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Spatial Patterns of Housing Growth and Settlement in Saguling Lakeside Area (Study of Morphology and Physiography)

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ABSTRACT :
Water edges settlement development has always have strong relationship with its water bodies be it lake or river. For example, by the road–settlement would face the road as main transportation cum logistic facility. On the other hand, along water edges, settlements can either orientated facing water bodies or be positioned as on its back. These two types of orientations may influence mutual relations between water bodies and its settlements. These mutual relationship can be realized via its impact on both the water bodies and its settlements.
Settlement development due to never ending increase of population has caused ever rising needs of housing provision.It has spread not only on urban areas but also on other cultivated areas such forest reserve edges, and major coastal areas. Waterfront areas have been increasly attractive settlement areas. There are many factors contributing to this phenomenon such as water as basic need of life, source of income, agriculture, water bodies as transportation facility, and last but not least its nature's beauty.
This research studies on settlement patterns at lakeside with case study of Lake/Dam Saguling which is located at West Bandung Regency of West Java. Apart from being Hydro Electrical Generator, Saguling Dam has been the surrounding areas water source and agriculture. Its water body patterns is widely spread and branched out to many surrounding districts. In some areas, it has become both informal and formal settlements. Settlement spatial pattern typology as been carried out through meticulous observation which relates natural condition and the menmade built environment as well as the lake-water bodies pattern.
With this study on morphology and physiography on the water bodies, it is hoped that there shall be continuous study on its impact and mutual reaction between the lake and its settlement to conclude recommendation on policies, development plans, and sustainable management strategies that benefit both settlement and the lake as a sustainable water body.
Keywords:)
Keywords : Lakeside Settlement, Structure, Disperse/Spread Patterns, Lake Physio/Morphology

INTRODUCTION

Settlement of an area is influenced by population growth, its activities, and its economic activities. With rapid population growth, it triggers bigger settlements needs. This applies to every urban areas, as an extremely dynamic area as rapid growth rate of population occurs daily and this causes extreme population density and extreme building density which eventually indicates decline in settlement living quality. The same goes to the outskirts, suburbs, rural areas, and specifically, coastal/water-edges areas.
Waterfront area as water-edges areas have been very attractive as residential areas. Many factors contribute to this phenomenon are water as the main source of life, income sources such as agriculture, water bodies as transportation facilty, and its nature's beauty. Unlike any other settlement areas, coastal settlement development is mainly related to its water body function be it river or lake. As any by the road settlement which faces the road as main transportation facility, waterline settlement can actualy either face the water or have its back facing the water body. These two types of orientation would eventually shape the mutual relationship between settlements and its water body. The influence can be observed through impact on both orientations received; the lake and the settlements.
Settlement literally means lodging arrangement in an area. Its models are defined via spread, patterns, arrangement, of the settlements. The settlement pattern understanding and its spread has really significant relationship (to be elaborated further). Based on this background, study on settlement pattern has been carried out with case study of Lake Saguling and this write up is indeed a publication on the study. Lake/Dam Saguling is located in West Bandung Regency, has been operating since 1985 as hydro electrical generator (PLTA). Apart from being hydro electrical generator, it has been main source of life to surrounding areas, main water source, and main local fishery source. As water source

attraction and income source function, Lake Saguling has attracted settlement along its waterline. Moreover, most branches of Lake Saguling has become prominent formal residential area of the region such as Kota Baru Parahyangan as city scale development area and informal residential on the other parts such as Batujajar and Rajamandala.

Its tree branches water body pattern has become unique characteristic to Lake Saguling which can be observed on individual branch via its width. Looking on more detail of its settlements, it has various diverse patterns, ranging from informal to formal residential area. Thus, through this study, typology structuring has been carried out on the settlements surrounding Lake Saguling in relation to its location of the lake and the lake typology itself. It is hoped that from this typology structuring, further study on its impact and mutual reaction between the lake and the settlement shall be observed thoroughly to conclude policy recommendations and eventually propose sustainable development plan-guidelines to both the lake and surrounding settlements

METHODOLOGY

Data Collection is obtained by aerial images tracing and supporting maps and secondary data collections from related bodies, institutions, with the use of existing literatures, related to the study. Supportive data is collected via observations, specifically on direct observations, on field surveys, on specific objects, to support maps analysis, aerial images, based on settlement patterns and nearest lake areas.Analysis Methods used are typo-morphology method analysis which is knowedge on forms and physical shapes. Morphology is a study on forms and shapes of surroundings, settlements (Carmona, 2003:61). Forms mean shapes that can be oserved and in fact configuration from several objects while shape is geometrical or external shape, outline of an object.

