CONCEPTUAL SPATIAL MODEL OF COASTAL SETTLEMENT IN URBANIZING AREA
Case Study on Fisherman Settlement, Tambak Mulyo-Semarang City

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ABSTRACT

Fisherman is a livelihood which is highly dependent on nature and demanding the actors to always be near the sea in order to ease them to reach the sea. Coastline area, therefore, is potential for the development of coastal settlement. A coastal settlement will certainly be different from any common settlement. The difference appears since not only public and social facilities as seen in common settlement that are needed by coastal settlement, but also several supporting facilities to accommodate the fisherman activities. Moreover, this kind of settlement has to face several natural disasters typically occurred in coastline area such as tidal flood and typhoon.

One of the coastal settlements in Semarang city is namely Tambak Mulyo fisherman settlement. There are many interesting aspects from this settlement since it is not only fishermen that reside in this settlement area.

The aims of this study are to find physical characteristic of coastal fisherman settlement in Tambak Mulyo, Semarang City and to examine its condition, advantage and disadvantage, based on its inhabitant point of view.

In order to reveal the conceptual spatial model which took place in the fisherman settlement of Tambak Mulyo, this research is done with postpositivistic rationalistic paradigm.

1. INTRODUCTION

The issue of coastal settlements at coastal area near dense cities has become recent issue in the last decade. A denser population will lead to the additional space of slum areas and the decreasing number of fishery and other marine products the fishermen may catch.

The development of coastal settlement in urbanizing areas is saturated with the development of non-coastal settlements. The non-coastal settlements are usually lack of ideal environmental facilities. In consequence, coastal settlements are driven out to the edge of coastal areas by forming new plain resulted from sedimentation process. As a result, the utilization of this new plain is out of control and causing unstructured slum areas.

The efforts to increase more caught-fishes and marine products are done by moving the fish auction center (TPI) to a separated location away from fishing settlements. TPI is a key component in establishing a network of fishing activities both intra-sector and cross-sector. Accordingly, it cannot be moved to another location without concerning to its relation with the other community activities. The newly built TPI is never been utilized since its establishment.

Based on the above description, it is necessary to understand the existence of spatial model of coastal settlement in Tambak Mulyo village, because it has become a preference to the communities and inseparable part to their life.

This study employs deductive quantitative approach under Post Positivistic Rationalistic paradigm. The proposed model of fisherman settlement is based on the conclusions of the existing conditions analysis and the community preferences regarding the settlement conditions in Tambak Mulyo.

2. LITERATURE REVIEW

A city is composed of various groups of population and settlement activities; often referred as clusters; related to one another in stages [1]. No single part of the city is capable to live independently. A network of relationships between groups of activities in various parts of the city is needed between sectors. Networking across sectors within a city is a key component to the life of the city dwellers and local economic activities. This is also a key component to drive the transformation of social life and culture for the local residents.
Rapoport (1977) [2] describes the phenomenon of continuity in the organization of urban space that binds groups of settlements in an urban system. In this case, the city serves as connective tissue. On a broader scale, Doxiadis argues that the built environment as a space of human life includes two major components namely: containers and contains. The container consists of nature and space, while the contain consists of human and society with a variety of networking activities of life. The success in planning built environment does not only rely on its physical attributes but also on the quality of its contain. There seems to be a strong relationship between the built environment with human behavior [3].

Based on the description above, a city can be seen from two very fundamental aspects of 1) inhabitation function of human activities; 2) man-made physical formations which are articulated over time. The sustainable inhabitation process in the form of urbanization lead to the sustainable growth of the cities as well. It also encourages changes in the physical form of the cities that never stops during the process of urban growth [4].

A spatial model is developed to change the urban structure to achieve the desired pattern, which has short journeys to work, easy access to services, and adequate provision of public space [5].

The study of spatial patterns on coastal settlement has a role to contribute ideas through conceptual spatial model.

Started from this concept, the aspects of urban linkages related to spatial model at several levels of spatial scale in a city can be formulated.

The term “spatial model” refers to a particular form of disaggregation, in which an area is divided into a number of similar units. The term of model is used to denote more than just static representation such as particular scale model of a building. Rather, a model is a replication that aims to abstract natural laws and/or social-cultural factors that are involved in the interaction of the real world [6].

A model can exist in various forms — from the mathematical consisting of abstract numerical expression to the physical such a spatial consisting as linkages among sectors. Clipson lists four types of models as quoted in Groat and Wang [6]: 1) iconic, 2) analog, 3) operational and 4) mathematical model. Spatial models; included in the category of operational models; deals with people’s interaction within physical contexts, but the emphasis is more upon to the data generated by role-play.

Based on prior study conducted by Department of Public Works [7], the fisherman settlement is formed by two main factors which have important role. The factors are natural and human factors. The existing types of fisherman settlement are:

a. Clustered Pattern
   The fisherman settlement is developing and encircling the activity center in the fisherman kampong.

b. Spread Pattern
   The fisherman settlement spreads uncontrollable.
c. Linear Pattern
The fisherman settlement is developed based on the shape of the coastline so that it creates linear settlement.

