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## MODEL OF STRUCTURING SETTLEMENT ON THE WATER IN COASTAL AREA OF TERNATE

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### ABSTRACT

*Ternate in North Maluku province has assets with a coastal marine area 5547.55 km<sup>2</sup>, wider plains than just covering 250.85 km<sup>2</sup>. Coastal areas become large enough portion for housing development; although prone to disasters, grow uncontrollably, lack of public facilities and the lack of environmental controls. This causes the quality of the coastal environment so declined. Arrangement is needed to prevent the development of sporadic and slums, as well as to anticipate disaster. The purpose of this study is to produce a model of the arrangement of settlements in the coastal zone of the water Ternate, for disaster mitigation. The research method is qualitative with purposive sampling system. The results showed that very precise grid pattern applied in the coastal areas because it can maximize the land use, circulation becomes more fluent evacuation, distribution function and development of the area easier, either macro or micro in accordance with the needs of the region. In addition, the grid pattern can support human circulation and transportation effectively and efficiently.*

**Keywords:** *model, settlement patterns, coastal areas, Ternate.*

### ABSTRAK

*Ternate di Provinsi Maluku Utara memiliki aset dengan luas area pesisir laut 5547.55 km<sup>2</sup>, dataran yang lebih luas dari 250.85 km<sup>2</sup>. Daerah pesisir menjadi porsi yang cukup besar untuk pembangunan perumahan; meskipun rawan bencana, tumbuh tak terkendali, kurang fasilitas umum dan kurang kontrol lingkungan. Hal ini menyebabkan kualitas lingkungan pesisir jadi menurun. Penataan diperlukan untuk mencegah perkembangan sporadis dan kumuh, serta untuk mengantisipasi bencana. Tujuan dari penelitian ini adalah untuk menghasilkan model penataan permukiman di zona pesisir air Ternate, untuk mitigasi bencana. Metode penelitian yang digunakan adalah kualitatif dengan sistem purposive sampling. Hasil penelitian menunjukkan bahwa pola grid sangat tepat diterapkan di daerah pesisir karena dapat memaksimalkan penggunaan lahan, sirkulasi membuat evakuasi lebih lancar, fungsi distribusi dan pembangunan daerah lebih mudah, baik makro maupun mikro*

*sesuai dengan kebutuhan daerah. Selain itu, pola grid dapat mendukung sirkulasi manusia dan transportasi secara efektif dan efisien.*

***Kata kunci:*** *model, pola permukiman, area pesisir, Ternate.*

## **INTRODUCTION**

North Maluku city of Ternate has ocean area larger than its land area. The city government has launched the concept of a waterfront city that seeks to integrate marine and terrestrial areas of planning. The growth of the city followed by a high population density causes the need for space becomes higher as well. The coastal area of Ternate since immemorial time has been used as a settlement for both migrants and indigenous populations. Bajo is pioneering the emergence of settlements in the zone above the water with typical houses on stilts. The existence of the Bajo tribes accompanied with other newcomers such as the Bugis-Makassar in addition to its own indigenous ethnic produce forms of existing settlements is more a result of acculturation of different cultures. Ternate has coastal marine biodiversity, coastal ecosystems such as coral reefs, abundant fish and mangrove forests. However, this condition has begun to change, one of which is the emergence of the problem of waste that struck coastal areas of Ternate. This problem becomes more complex with the reclamation activities for the construction of ring road and has placed the region more exposed coastal city of Ternate.

One area of the coastal zone with dense settlement conditions is Kampung Makassar. Kampung Makassar area was originally a fishing settlement area directly adjacent to the sea. The surrounding area is overgrown with mangrove trees which are a type of flora that grows naturally on the coast. Dense mangrove trees condition provides benefits to residential areas around the coast, particularly for disaster mitigation strong winds and abrasion. Mangroves serve to inhibit the flow of water that slammed inland sea that can cause abrasion. It also inhibits the quite strong sea breeze, which can cause damage to people's homes on the coast.

Along with the rapid population growth in the village area of Makassar, settlement grows increasingly shifted towards the beach. Mangrove trees were cut down to expand the settlement area. Due to limited space on land, the population eventually builds settlements on the water. And this custom continues to this day.

