UNPLANNED SETTLEMENT FORM IN POLONIA VILLAGE MEDAN INDONESIA

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ABSTRACT

Urbanization results in the increase of urban facilities and infrastructure needs in urban areas, especially the need for a place to stay. As a result, unplanned settlement is formed. The people living in Polonia Village for example look shabby and some are still living there illegally. The purpose of this research is to discover the form of settlement, the form of the distribution of community residences, the underlying terms and the process of the settlement formation in Polonia Village located on the banks of the Babura River. The research methods are qualitative approach in the form of interviews and quantitative approach in the form of a questionnaire. The results of this study are (1) Basically, the process of formation or the history of a settlement affects the settlement itself that it can develop sustainably, (2) The spreading pattern of the residential areas in every neighborhood in Polonia Village is an organic pattern and the road pattern is generally an irregular grid pattern, (3) The local communities' thoughts play an important role in shaping the physical environment of Polonia Village, and (4) Polonia Village Medan has six patterns of unplanned settlement such as organic pattern, linear pattern, cluster pattern, central corridor pattern, grid pattern, and leapfrogging development pattern. The results of this study can be useful for North Sumatera Department of Settlements and Spatial Planning and for the science development in the field of socio-cultural and morphology.

Keywords: Unplanned settlements; Polonia Village; unplanned settlement patterns.

INTRODUCTION

The settlement in Polonia Village has 13 neighborhoods and its location is oriented towards the Babura River. The people living on the the riverbanks are generally of low society class and are staying there illegally. This fact is based on the theory by Fernandez (2011:1) with the title *Physical and Spatial Characteristics of Slum Territories Vulnerable to Natural Disaster*, the settlement that generally grows in a riverbank is always unplannedly developed and run-down. Local people occupying these areas did not have land documents when setting up home there. So that settlement can be called as illegal settlements. Establishment of illegal settlements is the result of high level urbanization. The impact of urbanization led to the increase of the population in a city, along with the increase of the need for housing. This is consistent with Panudju's theory written in a book by Amiany (2011) which said that due to urbanization, the need for infrastructures in urban areas keeps on increasing, especially the need for a place to stay which resulted in the growing of unplanned settlements. Generally, people move from rural areas to the cities because downtown is the center of economic activities and it is an appeal to people who want to find work to have a better life.

There are reasons Polonia Village is suitable as the object of this research, and some of them are (1) the residents living there don't have land ownership letter registered on their own name, (2) the settlement there keeps on growing according to local residents' thoughts, (3) the society in this settlement consists of people from various ethnics, but the dominant ones are Javanese and Batakese, (4) the government or architects are not involved in the settlement formation process, and (5) this settlement grows on riverbank which in the beginning was transportation pathway. The purposes of this research are to find the settlement formation process, the residences distribution pattern, the influence of society's opinions in the formation of physical environment, and also to find unplanned settlement form in Polonia Village Medan. Important point of this research is that it is conducted not only to find the form and spreading pattern of settlements of the area, but also to find what underlies the process of settlements formation, Sarkar (2010). The results of this study can be an input to the Medan City government in planning the settlement structure. In addition, this study is very helpful for the development of science in the field of socio-cultural and morphological settlements that grow based on local wisdom.

MORPHOLOGY OF UNPLANNED SETTLEMENT

In general, the factors that influence the shape of unplanned settlements, Sarkar (2010); McKay (1968); Kvetina (2013); Katsamudanga (2007); Scott (1996), are economic factors, topography, climatic conditions, soil condition, defense factors, social factors, and urbanization. Based on these factors, it appears that the pattern of the settlements will be different from one another, thus the shape or the pattern of a settlement can be grouped into several categories as follows, Fernandez (2011):

Settlements with a Regular Grid Pattern

A form of housing that has a parallel and transverse circulation with nearly uniform dimensions (Figure 1). This settlement is common on relatively flat land. Its regular pattern is clearly visible in the form of grids or squares which follow the condition of the existing land. This kind of settlement pattern can be found in the Demerara Settlement (Figure 2) in Guyana.

