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# Small island settlement planning in Panggang island, DKI Jakarta

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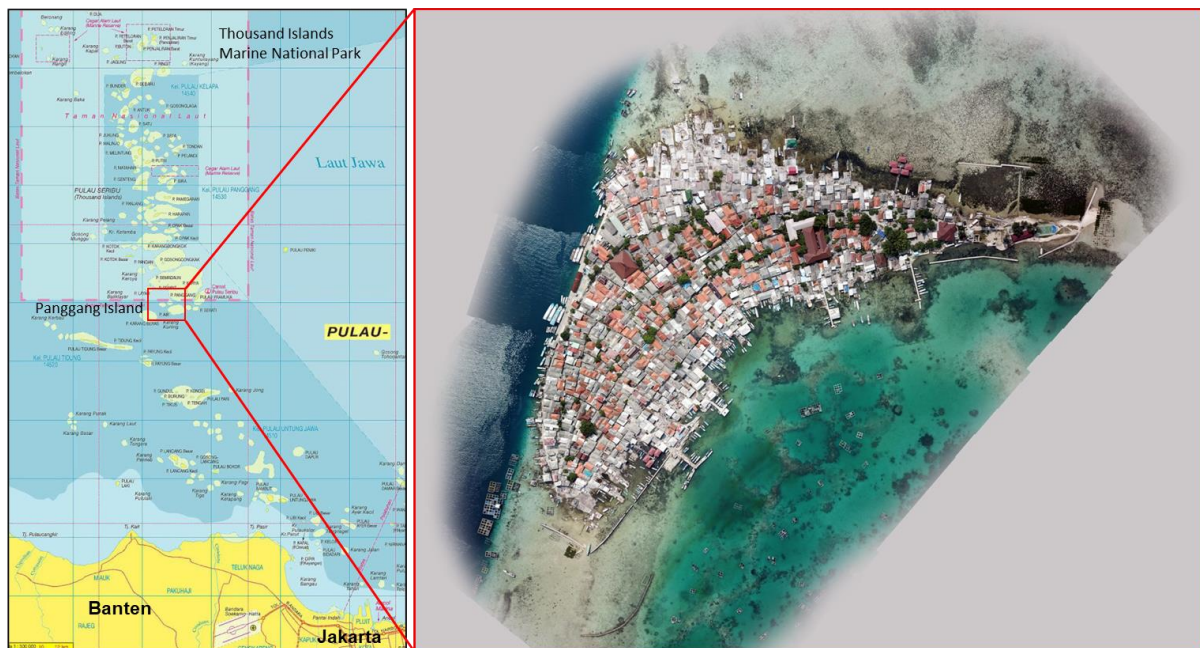
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**Abstract.** Despite the fact that North Jakarta has been prompted as the new frontier of development with megaprojects, artificial islands, and large-scale infrastructures, little attention is paid to the development of small islands in Kepulauan Seribu, north of Jakarta, focused on Panggang island, one of the inhabited islands in Kepulauan Seribu, among Indonesia's densest islands. There were the three challenges to the urbanization of small islands in the Jakarta megaregion, including: population growth, land availability and reclamation, and essential infrastructure provision. Through a participatory workshop with local authorities and communities, this paper proposed a model of sustainable settlement planning in Panggang Island, based on housing need assessment and spatial structure improvement to ensure the future settlement sustainability in Panggang island. To conclude, this paper critically reflects on the engagement process with local communities and the challenges in actualizing the settlement planning proposal in Pulau Pangang.

## 1. Introduction

Regardless the fact that Jakarta's North Coastal Area has been prompted as the new frontier of real estate development in post-Soeharto's era [1], the socio-spatiality of Seribu island remains under-researched apart from its potentiality in archipelagic tourism [2][3], thereby emphasizing that some of its inhabited islands, including Panggang island, have undergone rapid densification and spatial expansion through incremental reclamation, leading to severe environmental and health problems for its inhabitants. In Seribu island, particularly in Pari and Pramuka islands, the transformation is driven by a shift in economic structure from primary to tertiary sectors due to tourism and leisure business [4]. Meanwhile, in Panggang island, where tourism destination is not available, the transformation is mainly driven by migration in scout for jobs in fisheries and tourism related services. As Seribu island being designated as Maritime National Park based on the Ministry of Environment and Forestry's Regulation 76/2015, there have been growing concerns regarding the rapid transformation of the inhabited islands and the impact of tourism on its environment. Additionally, Seribu island had the highest climate-related social vulnerability, with sea-level rise and water pollution from Jakarta Bay as the main driving factors [5].