Nonetheless, the coastal zone of the water in Ternate remains oriented towards the development of settlements, given its strategic position as a regional and sits astride the city centre and one of the gates. However, the limited land area and population dependency of economic activity that would be associated with the sea making plans that do not need to override the interests and aspirations of the region's dwellers. Planning residential area on the water generally includes model development and structuring settlements typically including settlement patterns are applied to disaster mitigation.

## THEORY / RESEARCH METHODS

This study uses qualitative methods, because the research will be carried out in natural conditions and wants to get comprehensive information on the population of existing settlements on the water zone in Ternate. In addition, this study also examines nature (description), with the aim to evaluate the pattern of existing settlements (Bryan, 2001). Attempt to describe these facts in its early efforts focused on the expression of symptoms in full aspect of the investigation in order to clear the state or condition (Suryabrata, 2000). The study was conducted in the East Village Makassar, Ternate Central District (see Figure 1).

The populations in this study are all administrative territorial units of housing in the village of East Makassar, Ternate. The samples are set through purposive sampling technique, where houses and settlements are located and built in the land or on the water zone. Sample selection on the water zone was conducted due to the existing settlement pattern is still chaotic and environmental regulation has not been oriented to mitigate disaster. The distribution of the population and the sample can be seen in Figure 2.



**Figure 1.** Location Research Village East Makassar,  
Ternate Districts Central  
Source: field survey, 2011

Descriptive qualitative data analysis is used to analyze and simplify the data obtained from the primary and secondary data-based so that it will be easily read and understand such as: typology and morphology and settlement houses, neighbourhood characteristics, socio-economic and cultural life of the community, local wisdom.



**Figure 2.** Population Distribution and Sample  
Source: field survey, 2011

## RESULTS AND DISCUSSION

### Recent Settled Cultural Society above The Water

People who live in the zone above the water in the coastal areas of Ternate generally are nomads. They come from different origins. It is very difficult to find Ternate natives living in this region, because the natives generally live on land. Diverse origin of immigrants makes it difficult to identify in detail the living culture to generalize conclusions.

Primary data indicate that these settlers are originated from Makassar (the Bugis and Makassar tribes), Gorontalo, Ambon and other islands adjacent to Ternate. If the terms of its history, the residents living in this area because they want to find a job for a better life. The appeal of this region is a very strategic location, which is adjacent to the town centre of economic activity Ternate. This is in accordance with Rapoport (1997) statement that the formation of neighbourhoods is possible because of the formation process of occupancy as a functional container that is based on patterns of human activity and the effect of hue setting or environment, both physical and non-physical (social culture) and directly affects the activity patterns of living.

The settlers, who came from various regions, brought each of their habits and customs. Generally settlers came to take along the family. Habits of families living near lead home built to the size that can accommodate the entire family. Some families that cannot afford to have their own home or rent a home in the region tend to move in with family. This habit is characteristic of immigrants from rural communities.

Habit of hanging out with the family in a single occupancy will have an impact on the condition of homes and neighbourhoods. Limited land on the water, causing the size of the house is limited as well as the capacity of the occupants. The house became overcrowded and unfit for human habitation, consequently unwitting

residents tend to be stressed in the environment and trying to find a place for activities outside the home. Activities outside the home are also limited because of limited access to land. This causes the neighbourhoods become irregular and crowded, so that the quality of the environment is lowered (see Figure 3).



**Figure 3.** Makassar East Village Neighborhood Conditions, Ternate Districts Central  
Source: field survey, 2011

From the analysis of the live cultures can be concluded, that the habit of living near family, settled habit of doing activities on a limited land, and customs different cultures have produced diverse settled in accordance with the customs of each tribe who settled in the region.

### **Activity Patterns of Water Zone Communities**

Dependence of immigrant settler societies of the region as it relates to the proximity to the centre of the city's economy. Market presence has affected the economic life of the people above the water. Although the location of settlements is on the coast and above the water level. Generally people work in the informal sector as a trader, as a worker at a nearby market. In addition, a common sight encountered is growing rental homes that cater for workers in the market who want to live close to the workplace. This certainly will save on transportation costs and save time to work.