Shapes and forms may be used interchangeably but carry different basic understanding where 'forms' constitutes many elements and every single element shall be observed with obvious characteristics visually, integrated in a configuration.

Other keyword is "residential environment". It is vital since in many design and planning literatures, it is said that civilization begins residential activities/settlement activities. Settlement development complexity will then form bigger units of environment that is CITY. So city environment is indeed inseparable from residential environment.

Morphology is not a static study. It studies in physical shape such as height of buildings, road networks, building proportion and composition within a townscape, it then studies on the processes that back up changes and its dynamics, which forms city environment as its physical environment as its representation.

By learning morphology, city planners would be able to detect local patterns, from how it is formed until complete development of city environment. (Carmona et al 2003:61)

According to Moudon, typo-morphology approach is a dialectic reflection between building typology with city morphology. This dialectic tradition requires analysis on finding the absolute truth on values within building environment existence within horizontal building environment (plan/morphology) and vertical (architectural existence design). Then only it applies components within typology and morphology approaches. This study is applying connected variables comprising settlement spread patterns, population density, regional accessibility level (road/access networks density) and free variables such as lake characteristic patterns, covering slope steepness (gradient map), location height, water accessibility, due to available patterns.

Collected Data Covers:

1. Image Maps or Indonesian Geographical Map scale 1:25.000 (minimum)
2. Settlement spread map
3. Slope Gradient Map
4. Topographic Map
5. Groundwater Depth Map
6. Access Networks Maps
7. Land Usage Map

RESULTS AND DISCUSSION

1.1 General Characteristic

Lake Saguling is a man made lake that was formed from Citarum River. It is located within West Bandung Regency of West Java Province approximately 26KM of western Bandung City. It was built in 1980 and Hydro Electric Plant and located at 643meters above sea level with width of 53km2 with depth reaching 92mtrs.

Figure 1. Lake Saguling

Lake Saguling has few tree like branches which is a common form of a reservoir or manmade lake (O'Sullivan, Reynolds, 2004). It then branches out spreading to few directions forming deltas between water bodies. Formation of land pieces varies from few meters to exceeding 1km width.

Surrounding land of the lake accommodates many functions but only 3 types dominating functions that is farming land, settlements and secondary forests of bushes and trees. Over the years, roads and hills has covered its composition in few lakeside areas. Then these composition may then be classified into few typology suiting the settlement positions.

Figure 2. Land use pattern along side the lake

1.2 Findings – Spatial Pattern Analysis and Settlement Spread

1. Settlement at lakeside surrounding land

In this pattern, settlements exist around the boundaries of the lake. Settlements are only separated by trees from water bodies, while the surrounding nearby land is utilized for agriculture activities. Access networks can also be observed along the area of lakeside heading towards the settlements. This patterns exist from the middle of the lake towards the east side of the lake which the land is majorly flat and widening.

Referring to diagram below, despite so much empty land around the lake (reaching 1 km width), many have utilized the empty land as agriculture spot not as settlements, while settlements are majorly exist along the lakeside area.