**Figure 1.** Panggang island 's location in Kepulauan Seribu, DKI Jakarta  
(Source: Authors)

Nonetheless, those problems are not unique to Panggang island. Scholars elsewhere have addressed the challenge to island cities or urban islands, pointing out the spatiality of the island which has influenced the city-making process [6][7] and vice versa, how urbanization has impacted the socio-environmental condition of the urban island, particularly in shelter and housing [8]. Das [9] explicitly reports the appropriate response in addressing housing issues in small island cities, including: inclusivity, affordability, tenure security, and innovative design and technologies under pro-poor policy strategies. In his comparative studies, Das depicted several strategies of settlement planning, including land pooling and readjustment. The term refers to an effort of redrawing boundaries and adjustment of property rights [10][11] to allocate more space for facilities and utilities such as roads or greenery as high-density settlement usually is lacking in appropriate road structure and public space. Land readjustment also made *in situ* upgrading possible rather than evicting and relocating the inhabitants away from the original settlement site, leading to severe consequences of socio-economic opportunity loss [12]. Not only had it covered the response to the increase of population, but the need to solve housing and shelter issues has also considered to address the growing concern regarding the island's sustainability and resilience to climate change [13], as there have been trends to mimic eco-movement rather than providing a contextualized solution to the challenge of small island development [14].

This paper suggests the concern to address land and housing issues in Panggang island through a collaborative effort, acknowledging that the process is required to be conducted with local communities and authorities, in which the settlement planning proposal was made through consultation and participatory planning with different stakeholders. This paper further illustrated the principles, model, and process undertaken in Panggang island settlement planning. After briefly discussing the discourse of small island settlement planning in the introduction, this paper elaborated the methods and results of this study. The discussion is structured into two parts. The first part outlines settlement planning issues in Pulau Panggang, while the second part illustrates the planning model for settlement in Panggang Island. The discussion is followed by a conclusion and critical reflection regarding the limitation of consultation and participatory process in settlement planning.

## 2. Methods

This research was conducted, covering: field observation, mapping, and consultation with local communities and authorities in Panggang island from 2017-2019. Fieldworks were conducted several times in 2017-2018 and aimed to identify land use, housing density, available facilities, and utilities in Panggang island. The result of the field observation was mapped and sketched for the analysis and planning stage.

Consultative planning was conducted in three series of workshops. The first workshop was conducted in March 2017 at Universitas Tarumanagara to gather general issues on Panggang island and Seribu island development with around 50 participants from academia, planning practitioners and government officials. Following the mapping and workshop result, we conducted a planning workshop discussing the alternatives for settlement planning. The alternatives were devised based on our professional judgement of the settlement condition and possible planning proposal to be carried out in the area. Finally, the result was modelled and discussed in the second public workshop. Around 30 participants consisted of local authorities and communities (fishers, students, teachers, representative of the National Park) in Panggang island in September 2017 were involved. The model was developed based on population projection and potential land development on the island, involving land consolidation and reclamation scenarios to accommodate housing needs in 2027.

As there were concerns about land reclamation, land rights, and sailing routes, we consulted the findings with representatives from the Ministry of Marine Affairs and Fisheries and the Ministry of Transportation. We also interviewed representatives from the Ministry of Environment and Forestry to gather information about regulation in land reclamation. The meeting was purposed to scout for a middle ground in solving the local community's demand about land ownership and the need to reclaim land in expanding the settlement. The final proposal was then discussed with the local government of Seribu island in May 2018.