Growth of rental houses in the area were minimum in water facilities and land constraints, making this settlement became chaotic, crowded and irregular (Figure 4). The land is used for economic activity, regardless of the environmental carrying capacity. In addition to the lack of facilities prepared for inhabitants by the landlord, the lack of drying space, a space to interact and shared facilities cause the condition of rental homes become unhealthy and unfit for habitation. This suggests that the level of people's needs in this area for housing is still very high. Landlord is generally investing only because literacy opportunities, should take responsibility for creating a quality living environment better.

Patterns of activity that only people working in the informal sector leads to lower income levels. This affects the ability of communities to build their house and manage the environment. Because of the higher the economic level of society, the environment tends to pay more attention to comfort of settlement. Although no doubt that there is also a small percentage who have established economic level, but they are happy to live in this region. Activities in the informal sector will create a dependency to the environment outside the home, so that attention would be very little in the neighbourhoods.



**Figure 4.** Settlement Patterns at the Community Activity in Water, Urban Village East Makassar, Ternate.  
Source: field survey, 2011

Environmental degradation caused by the settlement lies in the tidal area. According to the interview results in this neighbourhood, a few years before the inner street was built, the water under the house still look clean because dirt will be swept away and flowed to the sea. In fact, at the beginning of the settlement, water was channelled to houses and can be used to bathe and play, because the water condition was clear and clean. Now the condition is far from expected. Sea water became stagnant, murky and dark, sometimes with unpleasant odours. This condition is further aggravated the condition of neighbourhoods.

It is necessary for the arrangement of settlement patterns that allow the distance between houses can be set, so that people can conduct their activities well, such as household activities (drying), the activity of interacting with the social environment, play activities for children as well as economic activity.

### **Now Settled Safety and Disaster Mitigation**

Location of settlements is on the coast and above the water, causing the settlement area is highly vulnerable to natural disasters. Natural disaster in question here are disasters caused by climate change found in offshore waters. Strong winds and earthquakes, as well as high waves are potentially large natural catastrophe in coastal areas. To anticipate this, it needs arrangement for residential neighbourhoods to mitigate the disaster (see Figure 5).



**Figure 5.** Settlement Layout Overlooking the Sea  
Source: field survey, 2011

Settlement lies parallel to the main road and overlooking the sea, can be said as vulnerable to the disaster, because the location of the area directly on the beach



with no obstructions. The position of the house is perpendicular to the direction of the sea breeze (beach) allowing the house to obtain wind without blocking. In addition, the houses are densely clustered, with a street/ alley is narrow, not allowing for the handling of the fire problem quickly. This condition can be found in most of the rural coastal communities. This is in line with Parwata (2004) who proposed that the traditional villages in Indonesia generally have homes clustered or centralized and is connected by small roads (rural roads) or footpath. Being scattered settlements, scattered their home, alone (disseminated rural settlement) so the distance between houses live far away. This condition should receive the attention of the public and the government to act to prevent it. Arrangement of settlements and neighbourhood mitigation seek the best solution to prevent natural disasters that potentially happen at any time in the settlement. Namely the establishment of settlement patterns that can allow prevention of disasters such as strong winds, high waves, tsunami and fire hazard.

### **Environmental Infrastructure Needs in Water**

Limited access to the environment and land constraints in the zone above the water are causing the unavailability of land to build public facilities in the region. The high level of demand for housing is not proportional to the need for facilities and environmental infrastructure. Some facilities are built without following the standard rules that should be required by residents. Facility was built on land that is limited by the capacity limitations, so it is not proportional to the availability of facility capacity that should be protected.

For road infrastructure, there is only main entrance road to the settlement, while to access hospital and other facilities there is road construction environments constructed with concrete. However, the width of the road does not meet the standards for four-wheeled vehicles passed, but only for two-wheeled vehicles such as motorcycles and bicycles. If there is a four-wheeled cart through this path, it will be very annoying for users and hinder other road users. In addition, due to the lack of space in the house due to excessive occupant, and the unavailability of facilities play in the environment, causing the road environment is used as a gathering place and a children's playground. This condition is further aggravated due to the narrow width of the road, so the road turned into a space in the environment where interaction among neighbours may occur (see Figure 6). Facilities such as existing roads should be widened in order to allow four-wheel vehicles to pass, especially fire trucks, for fire extinguishing. Meanwhile, housing for fishermen in coastal areas should be equipped with infrastructure, facilities sufficient for the survival of life and livelihood of the fishermen and their families.

