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Study On Urban Settlement Management In The Central Part Of Central Ciliwung Watershed, Bogor Prita Indah Pratiwi Lecturer of Landscape Architecture Department, Bogor Agricultural University chazter610@yahoo.com Debora Budiyono Lecturer of Landscape Architecture, Tribhuwana Tunggadewi University debora_shif@yahoo.com ABSTRACT The rapid population growth in Bogor city has implications for the increase of need for shelter.

It has encouraged a landuse change in the central part of Central Ciliwung Watershed. The riparian settlement is illegal settlement growing into slum area in the city center. The purpose of this study was to develop a management strategy of ecologically based urban settlement in the central part of Central Ciliwung Watershed.

The research was conducted in five stages: preparation and determination of research location, data collection, health and settlement environment identification, SWOT (Strenght, Weakness, Opportunities, Threats) analysis, management strategy formulation. Descriptive quantitative and qualitative method was applied in this research.

The results showed that the settlement management in the central part of Central Ciliwung Watershed was progressive strategy. It meant that the existing design was in less stable condition. The main priority of the management strategy in the central part of Central Ciliwung was ecological aspect.

The concept of settlement consisted of three zones, namely the housing zone, transition zone, and the public zone. There were 2 types of settlement: middle class and lower middle class settlement. Keywords: Ciliwung, Landscape Management, SWOT, Urban

Settlement, Watershed INTRODUCTION The collapse of houses along the river in various regions of Indonesia causes the death of residents. Landuse change taken place in riparian areas is made by the housing developers and the poor marginal community.

Whereas, riparian areas have a function as a buffer space between the aquatic and terrestrial ecosystem so that the function of rivers and human activities are not disturbed [1]. One of the riparian areas which has ecological function is the central part of Central Ciliwung Watershed in Bogor city. However, nowadays the river banks in Bogor city have changed in terms of ecological function.

Along the river bank of Central Ciliwung Watershed has been used by lower middle class of residents who have relatively low income. As a result, the environmental condition along the river is not concerned and managed, such as the loss of vegetation component as a supplier of nutrients to fauna component in the river.

The existence of this settlement creates the river as a household domestic waste disposal at the back of the house, not as waterfront or orientation for doing daily activities. The housing along the river is one of the spontaneous settlements formed from simple initial condition of the physical building [2].The initial condition of spontaneous settlements formation tends to be a slum house.

The characteristics of slum housing as an unstructured housing form, unpattern, no public facilities, poor physical infrastructure and uninhabitable environment (periodically flooded) show the existing riparian settlement in central part of Central Ciliwung Watershed [3]. If the condition of river bank of central Ciliwung, especially its water resource is not managed, it will cause problems both in terms of environmental spatial quality and public health quality.

The determination of the river bank width is one of the ways to maintain the ecological functions, hydraulic, and morphology of the river [4]. This step needs to be conducted in the river bank of Central Ciliwung Watershed in order to manage the landscape along the river as one of the alternatives which could be developed to reduce population density, environmental pollution, and flooding threat.

It could increase the ecological functions so that the aquatic, terrestrial, and ecotone ecosystem could be protected and sustained [5]. The design of the river bank area should notice the geographical factor and urban context underlying the decision and design solution [6]. The purpose of this study was to develop a management strategy of ecologically based urban settlement in the central part of Central Ciliwung Watershed.

RESEARCH METHOD The study was conducted in the central part of Central Ciliwung Watershed, Bogor, West Java. The location was selected with the existence of dense settlements which might have impact on the watershed ecology (Figure 1, 2, 3, and 4). The width of the central part of Central Ciliwung Watershed Bogor is 1014 hectares with the number of population of 87,846 people (Table 1). Figure 1.Ciliwung Watershed Land UseMap (Source: Budiman, 2012) Figure 2. The Existing Middle Class Housing (Source: Budiyono and Pratiwi, 2012) Figure 3.

