

Analysis on urban space design criteria (Case study: Musi river side settlement), Indonesia

Tutur Lusetyowati^{1,2}, Edy Sutriyono³, Ridhah Taqwa⁴ and Widya Fransiska F. Anwar⁵

¹*Environmental Science Study Program, Sriwijaya University, Palembang, Indonesia*

²*Architecture Department, Faculty of Engineering, Sriwijaya University, Palembang, Indonesia*

³*Geology Engineering Department, Faculty of Engineering, Sriwijaya University, Palembang, Indonesia*

⁴*Sociology Department, Faculty of Social and Political Science, Sriwijaya University, Palembang, Indonesia*

⁵*Architecture Department, Faculty of Engineering, Sriwijaya University, Palembang, Indonesia*

(Received 22 July, 2017; accepted 10 September, 2017)

ABSTRACT

Musi riverside settlement in Palembang has a unique characteristic because most of the people activities take place above the wetland. As a traditional settlement, this settlement grew naturally, without changed the natural environment. In traditional settlements, the development of urban fabric is unplanned and/or spontaneous. Urban spaces in this area are important in structuring the city, especially to set up zoning regulation. The research question is what are the design criteria in setting zoning regulation for the riverside settlement related to the natural condition and the local people need both physical and non-physical needs? The research method is case study method includes field observation and interview with residents. The analysis uses Analysis Hierarchy Process (AHP). The element that will be analyzed is the urban space that includes land use, building mass, circulation and open space. By using AHP will be visible where the criteria are a priority in setting zoning regulation for riverside settlement. This process will be undertaken in stages by considering many factors. Results of the analysis showed some elements of the vector priorities that need to be considered.

Key words : Riverside, Settlement, Urban space, Design criteria

Introduction

Palembang municipality is divided into two parts by the Musi River, namely Seberang Ulu and Seberang Ilir. Seberang Ulu has a flat topography and below the maximum high-water marks of the Musi River, but some area has been reclaimed for the new building. Almost the houses in the riverside settlement are stilt houses which influenced by tide water and the urban space pattern is formed and influenced by natural conditions (Lusetyowati,

2009).

In the wetland settlements, especially along the riverside, usually, use stilt houses. The settlements have unique characteristics because almost people activities carried out above the water. Human behavior and daily activities are influenced and adjusted the natural conditions. The development of the settlement also has its own characteristics, they grow naturally without give a significant change in its natural environment, by allowing the swamp as it is. However, the people's needs for urban space in

*Corresponding author's email: tutur_lus@yahoo.ac.id

these settlements are similar, both on dryland and wetland.

Urban space can be described as external space in town. It is seen as open space for movement in the open air, with public and private zones. The concept of urban space has been elaborated as space between buildings in towns and other localities.

According Shirvani (1985) and Cuthbert (2007), there are several physical elements forming the city include land use city, building form, and massing, circulation and parking, open space and pedestrian ways.

The physical space is formed as a relationship between various kinds of objects and humans apart in a space. This conceptual emphasis on the interdependence among others (Rapoport, 1977): (1) Process which specializes activity and functional relationships in a region; (2) The physical process that address the need for space such as form, shelter, transportation and communications; and (3) The process of creation and integration space between different parts, which placed variety activities at the space that contains variety resources.

Urban space regulation is also important to conserve the urban wetland area. To protect the urban wetland needs the wetland-oriented regulation based on the natural and local people characteristic. The traditional settlement in the wetland area, especially in the riverside, shows how the wetland can be protect. The harmonious relationship between natural environment, local people, and the built environment is important to be considering in wetland planning and development (Lussetyowati, 2016).

Materials and Methods

The research methods are mix method include qualitative and quantitative methods. The research strategy use concurrent method, consisting of case study method and survey method (Creswell, 2010). Concurrent method is a method which the researcher converges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. The concurrent mix method is a procedure where qualitative research (case studies) will be performed in conjunction with quantitative



Fig. 1. Map of study area

research (survey research).

Sampling used nonprobability sampling technique. Non-probability sampling technique is more appropriate because it represented the population and the results could be generalized (Morissan, 2012). The population is the residents who live in Kampong 3-4 Ulu, especially along the riverside. The sample selection is based on the spatial distribution that consists of 5 neighborhoods. Samples had been taken are selected sample or purposive sample, which includes 100 respondents, subjects or the selected elements that had certain characteristics and qualities. Each neighborhood is represented by 20 samples. The data collections used several methods, such as interviews, observation, and questionnaires.

A community survey conducted by the enclosed questionnaires which using the Likert scale. Each answer will be scaled 1 to 5 that include five answers: strongly (score 5), agree (score 4), less agree (score 3), not agree (score 2) and strongly disagree (score 1). The questionnaires include land use, building mass, circulation, open space and adaptation. The analysis method in identification the urban space elements was descriptive analysis, which explained the data include the object of research that has been obtained from the field observation and interviews.