Other existing facility in the region is Al-Quran recitation park (TPQ). TPQ are usually located in the mosques or in people's homes that has limited area. It is necessary for the arrangement of settlement patterns that allow the infrastructure to accommodate the entire community activities. Especially for accessibility wheeled vehicles and cars, such as fire engines, in the event of catastrophic fires. Given the chaotic conditions of the settlement, with irregular spacing coincide houses; this settlement has the potential for catastrophic fires.



**Figure 6.** Road Conditions at the Settlement in Kampung Makassar, Ternate  
Source: field survey, 2011

### **Analysis of Comfort Buildings**

In the coastal areas on the water zone with high density of population, fisherman, merchant marine, and most employees have activities outside the house in the morning until late afternoon. Rest period occurs during lunch time when residents usually returned home and resumed afterwards activism. With a habitable condition, the average buildings in these locations have occupied period for approximately 8 hours for 24 hours which is at 17:00 to 6:00 and 12:00 to 13:00 hours.

Duration building comfort zone in the area above the water generally occurs at the time of the afternoon until the morning, but some buildings indicate an underheating condition that occurs during the night until the morning. Underheating condition is more common in buildings that use lightweight wall material properties because they have an easier release and accept conditions of relatively low environmental temperature. Underheating occurrence in buildings leads to reduced duration of comfortable building for 24 hours in addition to the overheating that occurred during the day. This gives an indication of the hours in a comfortable state of occupants in the building at the time doing activities outside.

### **Arrangement of Buildings**

Distance between buildings in lowlands and in fairly high density area in general is exceptionally narrow that ranges beyond 0-1 meters above the water zone area. Distance between houses outside the zone there is a large enough water to 2.0 meters. It is seen as an effort of familiarity and ease of communication among residents (Table 1). In the houses on the beach, both the traditional and the modern, the houses some even have no distance, the foundation for roof walls joint/ coupling, but this only happened to two houses, not more. This density appears very helpful in anticipating high wind speeds in coastal areas.

Residential buildings have varying heights in each location. Most houses on the coast have the lowest height of 4.0 meters from the floor to the highest roof. Building forms that are found in all locations is a cube with a ratio of length: width: height is 1:1:1. Building geometry and proportion ignore this little bulge slope of the roof, because in all locations, the centre of the sloping roof which has a peak proportion is quite small compared to the entire roof.

Orientation of the building is strongly influenced by the local culture, with most of the positions are oriented to the north and south. Residential buildings have



a variety of skin covering the various buildings. In general, the skin covering the building is plastered brick (90%) and the rest of the boards and glass, the doors and windows. Floor coverings in traditional houses on the coast are still using stucco, while the modern houses on the coast already use ceramics. Roof coverings used mostly zinc and the surface reaches 20% of the overall building shell cover (see Figure 7).



**Figure 7.** Settlement Arrangements in The Village of East Makassar, Ternate  
Source: field survey, 2011

**Table 1.** Building Typology settings Lowlands (Coastal) with High Enough Density

No	Typologies	Traditional Beach	Modern Beach
1	Distance Between Buildings (Density)	0-1 meters	0-1 meters
2	Building Heights	5 meters	4 meters
3	Building forms / Mass:		
	a. Geometry	Cube	Cube
	b. Proportion	1:1:1	1:1:1
4	Building Orientation	North-South (0 <sup>0</sup> )	North-South (0 <sup>0</sup> )
5	Cover Material		
	a. Floor	Plastering 100%	Ceramics 100%
	b. Wall	Plastered brick 10%	Plastered brick 50%
		Board 90%	Board 40%
	c. Roof	Zinc 100%	Glass 10%
			Zinc 80%
	Aperture Leather / Out:		Roof tile 20%
6	a. Dimension	20m <sup>2</sup>	15m <sup>2</sup>
	b. Orientation	25%	20%
		South	South

Source: field survey, 2011

On the outside of the building, there are openings in the form of windows and doors. Wide apertures vary at each location, but the same orientation at all locations: north-south or on the front wall of the house. Wide aperture is the widest houses on the coast to 20.0 m<sup>2</sup> (15% of the house).