There are various fisherman activities in Tambak Mulyo settlement based on function, purpose, and community involvement as follows:

A. Production
Production covers the processing of fishing catchment, from material sorting to the processing of fishing catchment. Below are the examples of the products:

a. Terasi (traditional seasoning) processing.

b. Salted fish processing.

c. Grilled fish processing.

d. Fish drying process.

B. Trade
Trade is buying and selling the products of fisherman community covering fish and other processing result as mentioned above. Trade is classified into two systems, which are:

a. Direct buying and selling process
It is a buying and selling process involving the fisherman as the producers and buyer as the consumers.

Transaction usually takes place on the wharves. The diagram below shows the process of fish selling:

![Diagram of fish selling process](source)

b. Indirect buying and selling process
The new fish auction center (TPI) in Tambak Mulyo has not yet functioned maximally. The new TPI even tends to be slack since most of the fishermen choose to moor their boats on the old TPI.

- Fish selling through TPI
The fishermen who sell the fish through TPI are those who join the auction process in TPI. Fish and other sea products are marketed to wholesaler / or direct to consumers. Below is the diagram of fish auction process in TPI:

![Diagram of fish auction process in TPI](source)
Fig. 6: Linkages between fisherman and consumer in TPI
Source: Field survey, 2011

- Fish selling through resellers
The fishermen sell their fish catchment through small-scale sellers without joining auction process in TPI. The sellers will then sell the fish to fish sellers in the market. Below is the diagram of fish selling:

C. Fisherman Activities Classification
Fisherman activities in Tambak Mulyo are classified into two, which are:

a. Fisherman
   It covers social activities, such as:
   - Fishing.
   - Fishing catchment.
   - Fish processing.
   - Boat manufacturing and repairing.
   - Making fishing equipments and repairing.
   - Machines repairing.

b. Fisherman family, such as:
   - House caring.
   - Social activity involvement.
   - Fish processing.
   - Assist repairing fishing equipments.

Tambak Mulyo is not oriented to the sea or surrounding river. This situation is different with waterfront concept which utilizes water as architectural element to reinforce its function and beautifies the region.

The fishermen moor their boats at coastline or at the bank of Banger River. This location is not close to the fisherman settlement. This situation impedes the exploration of Banger River.

Fig. 7: Linkage between fishermen and consumers though small-scale sellers
Source: Field survey, 2011

1. Infrastructure (Public Facilities)
Similar to other settlement, Tambak Mulyo fisherman settlement has some important infrastructure such as:

- Water supply and wastewater networks
  The water supply networks in Tambak Mulyo come from artesian wells which are channeled to the community houses by using downfeet system. Meanwhile, the community uses drainages to flow wastewater and rainwater.

- Electricity networks

- Lighting
  Lighting facilities in Tambak Mulyo Kampong covers road lighting. This lighting is funded by the government and community collective fund. The public lightings funded by the community usually uses low class lamps. These lamps are not bright comparing to those which are funded by the government.
- **Neighbourhood road**
  Road is a vital transportation infrastructure. The roads in Tambak Mulyo are used mostly by the dwellers and anyone who wants to reach the local market. The roads in this settlement are neighbourhood roads, which are commonly made from paving blocks. Nevertheless, there are some roads covered by clays such as the main road. Most of the roads are elevated to avoid tidal flood.

- **Waste management**
  Waste and rubbish in Tambak Mulyo are not well managed.

**2. Social Facilities**

  Social facilities are needed to accommodate community activities, such as:

- **Worship facilities**
  Since the majority of Tambak Mulyo community is Moslem, the worship facilities are considered sufficient, seen from the existence of mushalla in almost every alley and a mosque.

- **Health facilities**
  There are some health facilities in Tambak Mulyo, such as health center, midwife, and Posyandu (usually for pregnant women and children). It is sufficient since the facilities can accommodate urgent health service.

- **Education facilities**
  Education facilities are those used for teaching and learning process. Education facility available in Tambak Mulyo Village is elementary school.

- **Sport facilities**
  Sport facility available in Tambak Mulyo is football field for children.

Besides the social facilities mentioned above, there are some specific facilities for fisherman such as:

- **Wharves**
  The places to moor the boat. Made of woods or bamboo for fisherman step reach the ground from their boats.

- **Docks**
  Docks are vacant land near the wharves to repair the boats.

- **Place to repair boat machine**
  It uses request by order system which means that the technician will come based on order to repair the boat. The machine can also be repaired in the technician’s house.

- **Fuel gas station**
  There are only small stalls selling diesel fuel.

- **Place for fish drying**
  There are some vacant land and public space.

- **Local market**
  It is a group of stalls selling fish and other fishing catchment. Local market also sells vegetables and other basic needs.

- **TPI (Fish Auction Center)**
  TPI is a place to auction off the fish. The fish will then be sold to the market sellers.

**3. FINDINGS AND ANALYSIS**

**A. Population**

Most Tambak Mulyo dwellers are working as fishermen. Therefore, there are several community activities which are conducted in the main road and areas adjacent directly to the sea. The activities are parking and boat landing, fish marketing, and boat reparation.