## 3. Results and Discussion

### *3.1 Settlement planning challenges in Panggang island*

Panggang island is probably among the densest small island in Indonesia. In 2017, 947 houses were identified on the 9 hectares island area. However, land plots and streets are irregular as the settlement have been growing spontaneously. In devising an alternative strategy for settlement planning in Panggang island, this paper identified sustainability challenges addressed in the planning concept, including:

#### *a. Population and density projection*

The population number in Panggang island has rapidly increased from around 2,800 in 1995 to 4,200 in 2016 [15]. With an estimated growth of 2.3% annually, this number is projected to reach 4,800 in 2027. Hence, 123 more houses are needed in 2027. With the limited availability of land and infrastructure, population growth is expected to add environmental pressure to the already dense island.

#### *b. Land availability and reclamation*

Based on our time series mapping and field observation, the Panggang island area has increased from 9 to 12 hectares in 10 years and is currently home to more than 4,200 inhabitants in 1,300 housing units. The land expansion has been made possible through plastic waste, corals, and sand piling on the coastal area solidified in several years. This transformation bears environmental impact to the decrease of biodiversity; especially as the settlement per se has limited basic infrastructure such as waste processing and drainage utilities, waste pollutants are directly disposed to the sea.

Meanwhile, there has been an issue with land ownership in the area. Mainly as reclaimed land is not subject to private ownership, migrants who reclaimed land cannot claim the ownership of the land.



The local government attempted to construct stilt houses in the coastal area, but this project was unsuccessful as local people had concerns about the housing structure and ownership.



**Figure 2.** A recent image of Panggang island indicating the change of coastal line after years of land reclamation (marked yellow)  
(Source: Authors)



**Figure 3.** Waste piling and land expansion in Panggang island  
(Source: Authors)

### *c. Limited infrastructure availability*

Besides challenges in population growth and land availability, Panggang island is served with limited infrastructure, especially a clean water network. Despite the Sea Water Reverse Osmosis (SWRO) and Brackish Water Reverse Osmosis (BWRO) installation in the area, the capacity and pipe network are insufficient to serve the whole population. Therefore, in meeting their water needs, people buy water in jerrycans and harvest rainwater. Besides water issues, there is also limited public green space and disconnected road structures due to the spontaneous development of the settlement.

### *3.2 Settlement planning concept for Panggang island*

Based on the abovementioned issues, we devised several planning alternatives for Panggang island. The alternatives are devised based on our assessment of the settlement condition and possible approach to the planning by using population projection and land development scenarios. Firstly, the primary consideration to the settlement planning is fulfilling future housing needs without

compromising environmental sustainability. Besides, we also considered the number of houses currently developed on reclaimed land, which is unregistered (135 units) to be added to housing planning and the need for housing estimated from population projection. Secondly, we took the aspiration of local people about housing form and land ownership into account. Thus, at last, the four alternatives for settlement planning in Panggang island is presented as follows:

**Table 1.** Settlement planning alternatives in Panggang island

Alternative	Settlement planning	Location	Consequences
Alternative 1	New land reclamation	By the coastal area	Environmental problems, biodiversity loss, and ocean current changes
Alternative 2	Large-scale land consolidation	Inland area	Land rights problems may arise as people lose their land rights
Alternative 3	Small-scale land consolidation	Inland area	Land rights problems may arise as people lose their land rights, but smaller scale of land consolidation may be more acceptable for large families
Alternative 4	Stilt or floating house	By the coastal area	A similar program was unsuccessfully implemented as people object to the housing concept