The Existing Lower Middle Housing (Source: Budiyono and Pratiwi, 2012) Figure 4. Existing Models of Central Ciliwung Watershed Housing, Bogor (Source: Budiyono dan Pratiwi, 2012) Table 1. Width Area and The Number of Residence District _Village _Width (Ha) _Number of Residence (people) _ _Central Bogor _Sempur _63 _7,829 _ _Central Bogor _Pabaton _72 _3,719 _ _Central Bogor _Babakan _128 _6,039 _ _North Bogor _Bantarjati _183 _22,339 _ _North Bogor _Cibuluh _194 _17,623 _ _Tanah Sareal _Kedung Badak _219 _21,786 _ _Tanah Sareal _Tanah Sareal _155 _8,511 _ _(Source: Budiman, 2012) The methods used in this study were survey and literature study.

The research stages were (1) preparation and determination of the location for observation of the physical aspects of housing and the environment, (2) primary and secondary data collection, (3) identification of health requirements for housing and settlement environment [7], (4) SWOT analysis (Strenght, Weakness, Opportunities, Threats) [8], and (5) management strategy of sustainable settlement. The data analysis method used was qualitative and quantitative data analysis.

Qualitative data analysis was analysis of the internal and external factors, whereas quantitative analysis was conducted by weighting and giving rating. The SWOT analysis stages as follows [9]: Identification of Internal Factor (IFE) and (EFE) External Factor and Significance Level Determination (Table 2 and Table 3). Table 2.

Significance Level of Internal Factor (IFE) Symbol _Strength Factor _Significance Level _Rating _ _S1 _ _ _ _ _S2 _ _ _ _ _Sn _ _ _ _ _Symbol _Weakness Factor _Significance Level _Rating _ _W1 _ _ _ _ _W2 _ _ _ _ _Wn _ _ _ _ _(Source: Rangkuti, 1994) Tabel 3. Significance Level of External Factor (EFE) Symbol _Opportunity Factor _Significance Level _Rating _ _S1 _ _ _ _ _S2 _ _ _ _ _Sn _ _ _ _ _Symbol _Threat Factor _Significance Level _Rating _ _T1 _ _ _ _ _T2 _ _ _ _ _Tn _ _ _ _ _(Source: Rangkuti, 1994) Each factor would be given the level of significance ranging from very important to not important as well as rating scale of 1 to 4 with the following ratings (Table 4): Table 4.

Significance Level Rating of Internal (IFE) dan External (EFE) Factor valuei _IFE matrix _EFE matrix _ _ _Strength (S) _Weakness _Opportunity _Threat _ _1 _Very small strength

_VVery big weakness _Low opportunity _Very big threat _ _2 _Moderate strength _Big weakness _Moderate opportunity _Big threat _ _3 _Big strength _Moderate weakness _High opportunity _Moderate threat _ _4 _Big strength _Small weakness _Very big opportunity _Small threat _ _(Source: Rangkuti, 1994) The Weighting Determination of Internal and External Factor Weighting was conducted by giving weight assessment of internal and external factors with the following conditions: horizontal factor indicator is less important than the vertical factor indicator, weight = 1 b.horizontal factor indicator is equally important than the vertical factor indicator, weight =2 c.

horizontal factor indicator is more important than the vertical factor indicator, weight = 3 d. horizontal factor indicator is very important than the vertical factor indicator, weight = 4 The weight of each variable was obtained by determining the value of each variable to the overall value of variable using the formula below [9]: Having weighted, total value weighting was calculated by multiplying each weight with the rating of every internal and external factor (Table 5 and Table 6). Table 5.

Determination of Total Weighting Score of Internal Factors (IFE) Symbol _S1 _S2 _Sn _W1 _W2 _Wn _Total _Weight _Rating _Score _ _S1 _ _ _ _ _ _ _ _ _ _ _ _S2 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _Sn _ _ _ _ _ _ _ _ _ _ _ _W1 _ _ _ _ _ _ _ _ _ _ _ _W2 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _Wn _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _Total _ _ _(Source:Rangkuti, 1994) Table 6.

