Sustainable Resilience of Vulnerable Urban Kampong Fisherman Settlement in Dadap, Indonesia

Assoc. Prof. DR. Ir. Budi Prayitno, M. Eng.
Department of Architecture and Planning, Faculty of Engineering, Universitas Gadjah Mada, Yogyakarta, Indonesia
budiprayitno_ugm@yahoo.com

Abstract. The congested space in a vulnerable urban fisherman kampong settlement is triggered by the inability to compete and the weak empowerment of the kampong’s sustainable assets. This situation necessitates a paradigm shifting from the competition between the interests of public and private sector into a harmonious coopetition. By using a case study in Dadap, this study aimed to map the vulnerability, resilience, and sustainability of the vulnerable kampong settlement as a basis for constructing a concept for the kampong’s sustainable resilience reinforcement. The research methods consisted of a descriptive qualitative method to analyse the level of the kampong’s sustainable resilience and space syntax to simulate the system of the kampong’s spatial structure. The results of this research show that reinforcing the resilience of living space and livelihood system of a vulnerable space of an urban kampong fisherman settlement can be done through constructing the triggers in the form of community-based economic empowerment facilities and sustainable coopetition approach through empowering the kampong’s sustainable assets with the concept of co-working, co-benefit and co-existence. Regarding the reinforcement of the kampong’s structural space system, it can be done through changing its configuration system from intra-space of inner area system to inter-space of area-wide system.

1. Introduction

The existence of fisherman settlement in Indonesia is identical with the image of poverty and slum. Kampong Dadap, which is located in Kosambi Subdistrict (kecamatan), Tangerang Regency, Banten Province, was initially a fishing village settlement. Over time, it became a densely populated urban kampong filled with economic, social, and environmental problems. Daily tidal flooding that strikes the kampong is one of the reasons why it is environmentally uninhabitable.

Moreover, the prostitution business in Dadap Cheng In adds to the complexity of the social and economic problems. In the beginning Dadap was known as seafood culinary region and the majority
of its residents are fisherman. It covers an area of 15 hectares with a population of 12,743; most of them occupy government-owned lands. Kali Perancis, which was a Soekarno-Hatta Airport drainage channel that flowed into the sea, is located here. In the course of time, the river experienced high levels of pollution due to the emergence of settlements along its banks. The pollution comes from domestic and industrial wastes that carry sediment and other waste materials; thus, they damage the estuary ecosystem.

Dadap’s built-up area reaches 85 percent and most of it consists of houses that cause a very high density and lack of public open space. The tidal flooding that hit this dense settlement along with lack of proper settlement infrastructure makes an unhealthy environment.

![Figure 2. Tidal flood in Dadap school area.](image)

Even worse, all the residents use the river and ditches to dispose all of the waste from household and small home-based industry. To fulfill their needs for clean water, a small proportion them use urban drinking water services while most of the others buy water from vendors. These social, economic, and environmental aspects are highly vulnerable to cause crimes and massive environmental issues.

The vulnerability of such settlements is generally generated from the residents’ failure to access their livelihood assets and therefore results in poverty [1]. And this is a part of urbanization process [2][3].

The complexity in this informal settlement is a highly vulnerable problem. On the other hand, Dadap is a very strategic area or otherwise known as ‘Golden Site’. There had even been a plan to develop it into Dadap International City central area. The idea was based on the strategic value of the area which is adjacent to Soekarno-Hatta International Airport and Pantai Indah Kapuk, a luxurious commercial and residential mega-project. The plan that was initially based on the area’s strategic and commercial potentials was rejected by the residents. Thus, by using social space approach through Sustainable Urban Renewal concept it was decided to maintain the area as a fisherman settlement. This concept was performed using Creative Co-Planning and Management approach. The social space approach in an informal settlement arrangement will be largely determined by the level of inclusiveness in the region design process [4]. The strategic and commercial potentials of this area have to synergize with the solution to the vulnerability of environmental degradation in Dadap.

The urban space of the synergy between spatial, economic, social, and environmental assets and the solution to the vulnerability of those assets needs to be re-framed in the hybrid space context [5].