To determine the vector priority use Analysis Hierarchy Process (AHP). The element that will be analyzed is the urban space that includes land use, building mass, circulation and open space. By using AHP will be visible where the criteria are a priority in setting zoning regulation for riverside settlement.

Results and Discussion

The Riverside Settlements Overview

Palembang Municipality area was largely swamp area, which going to decrease because of reclamation. Rapid development in the city emerged the need for land to build residential and more facilities. It is also triggered by changing the transport mode from the river transportation into the road. Some wetlands began dumped and changed into the dryland land for construction. This reclamation often didn't use the technical requirements for wetlands reclamation and emerged some negative impact for the city such as ponding of water during the rainy season and flooding in some areas.

Residential areas that still maintain the swamp

only exist in some areas, especially at the river banks that influence of tidal. Riverside settlement is still very important to be maintained in the original form. The reclamation without regulation can cause some negative impacts. Therefore it is necessary to set up regulation.

In the wetland settlements, especially along the riverside, usually, use stilt houses. The settlements have unique characteristics because almost people activities take place above the water. Human behavior and daily activities are influenced and adjusted the natural conditions. The development of the settlement also has its own characteristics, it grows naturally without give a significant change in its natural environment, by allowing the swamp as it is. However the people's needs for urban space in these settlements are similar, both on dryland and wetland (Lusetyowati, 2014).

Based on table 1, people daily activities in the riverside settlement are the same as in other settlements. Their activities mostly take place in their houses and its surroundings. Residents inhabitants such as shower, wash and defecate sometimes are still be done in the river, especially by local people who live along the riverside. Besides, people also work around the neighborhood to earn money, such as selling, fishing, boat building and others. These activities show the relationship between local people activities and the natural environment at the riverbank.

Outdoor activities in public spaces can be divided into three categories, they are necessary activities, optional activities and social activities (Gehl, 1987). Necessary activities include going to school or to work shopping, waiting for a bus or a person, distributing mail, in other words, all activities in which those involved are to greater or lesser degree required to participate. Everyday tasks belong to this group. And because the activities are necessary, the physical framework influences their incidence only slightly. These activities will take place throughout the year, under nearly all condition and more or less independent of the exterior environment. The optional activities include such activities as taking a walk to get breath of fresh air, standing around enjoying life, or sitting and sun bathing. These activities take place only when exterior conditions are optimal when weather and place invite them. The social activities depend on the existing public spaces. Social activities include children at play, greetings and social conversations, communal ac-

tivities of various kinds and as the most widespread social activities-passive contact, seeing and hearing other people.

Elements of Urban Space

Urban space that analyzes includes four elements, they are land use, building mass, circulation and open space (Shirvani, 1985). These urban spaces are important to consider in setting up the zoning regulation.

Land Use

The land use in residential settlement areas is the same as other settlements because the need of spaces is the same. In each neighborhood unit, there are some facilities such as educational facilities, health, worship, open space, trade and other necessary facilities. The division of space in the settlement follows the existing pattern but needs clearly of functions, such as which areas for public facilities and which areas for social facilities, both types of land

use should be placed in an easily accessible area. The residential area is the most extensive area in this settlement, approximately 80% of the total area.

Building Mass

The intensity of the buildings is very high with approximately 80% of building coverage. There are many slums area with the high-density building. The height of buildings mostly is one until two stories only. There are no high-rise buildings in this area.

Circulation

There are two main circulation systems; they are street and river channels. Between street and river channel is connected by alleys that called '*jerambah*'. Alleys are the main path for movement in wetland settlement with the stilt structure above the tidal land. The height of the stilt usually considers based on the highest tide in the area. Public facilities such as schools, mosques, offices, health centers, shops

Table 1. Local People Activities in Riverside Settlement

No	Activities	Existing Urban Space
1.	Activities in the home such as cooking, eating, sleeping, receiving guests, etc.	Some spaces in the house such living room, bedroom, family room, dining room, kitchen.
2	Washing	In the river or around the house.
3	Drying clothes	Around the house.
4	Throw garbage	Around the house.
5	Parking boats	On wooden place at the riverbank.
6	Parking four-wheeled vehicle	On the street side.
7	Praying	Mosque.
8	Socializing with neighbors	On the street side, alley (called ' <i>jerambah</i> '), mosque, terrace.
9	Children play	River bank, alley, space between buildings.
10	Shopping for daily needs	Stalls in the neighborhood, the shop on the roadside, vegetable vendors, boat stalls.
11	Ceremonial (wedding, traditional festival, child initiation, etc).	House, open space.