Determination of Total Weighting Score of External Factors (EFE) Symbol _O1 _O2 _On _T1 _T2 _Tn _Total _Weight _Rating _Value _ _O1 _ _ _ _ _ _ _ _ _ _ _ _O2 _ _ _ _ _ _ _ _ _ _ _ _ _On _ _ _ _ _ _ _ _ _ _ _ _T1 _ _ _ _ _ _ _ _ _ _ _ _T2 _ _ _ _ _ _ _ _ _ _ _ _Tn _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _Total _ _ _(Source: Rangkuti, 1994) If the total value of IFE and EFE is more than 2.5, the value indicates strong condition.

This could be mapped through IFE and EFE matrix which could be seen in Figure 5. Figure 5 IFE and EFE Matrix (Source: Rangkuti, 1994) Formulation of strategy and priority (ranking) Based on the matrix above, the appropriate strategy was obtained and incorporated into the SWOT matrix (Table 7). Table 7.

Formulation of Strategy through SWOT Matrix External Internal _Opportunity _Threat _ _ _ _ _ _Strength _SO Strategy Utilize all of the strengths to take and use the opportunities as possible _ST Strategy Use the strengths to overcome the threats _ _Weakness _Strategy WO Based on the use of opportunities by minimizing the existing weaknesses _Strategy WT Based on the defensive activities by minimizing the weakness and avoiding the threats _ _ _ _ _ _ _ _ _ _(Source: Rangkuti, 1994) Based on the analysis, the management development of program strategy was obtained with its priority level (Table 8). Table 8.

Program Priority of Management Development No _Alternative strategy _Linkage of SWOT elements _Score _Ranking _ _1 _ _ _ _ _ _2 _ _ _ _ _ _3 _ _ _ _ _ _(Source: Rangkuti, 1994) The SWOT analysis results will be derived into the criteria of management strategy in order to obtain a standard or criterion to establish housing in other watershed areas.

The criteria concept are arranged in a criteria matrix in which the indicators in formulation of housing strategy in the center part of Central Ciliwung Watershed (Table 9). Table 9. Criteria Matrix of Urban Riparian Settlement Management No _component (priority) _weight _design criteria of riparian settlement _ _ _ _ _1 _2 _3 _ _1 _Component 1 _ _ _ _ _ _ _ Variable 1 _ _ _ _ _ _2 _Component 2 _ _ _ _ _ _ _ Variable 2 _ _ _ _ _ _N _Component n _ _ _ _ _ _ _ Variable n _ _ _ _ _ _(Source: Rangkuti, 1994) The criteria obtained were organized into three criteria classifications through assessment: low score (1), moderate score (2), and high score (3).

The score indicated the fulfillment to the criteria for settlement management strategy in the central part of Central Ciliwung Watershed. Classification criteria for low, medium, and high were applied in settlement management strategy in order to gain scenario in managing settlement in the central part of Central Ciliwung watershed.

RESULTS AND DISCUSSION Identification of health requirements for housing and settlement Condition of housing and settlement environment as well as its assessment were clearly stated in Decree of Health Ministry Republic of Indonesia No. 829/Menkes/SK/VII/1999 [7] and Decree of Public Housing Ministry Republic of Indonesia No. 4/KPTS/BKP4/1995 [10].

People agree that housing is a prerequisite for mental health although it is difficult to prove the relationship [11 The location of the central part of central Ciliwung Watershed settlement did not conform with the standards because it was located in prone natural disaster area due to landslides located at <5 m from the river bank with fairly good air and soil quality and noise <55 dBA.

