience. These insights allow the research to assess which communities in Jakarta might benefit from or be at risk of displacement. The Centre for Digital Cultures (2024) highlights the role of digital technologies in envisioning future cities, supporting the use of GIS and digital modelling to develop speculative, technology-driven scenarios for Jakarta's adaptation to socio-environmental changes.

Urban Sustainability and Resilience

Urban resilience refers to a city's ability to recover from hardships and return to its normal state, encompassing responses to climate change, natural disasters, and other adversities (Jagannath, 2018). This theory supports the analysis of Jakarta's capacity to adapt to land subsidence and flooding by focusing on strategies for creating resilient urban design solutions. It frames the exploration of current adaptive strategies and informs scenario-building by emphasizing sustainable responses to future environmental risks.

Environmental Justice

Environmental justice focuses on "documenting and understanding the disproportionate and unequal environmental burdens that certain communities face" (Taylor, 2020). This theory allows the study to analyse how Jakarta's most vulnerable communities may be impacted by capital relocation and environmental pressures, ensuring that proposed solutions are inclusive and support community resilience.

Comparative Urban Studies

Examining cities with similar challenges, like Venice, Bangkok, and Brasília, offers insights into effective resilience strategies. This comparative approach helps Jakarta

identify relevant adaptive measures from proven global cases, enriching speculative scenario-building with practical strategies for urban adaptation.

6. Relevance of research

Jakarta faces complex and interlinked challenges, including extreme land subsidence, climate change, unequal access to clean water, pollution, and the legacy of colonial urban planning. By 2050, as much as 95% of North Jakarta could be submerged due to the city's rapid land subsidence, driven largely by excessive groundwater extraction and exacerbated by climate change impacts, such as rising sea-levels and rainfall variability (Chaussard et al., 2012).

Low-income communities will likely be most affected by the pressures of land subsidence and the capital relocation, as they can not simply relocate and are very limited in what they can do to adapt (Colven, 2020). This aligns with the environmental justice perspective, which emphasizes the need to address the "disproportionate and unequal environmental burdens that certain communities face" (Taylor, 2020).

Moreover, the relocation of Indonesia's capital to Nusantara represents a significant political shift that could alter Jakarta's socio-economic landscape. This move may reduce Jakarta's importance as an administrative center, potentially leading to reduced investment in its infrastructure and further marginalizing already vulnerable neighborhoods (Centre for Digital Cultures, 2024).

As a student of Architecture I can ofcourse not solve all these issues. However, this research will atleast try to outline strategies that could lift off some of the pressures of land subsidence in Jakarta. Making urban speculations of Jakarta's future in the face of land subsidence and capital relocation will atleast prepare us of what could become of Jakarta and how we can decide to respond to it. On that account, an architectural response is most certainly one that will be of necessity.

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