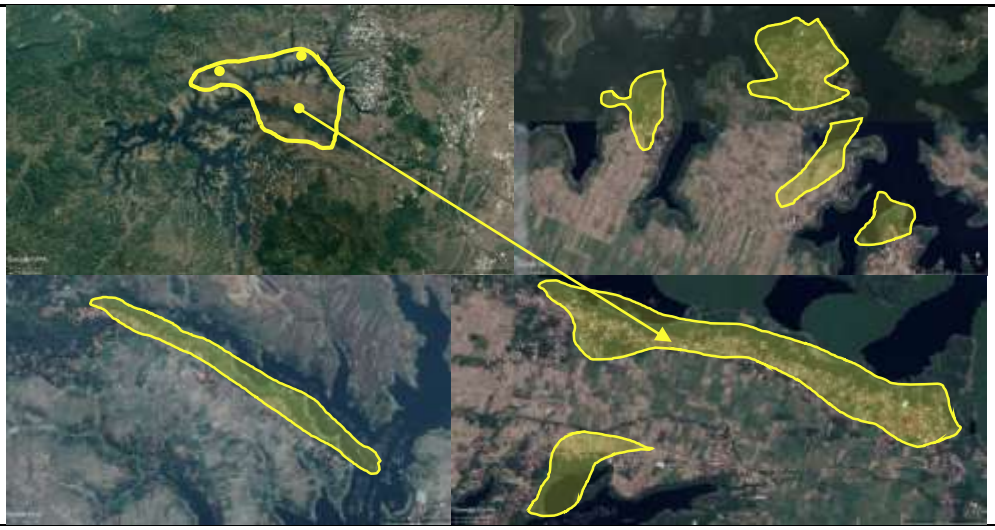

Figure 1.2. Settlements along the lakeside area
Source : modification from Google Earth, 2018

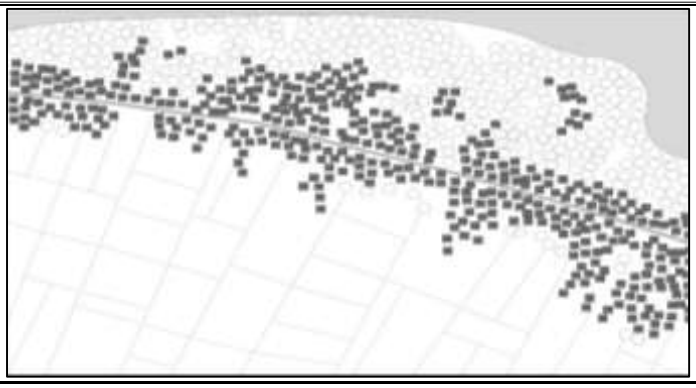

Figure 1.3. Settlements along the road and by the lakeside

2. Foothills Settlements

Settlements mainly occupy the foothills, while some may occupy flatter areas which is ideal for agricultural purposes. Agricultural areas are separated by trees and roads along the foothills. This type of pattern exist in southeast and northwest areas of the lake where many hills and flat land with sufficient width between the hills and lake bodies.

According to research carried out by O Chen Xiao (2017) and Ballabh , PIllay, Hariram (2014), steepness of slope, heights has negative impact towards settlements existence. Settlements tend to be in flatter and low level grounds. This is due to constructional limitations, limited land management and prone to natural disasters (Tao, Chen, Xiao, 2017). The above mentioned reasons explain why settlements are majorly built in foothill areas over highlands.

Tao, Chen, Xiao (2017) even state that agricultural land plays huge role for the settlers. Sufficient agricultural land would ensure daily needs of the residents, which makes them prioritizing agricultural lands allocation. Agricultural areas are most preferably to be developed in flatter lands and this explains that settlements would not be able to be developed in flatter grounds as it is mostly allocated for agricultural purposes.