The settlement has the facilities and infrastructure as follows: Playground at school, neighborhood parks Drainage with a clean condition and good flow, Street lighting, no sidewalks and safety fences, Communal clean water source from springs in park and individual clean water from PDAM Communal water closet in each neighborhood (4 units) and private water closet in middle-class homes, The trash in every home without garbage separation, throwing garbage into river behavior still found Health care facilities such as Posyandu in each village, a public phone in a few neighborhood, accessibility in the West side of the settlement is quite difficult because it could use

suspension bridge with a width of <1 m, entertainment venue such as Sempur park, school in East side of settlement, Electrical installation using the PLN Quite good food management Elephantiasis disease vector through mosquito larvae index was less than 5%.

Greening in middle class settlement was characterized by the presence of the park at least 40% of building area, while the lower middle class settlement almost has no garden. Lower middle-class settlement has a building area of 48 m2, while the middle-class settlement (150 m2) was in line with the standards of building area of 70-150 m2.

SWOT Analysis of Management Component The following table is a grouping of internal and external factors in the management of settlements in the central of Central Ciliwung Watershed. Table 9. Importance Level of Internal Factors in The Central Part of Central Ciliwung Watershed Management Importance level of internal factors _ _ _ _SYMBOL _FACTORS OF STRENGHT _IMPORTANCE LEVEL _SCORE _ _Location _ _ _ _ _S1 _Not located in the former landfills area or former mining and fire-prone free _Very big strength _4 _ _Air Quality _ _ _ _ _S2 _Do not contain toxic gases _Very big strength _4 _ _Noise and Vibration _ _ _ _ _S3 _Noise and Vibration < 55 dBA _ _3 _ _Environmental Infrastructure and Facilities _ _ _ _ _S4 _Playground for children, sports facilities, and family recreational facilities _Moderate Strength _2 _ _S5 _Drainage with clean and good condition _Very big strength _4 _ _S6 _Roads (suspension bridge) which has a safety rail and street lighting _Very big strength _4 _ _S7 _Communal: water spring from the Peranginan Park _Very big strength _4 _ _S8 _Communal: water closet 4 units in each neighborhood
Individuals: private water closet (middle-class settlement) _ Very big strength _4 _ _S9 _Trash bin in every house and have a garbage dump in several village _Very big strength _4 _ _S10 _Access to health care facilities, communications and education _Very big strength _4 _ _Greening _ _ _ _ _S11 _Garden with the size at least 40% of the total building area in middle-class settlement has _Big strength _3 _ _SYMBOL _FACTORS OF WEAKNESS _IMPORTANCE LEVEL _SCORE _ _Location _ _ _ _ _W1 _Not river oriented settlement and located in disaster-prone areas _Big weakness _2 _ _Environmental Infrastructure and Facilities _ _ _ _ _W2 _Insufficient drainage width _Very big weakness _1 _ _W3 _Roads with slope ± 45%, do not have sidewalks and safety fence _Very big weakness _1 _ _W4 _Waste disposal directly into river _Very big weakness _1 _ _W5 _No waste separation and throwing garbage behavior into the river _Big weakness _2 _ _W6 _Accessibility of vehicles is quite difficult, road width <1 m (settlement in West side), 5 m (settlement in East side) _Very big weakness _1 _ _W7 _No art studio _Moderate weakness _3 _ _W8 _Raising fish in cages (keramba) with food from inorganic chemicals _Big weakness _2 _ _Vector-borne Diseases _ _ _ _ _W9 _Mosquito larvae index:

elephantiasis _Moderate weakness _3 _ _Greening _ _ _ _ _W10 _Lower-class settlement almost does not has a garden _Moderate weakness _3 _ _(Source: Budiyono and Pratiwi, 2012) Table 10.