Source: Fernandez, 2011

Figure 1. Tarma Chico and Santa Rosa Settlement, Lima-Peru

Source: <https://www.google.co.id/maps/place/Demerara-Mahaica,+Guyana/@6.5375131,-58.2088644,2249m/data=!3m1!1e3!4m5!3m4!1s0x8da55b7200c4792b:0x122088727cb3fa60!8m2!3d6.546426!4d-58.0982046?hl=id>

Figure 2. Demerara Settlement in Guyana-South America

Settlement with Irregular Grid Pattern

This is an irregular and unclear grid pattern with physical and spatial configuration of irregular shape in a settlement. This irregular shape (Figure 3) is typically found on rocky land and flat ground. There's a clear grid pattern that can be seen here but it is irregularly directed. This occurs because of the difference between man-made road system and the nature lines, such as river lines. Ijburg Settlement (Figure 4) in Amsterdam is one example of a settlement with an irregular grid pattern.

Source: Fernandez, 2011

Figure 3. Dos de Mayo Settlement, Lima-Peru

Source: <https://www.google.co.id/maps/place/Ijburg/@52.3473511,4.858039,8014m/data=!3m1!1e3!4m5!3m4!1s0x47c60ebd9a860733:0xdcdc190fa755d732!8m2!3d52.355!4d4.997778>

Figure 4. Ijburg Settlement, Amsterdam

Settlement Patterns Adjusted to the Land Topography

This settlement pattern has a circulation path that is narrow and winding, growing naturally or unplanned and form complex networks that exist between the walls of the house. This pattern occurs as a result of the adjustments to the conditions of settlement topography (Figure 5). This pattern can be found in the Gecekondur Settlement, Ankara (Figure 6).

Settlement Patterns with Central Corridor Pattern

Settlements with central corridors pattern is a settlement with an environment that has many circulation branches, but they all converge towards central corridor, thus giving the impression of an main axial focus (Figure 7). In this pattern, a major access into the central corridor settlements can also be seen.

Source: Fernandez, 2011

Figure 5. Cerro El Agustino Settlement, Lima-Peru and Duncan Village Settlement, East London- South Africa

Source: UA Student Union, 2008

Figure 6. Gecekondusettlement, Ankara

Source: Fernandez, 2011

Figure 7. Mamede Settlement, Salvador de Bahia, Brazil

Settlement Pattern with Radial Pattern

Radial pattern is often found in contoured areas such as hills and mountains. The main access in radial pattern settlement (Figure 8) is usually stairs that cut straight through contour line of the land, and it is also

used as drainage system for storm water runoff. This pattern can be found in the Venta de Bravo Settlement, Michoacán, Mexico (Figure 9).

Settlement with Stage Shaped Circulation Pattern

That kind of settlement pattern is usually found in mountainous areas or areas with a fairly steep slope (Figure 10). The main access road is made parallel to the land contour. Examples of this pattern can be found at the settlements in Cappadocia, Turkey (Figure 11).

Source: Fernandez, 2011

Figure 8. Vila Natal Settlement, Salvador de Bahia -Brazil

Source: <http://geo-mexico.com/?tag=landforms&paged=2>

Figure 9. Venta de Bravo Settlement, Michoacán, Mexico

Source: Fernandez, 2011

Figure 10. Example of routes on contour lines

Source: UA Student Union, 2008

Figure 11. Settlement in Cappadocia, Turki

Meanwhile, in the process of residential areas development and expansion, its patterns can be classified as follows, Galster et al. in Besussi (2010):

1. **Compact Development** (settlement pattern with populous central region)

This settlement pattern has a central area that is densely populated (Figure 12). This pattern is characterized by settlements closely built with each other forming a row. This pattern can be found at Penrice settlements in the United Kingdom (Figure 13).

Sumber: Besussi, 2010

Figure 12. Compact Settlement

Source: <https://www.google.co.id/maps/place/Penrice,+Swansea,+Kerajaan+Inggris/@51.569644,-4.1766841,173m/data=!3m1!1e3!4m5!3m4!1s0x486e93064a3b51ef:0x3b12db80231e6d9!8m2!3d51.570474!4d-4.17669>

Figure 13. Penrice Settlement in United Kingdom

2. **Scattered Development** (settlement patterns which scattered randomly)

Residential areas in this settlement pattern are scattered randomly (Figure 14) and also uneven or irregular. This pattern can be found at Penmaen settlements in the United Kingdom (Figure 15).