Table 2. Land Use Tabulation Survey

No	Statement	Score
1	Land use is important in settlement planning especially in the wetland area.	4.24
2	Land use is sufficient the need in human settlement.	3.26
3	Land use for open space is adequate	2.94
4	Existing educational facilities is sufficient.	4.00
5	Existing health facilities is sufficient.	4.06
6	Worship facilities are already sufficient.	4.09
7	There are no other land uses have been available in the settlement.	3.28
8	Mix land use between residential and other activities would be better than single land use.	2.98
	Average score	3.61

etc usually use the street side, as well as the parking area for cars or tricycles called '*becak*', because of limitation of dryland area. To reach the wetland neighborhood only can use pedestrians or two-wheeled vehicles, so people who have a four-wheeled vehicle usually park on the street side. It needs local parking regulation in order not disturbing traffic movement.

Rivers formerly is a major transportation channel, the development dryland transport system makes this system only as the alternative paths, mainly the large river. The small rivers are no longer used as a transportation cause of sedimentation.

Neighborhood alleys are narrow alleys with between 1-2 meters width of stilts alleys called '*jerambah*'. *Jerambah* is made of wood and in some places using reinforced concrete. A limited access causes some problems, especially for the fire hazard, the fire trucks could not reach the site because there is no way could be passed.

Open Space

Open spaces include movement path (road, *jerambah*, rivers) and space between the buildings (Shirvani, 1985). Open spaces as public spaces primarily located in areas that can be stepped, it means is spaces where people can move (Lusetyowati, 2012). These spaces are formed by the dryland road or '*jerambah*' (alleys on stilts). Other open spaces are spaces between buildings that become swamps during the tide flooded season and become dry land during the dry season. To fulfill the need of open spaces, sometimes local people try to widen the land by adding the wooden board on stilts. Beside the veranda is also an important part of the house as a

place to socialize with neighbors. In Kampong 3-4 Ulu, there is not any open space for children playground. But the children have their own play patterns by adjusting the existing limitation spaces. Children can play everywhere, how and at any place.

The result of local community survey

In determining the influencing factors and the criteria of urban spatial layout in the wetland area, a survey was conducted in the local community, using a survey of 100 respondents. The survey has been done which includes the survey with questionnaires include four elements of urban space, including land use, building mass, circulation and open space. The results of the survey can be seen in the following table.

Based Table 2, data analysis with Likert scale, the average score of land use is 3.61 from scale 1 to 5. The highest score is the number 1 statement with 4.24 score. It indicates that land use is an important element in riverside settlement planning. This also shows that most respondents almost strongly agree with number 1 statement. The results of land use questionnaires show several things to underline, they are: (1) Land use is an important element in the arrangement of urban spaces in riverside settlement; (2) Socio-economic facilities are sufficient for the local people needs; and (3) The mix land use is not priority in spatial planning yet.

The results of building mass data processing get an average score about 3.48, with the highest value in the statement number 3. The questionnaire's results shows some important thing to underline, they are: (1) The distance between buildings is too nar-

Table 3. Building Mass Tabulation Survey

No	Statement	Score
1	The building mass in the settlements is good.	3.38
2	The building mass pattern is regularly.	4.00
3	The distance between buildings is too narrow.	4.12
4	The distance between building and street is quite good.	3.45
5	The distance between the building and the footpath is enough.	3.28
6	Land ownership boundaries are clear.	3.14
7	Comparison of floor area to site is quite high (more than 75%).	3.35
8	Building height that appropriate in the settlements is between 1-2 floors.	3.89
9	High-rise building is appropriate in the area.	2.44
10	Most of the buildings oriented to the street or alley.	4.00
11	Building along the river banks mostly oriented to the river.	3.32
12	There is a clear pattern between buildings and open spaces.	3.33
	Average score	3.48

Table 4. Circulation Tabulation Survey

No	Statement	Score
1	There are adequate roads and streets.	4.23
2	The local street has connected the house to the street.	4.28
3	Lack of the pedestrian ways for movement	4.15
4	Circulation pattern is well defined	3.15
5	Streets connect to the river transportation	3.75
6	There is an adequate car park.	4.33
	Average score	3.98

row; (2) The building mass pattern is irregular and have no pattern; (3) The buildings height is between 1-3 floors, related with the wetland area, but respondents also consider medium-rise buildings (4-10 floors) still appropriate for the area. (4) The building orientation is mostly towards the road or the alley and not to the rivers.

Based on table 4, data analysis with Likert scale, the average score of circulation is 3.98, with the highest score in the statement number 2. The questionnaire result of circulation shows as follow: (1) The main road is adequate for circulation, as well as alley; (2) The path still lacks for movement; (3) Circulation pattern still needs structuring; (4) There is a relationship between the main road and the river; and (5) The parking space is adequate.