Importance Level of External Factors of Ciliwung Watershed Management Importance level of External Factors _ _ _ _SYMBOL _FACTORS OF OPPORTUNITY _IMPORTANCE LEVEL _SCORE _ _Environmental Infrastructure and Facilities _ _ _ _ _O1 _Individual: local water company (PDAM) _Very big opportunity _4 _ _O2 _Electrical installation settings: PLN _Very big opportunity _ 4 _ _SYMBOL _FACTORS OF THREAT _IMPORTANCE LEVEL _SCORE _ _Vektor Penyakit _ _ _ _ _T1 _Mosquito larvae index: elephantiasis _Moderate threat _3 _ _(Source: Budiyono and Pratiwi 2012) Figure 6.

Quadrant Matrix of SWOT Method in The Central Part of Central Ciliwung Watershed Management (Source: Budiyono and Pratiwi, 2012)
The results showed the total score for the internal factors of 0.08, while the external factors of 0.2. Based on the value of the IFE and EFE, they were mapped into quadrants matrix of SWOT to determine the appropriate strategy.

An appropriate strategy for managing the central part of Central Ciliwung Watershed located in the first quadrant was a progressive strategy. It meant that the existing design was in less stable condition, but this design will experience serious challenges from the environment to continue if it only rely on the previous strategy (Figure 6). Recommended strategies were scored and ranked into alternative strategies (Table 11). Tabel 11.

Priority of Alternative Management Strategies No _Alternative Strategy _The linkage element of SWOT _Score _Rank _ _1 _Ecological-based management of riparian settlement _S1, S2, S3, S5, S7, S8, O1 _1,73 _1 _ _2 _Infrastructure and facility development on each municipality (drainage, roads, bridges, water closet, water, trash bin, health care, communication and education) _ S4, S6, S7, O2 _ 1,33 _ 6 _ _3 _Closed drainage arrangement according to standards of healthy housing, placement of water closet in every home away from the river >10 m _ S1, S5, S8, S9, T1 _1,61 _ 3 _ _4 _River oriented settlement arrangement following topography _W1, W3, W6, W8, O1 _1,51 _5 _ _5 _Arrangement of infrastructure and facilities supporting the distribution of water resources (PDAM) and electricity (PLN) _W2, W3, W4, W6, W7, O2 _1,67 _2 _ _6 _Utilization of open space as a neighborhood park and the art studio to improve air quality _W7, W10 _0,29 _7 _ _7 _Placement of water waste management installation in each neighborhood and spraying houses regularly _W1, W4, W8, T1 _1,57 _4 _ _(Source: Budiyono and Pratiwi, 2012) Component of riparian settlement had low, medium, and high score visualized in concept figure 3 in order to obtain an arrangement model.

The concept of settlement consisted of three zones, namely the housing zone, transition zone used for centers of economic activity, and the public zone used as a recreation place. The empty space among each other villages used as green open space. There were two classes of settlement, namely middle class settlement, and lower middle class settlement (type 1,2, and 3).

Middle Class Settlement The existing settlement was categorized into formal settlement consisting of official developed housing of KODIM AD, My Residence [12]. The first model was a middle-class settlement with building area of 70-150 m2 and land area 90-150 m2 located on river border line distance more than 5 m (Figure 7). Figure 8 showed that the main priority in developing ecologically-based housing design were using traditional-modern form [13].

Settlement arrangement followed the topography and river flow linearly with grid pattern. It was in line with the statement [14] that riparian settlement design has two important aspects that underlie the decisions and design solution, namely geographic context (land condition, climate) and urban context (user, historical-cultural repertoire, accessibility and circulation, visual character).

Neighborhood garden was located in the central of the settlement surrounded by facilities and infrastructure supporting the settlements and community's activity. Besides of that, this model have to be able to facilitate local people's habbit such as by providing facility and infrastructure: electricity, drainage, sufficient clean water, washing closet (3x4 m2) > 5 units/neighborhood, communal and individual disposal and municipal waste water treatment system, educational facilities (kindergarten, elementary school), worship facilities, medical facilities, government services (neighborhood office: RT/RW), commercial services (shops, stall), art and cultural studio.