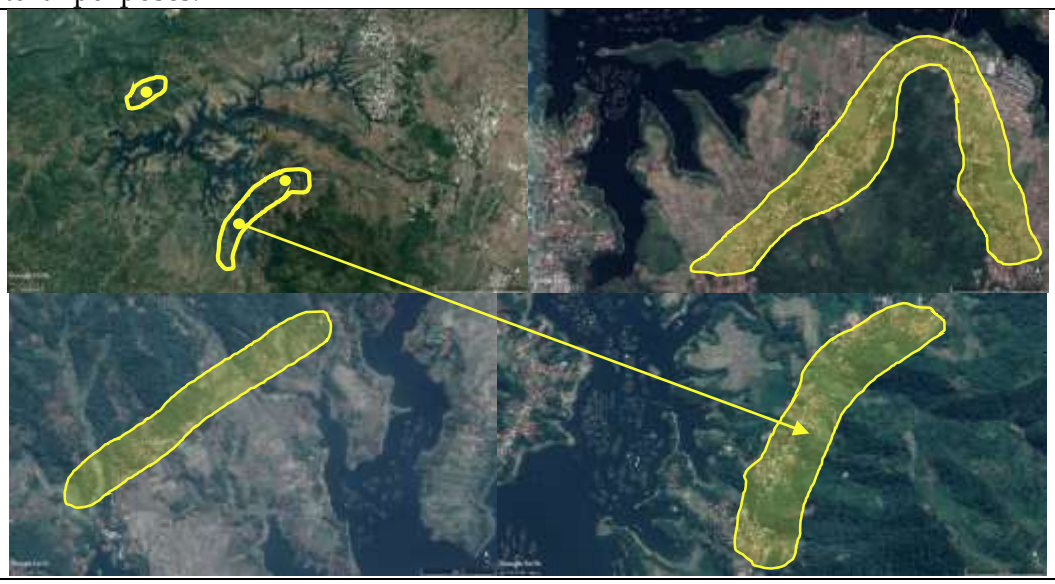

Figure 4. Hillside Settlements
Source : interpretation and modifications from Google Earth

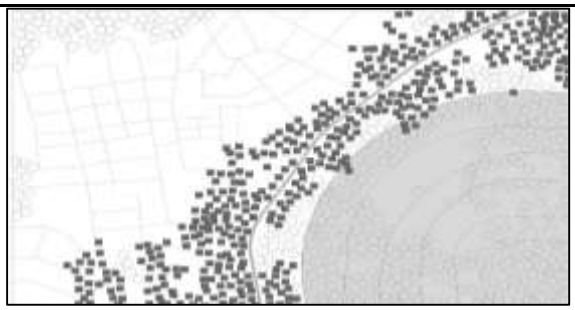

Figure 5. Hillside Settlements Patterns

3. Narrow Lands Settlements

This settlement accupies extremely narrow area where settlements are optimized to accupy the entire narrow space. Greenbelt can be seen to set as boundaries between lake and settlements. Access networks shall follow settlement existence and can obviously observed at southern part of the lake. Despite extremely narrow space, settlements never failed to exist and overly populated occupying the entire area where it is impossible to observe any agricultural areas.