2. RESEARCH METHODS

This study uses qualitative descriptive method in analyzing the vulnerability, resilience, and sustainability aspects; whereas in analyzing the spatial structure of the settlement the study uses spatial observation through space syntax simulation. The observation location is the fisherman settlement in Dadap, Tangerang Regency. It is adjacent to the reclaimed settlement area, i.e., Pantai Indah Kapuk and Soekarno-Hatta International Airport.

The spatial simulation approach used in this study is space configuration with the integration and intelligibility values of the area. A high integration value provides an overview of how the Dadap area connects with its surrounding areas in meso-scale (intra-space) and macro-scale (inter-space). Intelligibility value is a space clarity value, determined by looking at two variables which are integration and connectivity values. The two variables have cognitive and spatial-physical
relationship. Space proximity in a regional system could be discovered by knowing the intelligibility value. Measurement of the integration and intelligibility value reveals the accessibility rate of research area. Therefore, it is easier to observe the movements from, to, or pass the research area.

3. VULNERABLE SPACE

The vulnerability of a space is always associated with access and infrastructure. As an informal settlement, Dadap’s condition is largely determined by urban livelihood aspects such as location, accessibility, mobility, and linkage. The spatial expansion process that commonly occurs in an urban space is highly dependent on the integration and the informal linkage between activities and economic generators [1]. Spatial assets within the urban space linkage system are influenced by the radius range of urban economic network system. Dadap, an urban kampong fisherman settlement, was one of the fishing port centers and it is now defeated by a fishing port in Muara Kamal whose economic activities are much stronger. As a result, the economic activities in Dadap shifted into services activities that are at risk of social and public health vulnerability, namely the prostitution business and other economic activities that support it. What remains of the fisherman village is an abandoned dock for some fisherman boats and the green mussel cultivation using keramba, a floating fish nets or cages.

Figure 3. Abandoned fisherman boats in Dadap

The social and economic resilience to the vulnerable situation could be accomplished through an adaptation process which utilizes the remaining assets [6][7]. In this case, the remaining asset is the green mussel cultivation using keramba.

The slum in Dadap is the result of weak government intervention in local planning, urban health facilities, and lack of livelihood potential for the residents; thus, they lead to the massive slum phase or otherwise known as attaching, the third phase of three phases of informal settlement after settling and inserting [8][9][10][11].

3.1. Network Analysis

On a macro scale, Dadap is flanked by several fast-growing facilities namely the development of reclaimed islands, housing for the high-income group, and the expansion of Soekarno-Hatta airport. The area is a strategic node located between Tangerang Regency and Jakarta Metropolitan City. The interface zone acts as a driving force that is often analogous to a machine [12]. Circulation and intensity of activities that constitute a network could be managed through spatial simulations and assessed from connectivity, integration, and intelligibility of the space.

The road network in Dadap consists of two types; neighborhood streets and kampong streets such as alleys. The alleys follow the irregular pattern of the housing. The road network pattern is influenced by the configuration of neighborhood streets along the Kali Perancis banks and the public facilities distribution pattern in Dadap. The surrounding area of Dadap is a mix of residential and industrial area. The industrial area is a big plot, and it is a private zone that follows the grid pattern. Spatial analysis through space syntax method shows the intra network-based value is moderate with the average of 0.36 from the range of 0.31-0.98. The intelligibility value, which is a relationship between the integration value and connectivity, of Dadap is R²=0.03. That means the settlement has low intelligibility value in the spatial relationship. On the contrary, inter network-based analysis shows a quite high value with the average of 1.77 from the range of 0.3-3.7. The relationship between the
region’s integration and connectivity or the intelligibility value scores $R^2=0.4$, which means the region has a medium intelligibility value.

The different results of the two simulations above are the outcome of Dadap’s weak integration with its surrounding area. This region is known as a pass-through only area, which is an area that is only passed through by people, not as the main destination. This situation causes the settlement to have its own intra-system which is very vulnerable to be resilient due to lack of livelihood asset potentials, urban services shortage, and weak government intervention.