Moreover, it required continuous socialization through public policy and law enforcement so that communities could perform their participation by maintaining the facilities [15]. Figure 7. Middle Class Settlement Model (Source: Budiyono and Pratiwi, 2012) Figure 8. 3D Model of Middle Class Housing (Source: Artha and Wibisono, 2012) Lower Middle Class Settlement The existing settlement was cetogorized into spontaneous settlement formed with very simple building [16], unstructured form, no pattern, minimal public facilities, poor infrastructure and facilities, uninhabitable environment [17], no green open space, almost no building permit (Survey 2012). Based on standards of Law no.

4 year 1992 [18], the lower middle settlement in the central part of Central Ciliwung

Watershed was divided into 3 types of models, as follows: Type 1 The lower middle class settlement type 1 on the West side was river oriented settlement with grid pattern to adjust the very steep slope so that every row of houses have different heights, facilitate the circulation of people, vehicles, and air/wind, river border line distance more than 5 m, and could optimize the capacity of narrow area (Figure 9).

The settlement consisted of facilities and infrastructure, such as single house type with building area of 36-70 m2 and land area of 50-90 m2 inhabited by 5-6 people/house, neighborhood-scale government facilities, neighborhood health center (posyandu), kindergarten, mosque, art studio facilities, security (poskamling), school, neighborhood parks with a size of 50 m2, circulation steps with a width of 2 m, 5 units of water closet/neighborhood, street lights in every home, closed drainage system, trash bin with organic and inorganic waste sorting system in every home.

Figure 10 showed the ecologically-based lower middle class housing model using traditional-modern form [13]. Circulation consisted of a two-way circulation using steps with a width of 5 m and green space corridor on the both sides (trees and flowering shrubs), and pedestrian path with a width of 2 m. Figure 9. Lower Middle Class Settlement Model Type 1 (Source: Budiyono and Pratiwi, 2012) Figure 10.

3D Model of Lower Middle Class Housing (Source: Artha and Wibisono, 2012) Type 2 This type of settlement model was located in West and East side (Figure 11). The settlement in the West side had a very steep slope, while in the East side tended to be flat. The settlement pattern of this type was similar to the first type. The significant differences with the first type was the layout of open space in which the West side of this type was right on the riverbank with a smaller size than the first type.

The West side settlement did not have education facilities because the area was inadequate and located in the same neighborhood (RW) with the East side. There was a suspension bridge as a link between both sides of settlements so that students could go to school to the East side using the bridge. Facilities and infrastructure of this type were the same with the first type.
Gambar 11.

Lower Middle Class Settlement Model Type 2 (Source: Budiyono and Pratiwi, 2012) Type 3 This type of settlement model was located in East side (Figure 12). The settlement pattern of type was similar to the first and second type, this type has similarity with the East side of type 2 in which the slope tends to be flat. Facilities and infrastructure in the settlement of this model was also the same with the previous lower middle settlements. Gambar 12.

Lower Middle Class Settlement Model Type 3 (Source: Budiyono and Pratiwi, 2012) CONCLUSION Settlement management of the central part of Central Ciliwung Watershed located in the first quadrant of SWOT is progressive strategy. It means that the existing design is in less stable condition, but this design will experience serious challenges from the environment to continue if it only rely on the previous strategy.

Seven strategic priorities in managing urban riparian settlement are ecological-based management of riparian ecological settlements, infrastructure and facility development on each municipality (drainage, roads, bridges, water closet, water, trash bin, health care, communication and education), closed drainage arrangement according to standards of healthy housing, placement of water closet in every home away from the river >10 m, river-oriented settlement arrengement following topography, infrastructure and facilities arrangement supporting the distribution of water resources (PDAM) and electricity (PLN), utilization of open space as a neighborhood garden and the art studio to improve air quality, and placement of water waste management installation in each neighborhood and spraying houses regularly.

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