Source: Authors

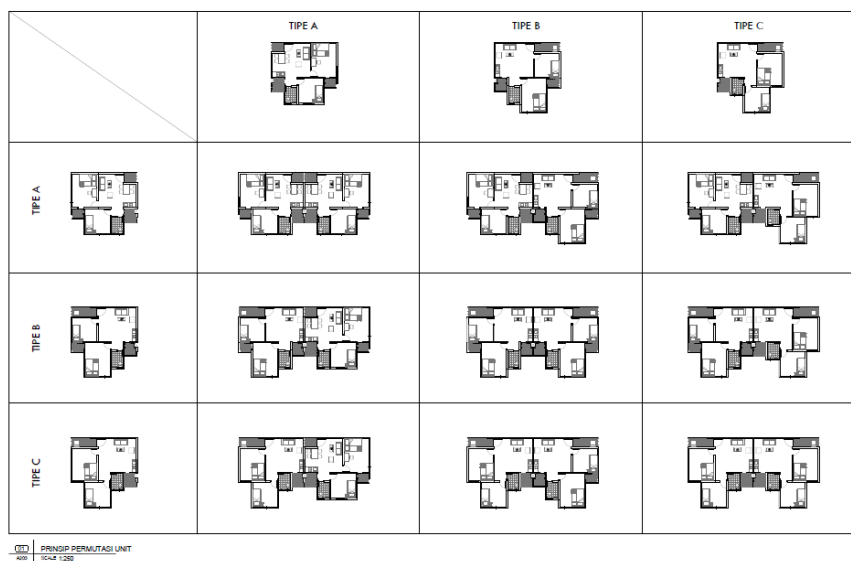


**Figure 4.** Final proposal of settlement planning in Panggang island (source: Tri Putra Bakti)

The proposal of housing development is in accordance with Das [9], De Souza and Koizumi [10] recommendations regarding the land pooling with pro-poor mainstreaming for housing in small island development. It also coincides with the importance of acknowledging the island's rapid transformation [9] which in the long term may affect the environmental quality of Thousand Islands and the tourism economy. Considering the abovementioned alternatives and opinions from the inhabitants, the settlement planning was directed to fulfil the housing needs without largely reclaiming land. It would

likely cause environmental problems and shift the ocean currents. Bearing such principles in mind, we propose a concept of land consolidation on the already reclaimed land (see Figure 4). The land consolidation will result in the densification of settlement in mid-rise vertical housing in the east and west of the island. Mid-rise vertical housing is preferred as landed housing development is impossible with the limited availability of land in Panggang island. The proposed housing blocks of two floors will consist of 298 units which are sufficient to re-house people who used to settle on the reclaimed land, the future population of Panggang island and other 30 houses for the commercial-rented house. As a result of the proposed land readjustment, more de-centred public (green) spaces may be available in the island, such as along the coastal area and within the vertical housing area and the already existing green space south of the island. To increase its popularity in tourism, we also proposed cultural centres and piers to attract visitors to Panggang island. This plan does not suggest further land reclamation to avoid further environmental pollution and biodiversity loss which might affect the tourism economy in Seribu island. However, there is a consequence of land ownership loss as several inhabitants will be relocated into walk-up flats.

The proposal is detailed into the housing unit types to accommodate different family sizes and needs in Panggang Island. We subsequently proposed three types of housing units (A, B, C) with different layouts, size (46-47.5 sqm), number of rooms (4-6 rooms), and balconies (1-2 balconies) to increase the possibilities of other functions such as space for community activity, rainwater harvesting, urban farming, or economic activities to be accommodated in the housing units. The unit permutation of housing modules in Panggang Island is shown in Figure 5 below:



**Figure 5.** Housing unit combination proposal for Panggang Island (source: Tri Putra Bakti)

#### 4. Conclusion

Small island urbanization has its precarity – from the high-density settlement, climate threat, and environmental degradation. With relatively high population growth, small islands, including Panggang island in Seribu island, face challenges in their sustainability. Through consultative and participatory workshops with different stakeholders, including local communities, local, and national government, we proposed a planning concept for Panggang island settlement. The planning concept is based on three burgeoning challenges: population growth, land availability and reclamation, and limited basic infrastructure. We devised four different alternatives, including land development and consequences, including new land reclamation, extensive and small-scale land reclamation, and floating or stilt house development. Considering the people's opinions and consequences, we proposed land consolidation on the reclaimed area to provide more space for the future population and infrastructure, including road structure improvement and public green space provision.

As a reflection of this research, this paper acknowledged the limitation of the participation process as it only involves local elites; hence the opinion cannot thoroughly represent the view of the inhabitants of Panggang island. With our positivist planning approach, technical consideration has obscured social and political challenges critical in sustainable and resilient community development [12]. Hence, to implement this proposal, further consultation and deeper participation of local communities and local government are needed to ensure their approval and sustainability of this project. Detailed land ownership and funding schemes on the housing development are required to be further discussed. Therefore, strong community organizations and local authorities will be required to monitor and evaluate the implementation of this project.

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