3.2. Space as a competition domain

It could be seen from the space syntax simulation that Dadap is experiencing congested domain. Its pattern of intra-network space that filled with informality characters, degraded environmental quality and livelihoods shows a highly vulnerable sustainability system. The trigger of the vulnerability is the lack of access to livelihoods [13][14]. The decline of Dadap’s fishing port functions due to competitiveness loss against Muara Kamal fishing port causes the fishing port livelihoods access to become very weak. The residents’ response to this condition was informal and unplanned. As a result, they are environmentally, economically, and socially marginalized; thus, they have no access to development agencies or sources. The failure to adapt in this vulnerable space is a consequence of access, livelihoods and space shortages [8][15][16].

Without a strong intervention and adequate resources, the congestion of various marginalized space adaptation processes would result in social, economic, and environmental degradation. In other words, the sustainability value of the settlement in Dadap would experience degradation because it is economically and spatially defeated. On the other hand, the reclamation development and airport expansion are spatially supported by various abundant resources. The contrast is very apparent even though Dadap is located in the interface area between the two mega-development projects.

4. SUSTAINABLE RESILIENCE

Regional resilience is the ability of a region to survive and adapt to exogenous disturbances that threaten the sustainability of its function, space structure, and identity [17][7][18]. Therefore, mitigation strategies against those disturbances are needed. They have to be capable of responding to environmental, economic, and social changes as well as being future-oriented. As a waterfront settlement, Dadap must be able to adapt to the climate and tidal change. Similarly, the dynamics of socio-economic life and the fisherman livelihoods, which are vulnerable to the failure to access livelihood resources, have to be capable of creating diverse activities that are adaptive to the socio-economic dynamics of fisheries.

4.1. Co-exist, Co-working, and Co-benefit

Sustainable space design principle, which is based on social; economic; and environmental pillars, has to be adopted into a resilient and adaptive system. From a social point of view, the residents of fisherman settlement have to harmonically synergize with the life of commercial settlement for the high-income group. Public open space is a medium that has the potential to synergize these two different conditions [19]. Co-existential theory of informal and formal sectors is widely developed in urban areas [5]. Environmental coexistence could be interpreted as the ecological relationship between land and water [20]. Social co-working is, for example, a partnership that involves various stakeholders such as fisherman community, commercial settlement community, private sectors, and government [20]. Economic co-benefit means the synergy of economic activities between community-based livelihoods and commercial-based enterprises [20]. This sustainable resilience has to be spatially structured in order to synergize the social, economic, and natural potentials in macro spatial context to face the development of the airport and reclaimed land.

The initial approach was relocating the residents to vertical housings in the same location, but it was rejected by Dadap fishing community. The rejection was underpinned by the lack of secure tenure and livelihood certainty. For them, the acceptable solution was tenure and livelihood security by
giving cheap vertical housings and building an integrated culinary tourism center. These two facilities would trigger the fisherman community’s willingness to work together with the government and private sectors in organizing the area by using sustainable urban renewal.

![Figure 4. Proposed Dadap Urban Kampong Renewal.](image)

Environmental sustainability and resilience are realized with the concept of floating culinary facilities, pillar housings, and polder system engineering. Social sustainability and resilience are, for example, an interaction between the management of oceanic culinary tourism center and Dadap residents with the residents of Pantai Indah Kapuk as their target market. Economic sustainability and resilience, for instance, a management partnership using shared values approach between community-based businesses and private enterprises.

![Figure 5. Dadap oceanic culinary complex building (using floating construction technology).](image)

4.2. From Competition to Coopetition
As a congested space, which is due to being spatially and economically defeated by the rapid development of Soekarno-Hatta airport and the reclamation for commercial area construction, Dadap needs to be resilient. A sustainable approach that could be performed is harmonious coopetition. The waterfront urban space could participate in a coopetition by means of diversification through job creation and economic regeneration [21]. The competition in waterfront space is a model of urban waterfront regeneration where the shape of mix used and hybrid function become the concept of architectural development.