## Grid Pattern Analysis on Settlement of The Water

The pattern in East Makassar village settlement area is homogeneous textural patterns that allow an arrangement (Zahnd, 1999 in Yuliana, 2013). Based on Focus Group Discussion (FGD), the selected model is Grid settlement patterns. Grid pattern is formed because of the need for a system of rectangular (grid iron) in order to provide a form of geometry in urban spaces. Form distribution of clusters in a grid pattern is practical and efficient. Excess use of these patterns in the arrangement of areas including: a more efficient circulation in the environment and closer mileage and a higher level of flexibility movements that can accommodate the movement of people with a high level of mobility without congestion.

However, there are two weaknesses of an area when applying grid street pattern. First, on the pattern of vehicular traffic and pedestrians can go straight through the traffic so that the traffic frequency is higher and polluting fumes and noise on residents. The second drawback is because there are a lot of alley, the oversight of security in the region is relatively more difficult. Nevertheless, the study site, the existing road can be traversed only for pedestrians, two-wheeler and wagon, as it is located on the water and land conditions are cramped. Four-wheeled vehicles cannot go into the entire area settlements, but only on certain road to disaster mitigation. So that the model can be applied to both grids without causing traffic jams.

The application of grid patterns in the settlement on the water in Ternate can be reviewed from several aspects, namely:

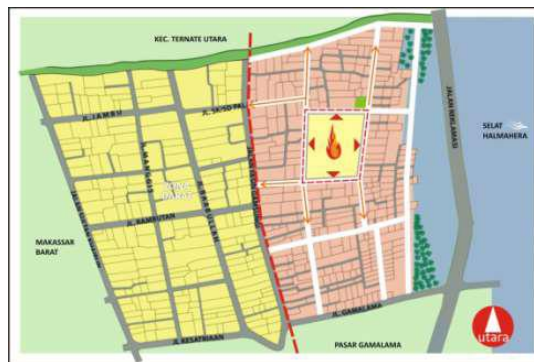
1. Maximize the use of land on the water. The form of a grid pattern blocks or rectangular plots is able to maximize all existing land. This pattern is most economically efficient in the arrangement of plot, so it is very popular in the planning applied in real estates in the United States in the 1940s and 1950s. With this pattern, not one bit of land is wasted. Once the land is formed into blocks, with streets that have been divided into the main road and the road divider, division of functions of each block according to the calculation needs can take place: whether it's residential needs, facility needs, and the needs of green open space. Application of a grid pattern on the residential area on the water in the village zone of Makassar is quite proper because the existing condition areas have already used this pattern in accordance with the historical development of the area. Access roads are classified into main roads and connecting roads. After that, improvement of the quality and dimensions of the road can take place. Each block was defined based on its functions, such as residential functions, facilities or green space (see Figure 8).
2. Tsunami Disaster Management and Fire. Location of Kampung Makassar settlements is in coastal areas and in the tide, causing the settlement area is very prone to natural disasters. Natural disaster intended here are disasters caused by climate change in the waters off the coast, such as high winds, and tsunami. To anticipate this, it needs arrangement, residential neighbourhoods, and landscapes that have the nature of disaster mitigation. Grid pattern applied to the planning of residential areas allows evacuation circulation becomes more convenient (see Figure 9). Roads that are connected to one another give enough room for the emergency vehicle to provide assistance, as well as evacuation effort without using a vehi-

cle. Moreover, to anticipate the impact of fires spreading, grid pattern will allocate the flame only at the burnt block while other blocks will be spared.