Those activities were done in wharves, TPI (fish auction center), and docks. Besides, there are also some activities that are conducted on the ground such as fish drying, fuel station, and boat reparation. Fish drying is considered as the most disturbing activity due to the odor. Therefore, facilities to accommodate the interaction between fisherman and non-fisherman community are needed.

**B. Nature**

Tidal flood is a typical disaster, it seems identical to the location of Tambak Mulyo. It can happen in a sudden. Besides, the location of Tambak Mulyo which is directly adjacent to the sea makes it highly vulnerable to the natural disaster such as big wave or tsunami. Therefore, buffer zones are needed to give enough time for the community to prepare and reduce the damage to the housing. This area also functions as mitigation area.

The first area is buffer area which is located adjacent to the sea. It may consist of mangrove forest which serves to reduce the effect of disaster. Other facilities such as wharves, docks, place for fish drying, and place to repair boat, should be located in buffer area. To do their daily activities, it is not necessary for the dwellers to enter the river areas, they can do it in the coastline.
The second area is a location with social and public facilities spreading in the settlement area, so that it is accessible when the disaster happens.

![Diagram of Buffer and Mitigation Areas]

**Fig. 9: Buffer and mitigation areas are required to deal with disasters**
*Source: Analysis, 2011*

C. Houses

Generally the houses in Tambak Mulyo are permanent houses made of bricks. Nevertheless there are also semi-permanent houses and temporary houses made of wood and bamboo. Most of the houses are located on the ground rather than on waters. Tambakmulyo's settlements have to challenge to the tidal flood and land subsidence. Therefore, the dwellers must elevate their floor regularly. It needs high cost indeed. For this reason, there are many sink houses because of the occupants’ incapability to adjust the condition of their house against the land subsidence and tidal flood.

D. Infrastructure

The community in Tambak Mulyo thinks that the infrastructure is not sufficient, such as:

a. Road
   Road condition is poor since it is too narrow that makes it inaccessible for fire-fighting car. Besides, it is also often inundated by tidal flood.

b. Wastewater drainage
   There are many drainages which are not well functioned since it is clogged up by mud and garbage.

c. Waste management
   Waste management is poor since there is garbage littered in public area. It is worsened by the community less awareness to have healthy life style.

For other infrastructure such as electricity, freshwater, and telephone network get positive response from the community since it has been sufficient.

Based on the field finding, related to coastal settlement spatial planning, a good infrastructure planning is essentially needed. The main access must have a good quality and sufficient width to connect the fisherman settlement with the main road networks. It, then, will accommodate the community productivity.

Neighbourhood infrastructure such as waste disposal and firefighter networks on the area must be spread evenly in the settlement area.

The location can be integrated with the public and social facilities.

![Diagram of Infrastructure Needs]

**Fig. 10: Infrastructure is needed and can be adjusted according to the road networks**
*Source: Analysis, 2011*

E. Facilities

Related to the fisherman settlement, the facilities can be classified into:

- Main Facilities of Fisherman Settlement are the focus/center of a fisherman settlement. The facilities function as a connector between the activity of fishing and its catchment and its distribution. The distribution is performed in ground, in a form of: TPI, local market, wharf. It is important to get sufficient main access. Moreover, it has to be accessible so that the community, both fisherman and non-fisherman, can make use of it.

- Coastline Fisherman Facilities are supporting facilities for the fishermen that are located on the water, such as docks, fuel station, aquaculture, and tourism harbor. These facilities may serve as buffer to retain wave and natural disaster, thus it can be combined with mangrove forest.

- Land Fisherman Facilities are supporting facilities for the fishermen that are located on
the ground such as boat reparation facilities, fishing equipments reparation, and fish drying.

- Primary facilities, which function is to connect the activities of fisherman and non-fisherman community. These facilities should be located along the main road which have direct accessibility to the main facilities such as education, health, and worship facilities.

- Secondary facilities, which function is to connect the activities of fisherman and non-fisherman community in a smaller scale. These facilities need to be spread evenly in the settlement area. These facilities can be in a form of group of social and public facilities such as Open Space which functions as recreational and sport site as well as drying fish and repair fishing equipments, security post, mosque and disaster mitigation facilities.

4. CONCLUSION

The structure of conceptual spatial model is divided into two dominant clusters of population, that are 1) fisherman cluster and 2) non-fisherman cluster, which domination is increasing. Despite of the obvious classification, in fact, the activities of both clusters are interlinked.

The components of the spatial model are:

1) Fisherman facility share side of which environment center is open space which is used for net reparation, machine reparation, and fish drying process.
2) Secondary facilities of which environment center is open space which is used as children playground.
3) Common facility area, which are educational and religious facilities.
4) Main facility center, that are fish auction center, market and wharf, as well as solar station.
5) Fisherman facility sea side, include buffer zones, that are mangrove forest, bagan ikan.
6) Main access to reach fisherman core facilities, which also serves as main road in the settlement area to connect fisherman and non-fisherman core facilities.

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