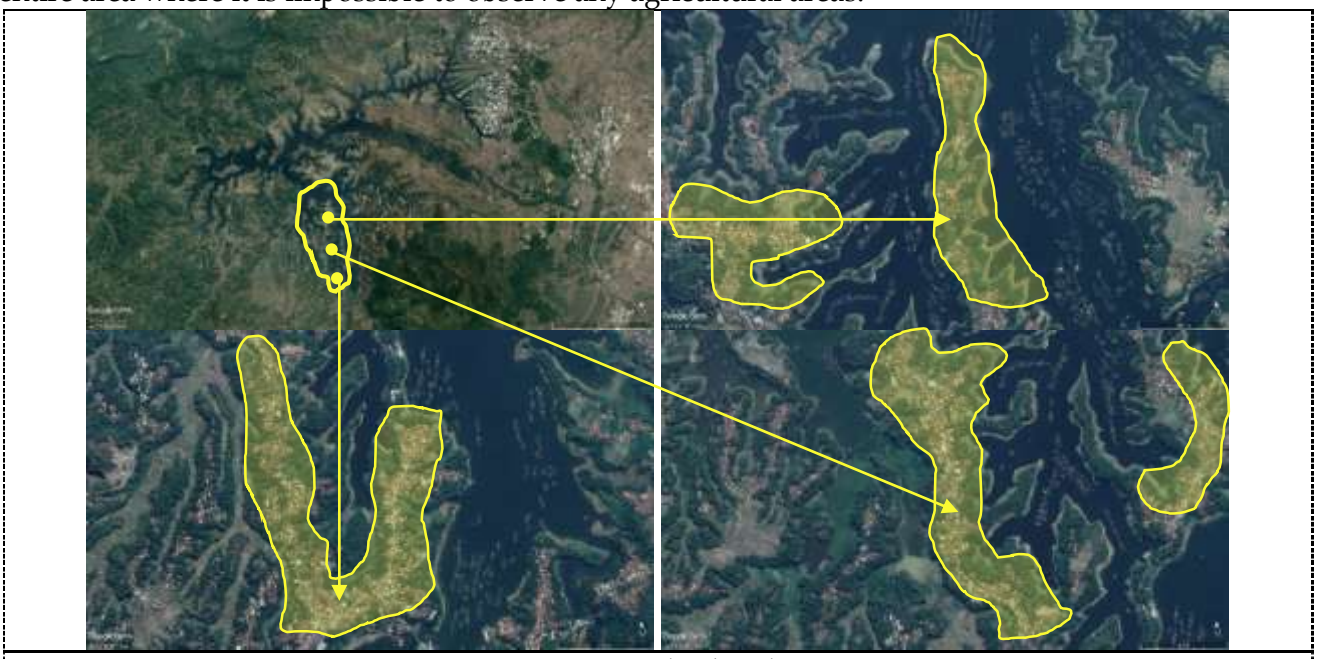

Figure 6. Narrow land settlements
Source : interpretation and modification of Google Earth

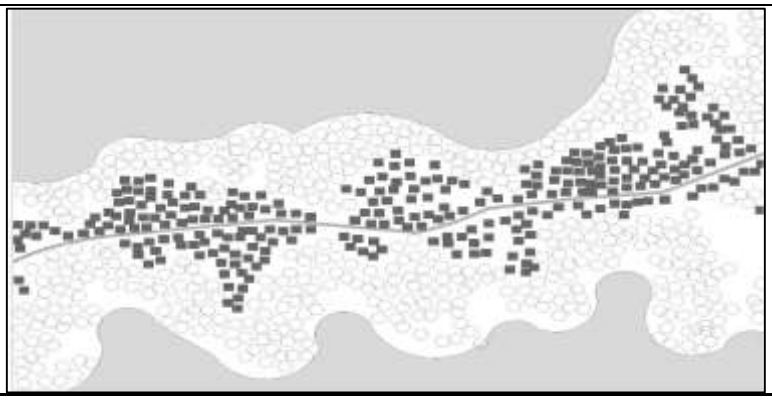

Figure 7. Settlements occupying narrow areas

4. Mixed existence between settlements and agricultural land

Refering to this pattern, settlement co exist with agricultural lands randomly, and we can still observe settlement by the lakeside obviously. Greenery has also played role of boundary separating lake with settlements and road networks can be observed in the middle of settlements. This patterns shall be observed in northeast where the land is even wider compared to those narrow lands.

Figure 8. Settlements that co exist with Agricultural Lands
Source : interpretation and modification from Google Earth 2018

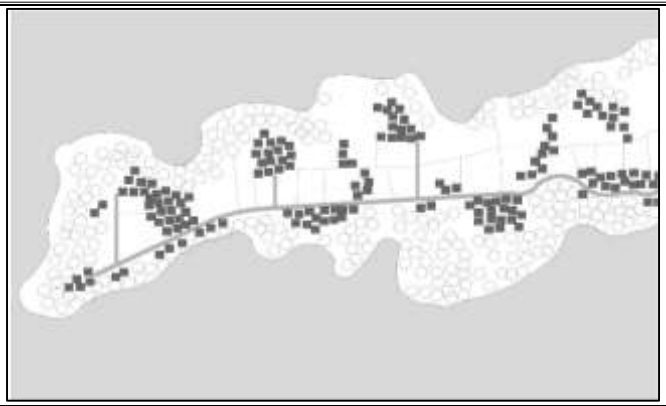

Figure 9. Settlements that co exist with agricultural lands pattern

5. Along the Road Settlements

This pattern follows roads developments and despite located in the middle of the area. This pattern able to be observed in southeast areas of the lake wher such vast spread lands and some roads intercepts through it.

There are few reasons why settlement exist along the roads and one of them is roads provide access of inflow and outflow of the area which it then helps commodity distribution from one point to another. These commodity arranging from foods, industrial materials, human migrations, information transmission and it is natural for this settlement to keep growing.