**Figure 8.** Structuring the Makassar village area on the water

Source: field survey, 2011



**Figure 9.** Visualization Grid Pattern Localize The Fire on The Block Affected, as well as Evacuation Routes and Fire Management

Source: field survey, 2011

3. Division of function and development of the area. Grid pattern which divides the area into blocks, divide the function of each block in accordance with the requirements of macro and micro areas (see Figure 10). The existing blocks can be directly plotted for a particular function, such as particularly for settlements, with a maximum capacity of land in accordance with their respective regional function (Shirvani, 1985). If the block is large enough, it can also be combined with the green open space. However, for the condition of the village area of Makassar on the water zone that land is limited, green open space, and public facilities and social amenities should be placed on one particular block with conditions that the farthest distance towards the area is 200 meters. Stages of development and improvement can be more easily implemented. For example in the area of village land-use planning Makassar Water Zone, the first block prioritized is the block

closest to the sea. It is intended as a delineation of the area to avoid the expansion of settlements to the sea. This block can be designated as green space as well as social and public facilities. Open space is further defined by Rapuano (1964) in Yuliani (2013) as land with the use of a specific function or quality of its composition performance. Residential building affected by the eviction of the block, moved to another block by constructing multi-stories buildings or houses, to meet the space needs of each family being moved, and so forth until the area is well ordered.



**Figure 10.** Distribution of land use  
Source: field survey, 2011

4. Human Circulation and Transport Modes. Transportation circulation is the principle point of connecting two or more nodes effectively and efficiently. Thus, the shorter the distance, the time spent will be lessened. Linear and grid pattern are the most ideal pattern to realize this principle. Straight streets that are connected to each other, allowing access from one place to another will significantly simplified the transport. Smoothness is highly desired by every society who uses the pathway besides for emergency conditions, such as the path for the ambulance, and fire departments in the event of a disaster. This indeed must be accompanied by an increase in the quality and dimensions of the road in accordance with existing standards in accordance with the classification of existing roads, the local roads, secondary roads and primary roads.

## CONCLUSIONS

Based on the above discussion, it can be concluded that the condition of coastal settlements in East Makassar Ternate village is affected by several factors. The factors such as: the culture that the inhabitants tend to live close to their families, group life and the tendency to bring the culture of the village of origin settlers affect the settlement patterns formed. Availability of facilities and infrastructure are minimal due to the limited land which resulted in the community has limited access to the facilities, open space, a playground and a means of transport, as well as mitigation on natural disasters, especially tsunami, high winds and fire. In addition, the building

standard as well as comfort, orderliness and security factor do not comply with community standards of comfort living, causing these settlements vulnerable to disasters. Application of a grid pattern on the settlement on the water in the Makassar village is very proper, because the existing condition of the area has already been using this pattern in accordance with the historical development of the area. This model can meet the needs of the community to interact and be able to maximize the use of land. Each block is defined based on its functions, such as residential functions, public facilities or green space. Grid pattern allows the circulation becomes smoother for evacuation and emergency vehicles, and this pattern can localize the fire in the fire-hit block alone, while another block will be spared. Grid pattern which divides the area into blocks, also divide the function of each block in accordance with the requirements of macro and micro areas. Stages of development and development can be more easily implemented. In addition, for the smooth accessibility, the grid pattern can support the circulation of people and transportation efficiently and effectively.

## REFERENCES

- Bryan, L. (2001), *The Language of Space*, Architectural Press, Oxford Auckland Boston Johannesburg Melbourne New Delhi.
- Rapoport, A. (1997), *Human Aspect Or Urban Form: (Toward A Man Environment Approach To Urban Form and Design)*, Pergamon Press, Oxford.
- Rapuno, M., Pirone, D. R. P. P. and Wigginton, B. E. (1964), *Open Space in Urban Design*. Ohio: The Cleveland Development Foundation published by Program Magister Teknik Arsitektur Universitas Diponegoro
- Shirvani, H. (1985), *The Urban Design Process*, Van Nostrand Reinhold Company, inc, New York.
- Suryabrata, S. (2000), *Metodologi Penelitian*, Universitas Gajah mada, Yogyakarta.
- Yuliana, K. and Kurniati, R. (2013), Upaya Pelestarian Kampung Kauman Semarang Sebagai Kawasan Wisata Budaya, *Jurnal Teknik PWK*, 2(2), 208-222, Universitas Diponegoro, Semarang.

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