Based on data analysis with Likert scale, the average score of open space is 2.72, with the highest score in the statement number 6. The questionnaire result of open space shows as follow: (1) The open space is not fulfilling the needs of local people; (2) Waterfront didn't work properly; (3) Waterfront is not as the building orientation, while the riverside have high potential to be public open spaces; and (4) There are not enough open spaces for children's playground.

Based on Table 5, the results of questionnaire

data processing and measurement with the Likert scale of all the urban space elements, the average score shows as follow.

Table 5. Measurement with Likert of Urban Space elements

No	Criteria	Average score
1	Land use	3.61
2	Building mass	3.48
3	Circulation	3.98
4	Open Space	2.72

Table 6. Results of Vector Priority of Urban Space Elements

Sl. No	Element of urban space	Score of vector priority
1	Land use	0.146
2	Building mass	0.100
3	Circulation	0.208
4	Open Space	0.038

Analytic Hierarchy Process

The design criteria will be determined using the Analytic Hierarchy Process (AHP) method. The result of measurements with the Likert scale of the elements of urban space will be used as a basis data in determining the vector calculation of urban space element priority. The result of vector priority calculation shows as Table 6.

The vector priorities lead to determine the design criteria of urban space design. These criteria also can be considered to set up the zoning regulation for riverside settlement. Circulation is the first priority in design criteria. Circulation is structuring the riverside settlement. The second place is land use. Land use gives two-dimensional plan in urban development. To set up zoning regulation, the urban space

Table 4. Open Space Tabulation Survey

No	Statement	Score
1	Open spaces are adequate for the local people needs.	2.78
2	Green open space is sufficient for this area.	2.56
3	Open spaces along the riverbank work properly.	2.61
4	There are green open spaces along the riverbank that fulfill the local people needs.	2.62
5	Riverbank is the building orientation.	2.79
6	Residents can easily use the existing open space.	2.93
7	There are open spaces for children playground.	2.76
	Average score	2.72

vector priority is one of some consideration. In this case, vector priority is determined based on the preference of local community. According to Xia *et al.*, (2014), zoning regulation scenario considers land use suitability, planning compatibility and spatial compactness. Land use zoning, for instance, can be generated based on the participatory preference of planner and stakeholder.

Conclusion

Based on the results of survey and data processing using Likert scale and Analytic Hierarchy Process, it is concluded that the criteria of urban spatial design based on urban space elements in order of priority vectors are: (1) Circulation; (2) Land use; (3) Building mass; and (4) Open space. These design criteria are determined based on local community preference.

Urban space regulation is important in conservation the urban wetland area. To protect the urban wetland needs the wetland-oriented regulation based on the natural and local people characteristic. The harmonious relationship between natural environment, local people, and the built environment is important to be considering in wetland planning and development.

References

Creswell, J.W. 2010. *Research Design, Pendekatan Kualitatif,*

- Kuantitatif dan Mixed.* Yogyakarta: Pustaka Pelajar.
- Cuthbert, A.R. 2007. Urban design: requirement for an era - review and critique of the last 50 years. *Urban Des. Int.* 12(4) : 177–223.
- Gehl, J. 1987. *Life Between Building, Using Public Space.* New York: Van Nostrand Reinhold.
- Lusetyowati, T. 2009. Study On Community Participation of Kampong 3-4 Ulu Palembang Revitalization. in Proceeding of International Seminar Making Space For a Better Quality of Living. Yogyakarta: Universitas Gadjah Mada.
- Lusetyowati, T. 2012. Penggunaan Ruang Publik Di Permukiman Tepian Sungai Musi Palembang. Dalam Prosiding Seminar Nasional Ruang Bersama Nusantara. Palembang: Universitas Sriwijaya.
- Lusetyowati, T. 2014. Studi Perkembangan Permukiman Daerah Rawa Di Kota Palembang. Dalam Seminar Nasional Membangun Kota Berbasis Lokalitas. Palembang: Universitas Sriwijaya.
- Lusetyowati, T. 2016. Identification of Urban Space of Riverside Settlement, Case Study /: 3-4 Ulu Palembang. In *Proceeding of Fourth International Conference on Sustainable Built Environment.* Yogyakarta: Universitas Islam Indonesia.
- Morissan. 2012. *Metode Penelitian Survei.* Jakarta: Kencana Prenada Media Group.
- Rapoport, A. 1977. *Human Aspect Of Urban Form.* New York: Pergamon Press.
- Shirvani, H. 1985. *The Urban Design Process.* New York: Van Nostrand Reinhold.
- Xia, Y., Liu, D., Liu, Y., He, J. and Hong, X. 2014. Alternative Zoning Scenarios for Regional Sustainable Land Use Controls in China/: A Knowledge-Based Multiobjective Optimisation Model. *Int. J. Environ. Res. Public Health.* 11 : 8839–8866.