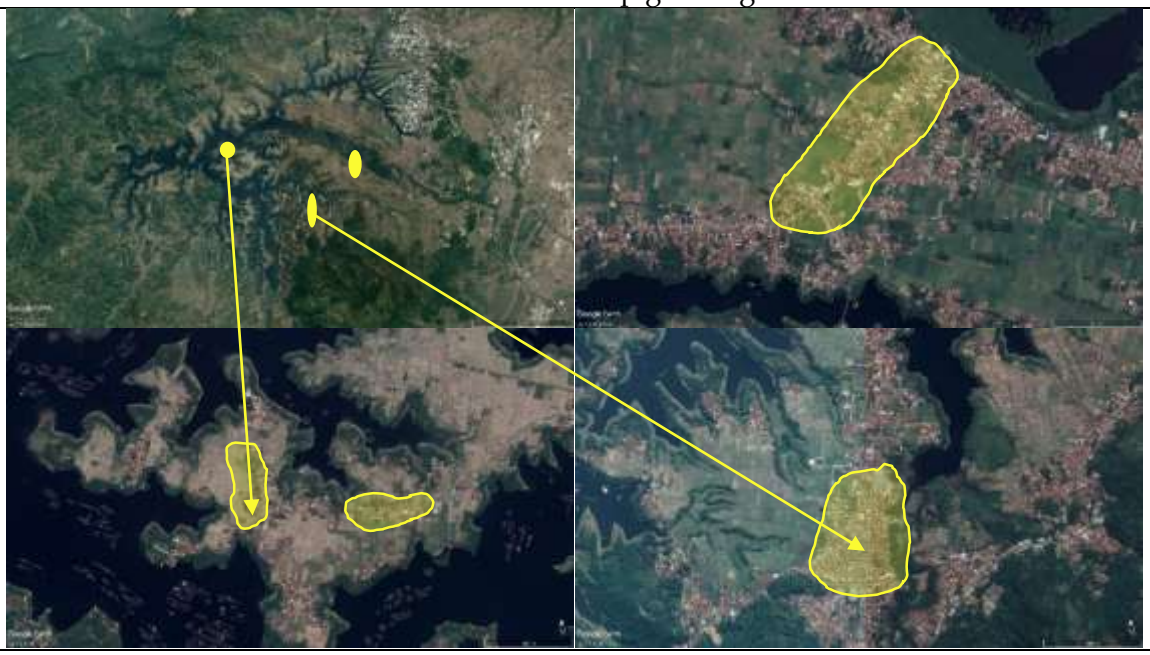

Figure 10. Settlements along the road access
Source : modification from Google Earth

Figure 11. Settlements along road access

The following can then visualize patterns and settlement spread based on specific road access exist in the area and via the area's image map analysis, we can identify few characters as mentioned below:

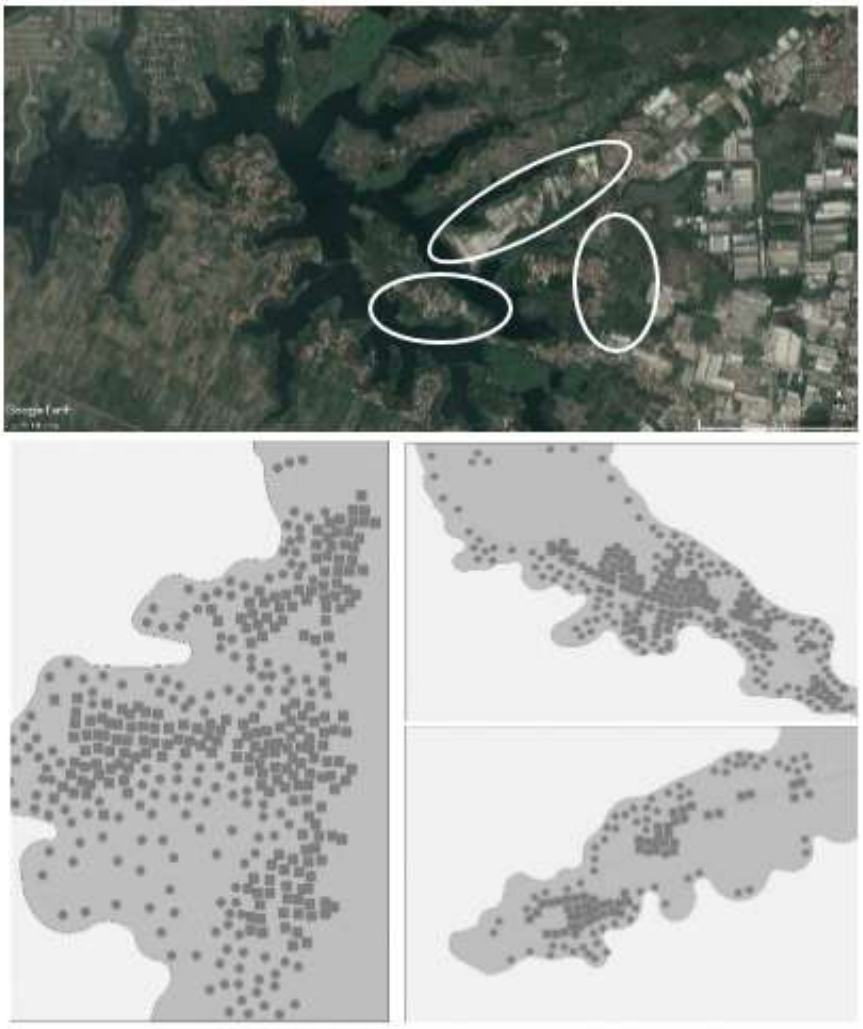

Figure 12. Settlement patterns gathered at specified points and some are tend to occupy the flatter grounds.

Figure 13. Settlement pattern tend to be along the stretch of the lakeside and aligned with road

Tabel 1.1. Spatial Pattern Summary and Settlement Spread in Lake Saguling Areas

Land Forms and Patterns of the Lake	Topography patterns of the lakeside	Settlement patterns	Public Space Patterns	Road Access Patterns	Sustainability
To lands that exist in between two lake branches •narrow •medium •wide	•Relatively steep •Contour between 20-60%	Settlements tend to be built in wider land and if ever existed it is stretched along the the river Public Facility and social facilty are rare to allocated in this area	Naturally, open space that exist formed from the river itself While as for menmade open space is built further than settlement stretch	Direct road access should it is existed within road networks	Settlements that are existed in between lake branches may face diffuclty to survive over long periods, and to the existing can possibly survive yet little chances to expand and grow As for branches that is relatively far away from relatively steep contour, there's possibility to develop settlements with meticulous consideration on environmental concerns and conditions
As for lands by the lake •Elongates •Bay in form •Cape in form	Relatively flat Contour between 0-30 %	Residential area are located by the lakeside stretch , bay in form, or cape in form and still form linear patterns along water bodies or circulation access (road and small Sts Public and social facility are not influenced by settlement pattern spread, and only apply to residential that has been existed within settlements	Naturally, in settlement areas, tend to have green open space along the stretch of the lake and iun between settlements there are open spaces As for menmade green open space only limited to formal in nature that is community parks	Access are made direct and indirect depending on road patterns and where settlements are located	Settlements in elongated area and cape in form are even more identifiable while bay in form may be rarely to be developed

Source: Analysis by researcher, 2018

CONCLUSION

Patterns and settlement spread at Lake Saguling generally influenced by variety land usage, topographic conditions, and accessibility factors. This can be observed from observation findings and analysis that these settlement clusters tend to occupy relatively flat contour, near to water source and accessibility to existing roads.

In general the factors that influence the settlement spatial pattern are the natural contexts, street system and the plots division, the last one mostly happens in formal settlement area, while in the informal settlement it could be all of the elements. At Saguling lakeside, socio-economic factors also has derived on the specific pattern. Flat lands are favored due to its agricultural feasibility and income source to most residents who are mostly farmers.

Moreover, the morphology and physiology emphasized more on physical condition and this research mostly using interpretation of satellite data and visual observation, perhaps on the next research it could be more specific on the hydrogeology aspect as well.

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