Waterfront space constructs a place that based on local identity. The architectural identities of the commercial residential area Pantai Indah Kapuk and the expansion of Soekarno-Hatta airport have to be capable of harmonious coopetition and competition that results in production and place identity and thus become their brand marketing. Dadap’s new identity needs to synergize with the Pantai Indah Kapuk’s identity, which is an integrated luxurious residential area, and also with the modern identity of Soekarno-Hatta airport expansion. The integration of those identities does not always mean a similarity in their appearances, but rather a co-presence relationship between different groups [12].

Coopetition in spatial structures is determined by the degree of connectivity and spatial integration as shown by its intelligibility value. An architectural work will be more integrated if it successfully constructs a place and architecture imagery harmoniously [21]. Similarly, spatial and architectural transformation in waterfront space is also a branded form of place making [22]. Therefore, a sustainable urban renewal in Dadap, a transformation from slum fisherman settlement to a new residential area, needs to be developed by using appropriate spatial structure and local architectural imagery.
5. INTER-SPACE REFRAMING DESIGN

Urban spatial structure is a determinant of urban movement for both pedestrian and vehicular, whose functions change rapidly [12]. Pedestrian and vehicular spatial patterns form movement and social interaction patterns [23][24][25]. These spatial patterns are spatial assets for the establishment of network, social, economy, and environment [10]. Spatial vulnerability due to settlement and environment quality degradation leads to weak networks, and neighboring relationships as well as lack of opportunities to improve livelihoods.

5.1. Place and Network

A place is a space whose life within it is largely determined by the effectiveness of the network system that forms it. As a place, Dadap experiences quality degradation in its space and its network. This condition could be seen from its low intelligibility value from the space syntax simulation. Therefore, it is necessary to strengthen its intelligibility value; from a region that has a weak relationship with its surrounding area and a pass-through only area to be the main destination area.

By strengthening the inter-space network and the establishment of regional activation generator in the form of an integrated culinary tourism center, it is expected that they could increase Dadap’s intelligibility value, from a pass-through only area to be the main destination area.

5.2. Reframing Space

To transform a region from a pass-through only area into a destination area, reframing space structure is required by strengthening its connectivity and integration network.

Space syntax simulation shows that there is a 0.17 increase in the existing value. The intra-space (local integration) intelligibility value also rises from 0.41 to 0.58, and from the average integration value of 1.77 to 1.81.
The inter-space (global integration) intelligibility value, which is the relationship of settlement in Dadap with its surrounding area, also experiences improvement from 0.038 to 0.045, but the average integration value falls from 0.36 to 0.34.
The comparison between local and global context, both in terms of the integration and intelligibility value, shows that there is an improvement of regional value but a decline in global value of the region. This result implies that Dadap could be transformed into a destination area and not as a passed-through only area anymore. The simulation results reveal that the structural value of a region would rise after its network is improved by connecting it with the surrounding area. In addition, the improvement also results in the decline of the region’s global value.

6. CONCLUSION
Fisherman urban kampong settlement is vulnerable because it lost in competing against the strong development of its surrounding area; hence, this leads to the degradation of its quality and environment. The fisherman settlement that is always vulnerable to the dynamics of environmental change must be able to adapt ecologically. Therefore, the resilience concept which is required in order to improve the adaptability and strengthening values must be based on social, economic, and environmental aspects. The paradigm shift in the way of looking at a competition, from something that would bring negative impacts to one that would give positive outcomes, is known as coopetition. Coopetition is an act that synergizes competition and coopetition. It could be adopted into the sustainable resilience concept by using social co-working, economic co-benefit, and co-existence in the ecological environment.

The continuous strengthening of the resilience value has to be structured based on the concept of inter-area and reinforced with trigger generators as the regional attractions. Efforts to redefine the function of fisherman settlement areas, reconnect the spatial network structure, and revitalize the function of community livelihoods are embodied in the concept of inter-space reframing design.

The discussion of space resilience and sustainability theory discovers that the resilience level of a space is highly determined by social, economic, and environmental aspects. Those aspects are the pillars of sustainability which will decide the resilience level of a space.

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Figure 10. Proposed global integration value. Source: Author, 2017
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