Source: Besussi, 2010

Figure 14. Scattered settlement

Source: <https://www.google.co.id/maps/place/Penmaen,+Kerajaan+Inggris/@51.674466,-3.184373,9389m/data=!3m1!1e3!4m5!3m4!1s0x486e21a2d070d8f7:0x25c3582f56287ef3!8m2!3d51.6748594!4d-3.1757295?hl=id>

Figure 15. Penmaen Settlement in United Kingdom

3. **Linear Strip Development**

Residential settlements with linear pattern is built in a linearly or longitudinally (Figure 16). Normally this pattern is built to follow the transport line of an area (Figure 17).

Source :Besussi, 2010

Figure 16. Linear Development

Source: Wikipedia.org

Figure 17. Quebec Settlement in riverbank of Saint Lawrence, Canada

4. **Polynucleated Development** (dispersed settlement pattern with some scattered central areas)
The residential areas in this settlement pattern are scatteredly built in groups (Figure 18). This pattern can be found at the Ijburg settlements, Amsterdam (Figure 19).

Source: Besussi, 2010

Figure 18. Polynucleated Development

Source: <https://www.google.co.id/maps/place/Ijburg/@52.3473511,4.858039,8014m/data=!3m1!1e3!4m5!3m4!1s0x47c60ebd9a860733:0xdedc190fa755d732!8m2!3d52.355!4d4.997778>

Figure 19. Ijburg Settlement in Amsterdam.

Leap frogging Development

This pattern is almost the same as scattered development pattern, and the difference is that there is a group of populous residential area as the center of the settlement in this pattern (Figure 20).

Source: Besussi, 2011

Figure 20. Leap frogging Development

METHODOLOGY

In obtaining the data needed in this research, the researcher uses two research methods, quantitative and qualitative methods. To find the data about the formation process of a settlement, qualitative method (interview) is used towards the residents or predecessors in Polonia Village. To find the building mass and road distribution pattern, observation method is used towards the research location. The observation is carried out for 2-3 weeks in the research location. And the data related to the image of the residents' thoughts is collected by distributing questionnaires and tabulated using frequency method. Meanwhile, the criterias in choosing respondents for this research are the respondent is the head of a family, understands the creation process of the surrounding physical environment, knows about the ownership of the land they dwell at, and is willing to voice out his thoughts about the houses built there, such as the house position in accordance with the land lot, the roads, the river and with another space. The result of the tabulation is then analyzed with the data that is collected by observation method, and then interpreted with literature reviews that have been done beforehand. Population in this research is the residents of Polonia Village Medan. Sample selection is conducted with purposive sampling technique, which is done with a certain requirement. This requirement is that every neighborhood has a uniqueness in the shape of a growing process as a result of the presence

of several tribes in the settlement. The respondents in this research are 110 adults. In deciding variables and indicators, a literature review is made based on the problems that will be solved. Based on these indicators, necessary data is formulated. The map of the research area can be referred to Figure 21.

RESULTS AND DISCUSSIONS

The Formation Process of Unplanned Settlement in Polonia Village Medan

The study on the settlement formation process in Polonia Village Medan is carried out through interviews with the village predecessors because they are the ones who know how the settlement was formed at the beginning and how the process was until it become like it is now. Through the method, some discoveries which happened in Polonia Village in the past are found. The discoveries are classified in the range of 20 year. The discoveries are then integrated with the theories which also have been analyzed before.

Residences Distribution Pattern in Unplanned Settlement in Polonia Village Medan

A settlement area is formed because there are residence areas and roads as connector between one and another neighborhood. When residence areas are integrated with roads as a connector between places, a pattern then can be seen. In other words, the placement of residence areas and roads tend to form a pattern. The pattern can have a regular or irregular form. The placement of residence areas and roads with government or decision makers involved in it tend to has regular pattern. And on the other hand, if the placement of building mass and roads is without any government or decision makers involvement, it tend to have irregular placement. To obtain data about residences distribution pattern in Polonia Village, observation towards research location is conducted for about 2-3 weeks. This observation is to find out the pattern of each neighbourhood in Polonia Village, and from this, the settlement pattern in Polonia Village can then be known. The pattern study can be referred to Table 2

The Influence of Society's Thoughts in Forming Physical Environment in Polonia Village Medan

To obtain data regarding the influence of society's thought in forming physical environment in Polonia Village, researcher uses quantitative method, or by distributing questionnaires. The questionnaires

contain questions related with some images of local society's thoughts. Questionnaires results are tabulated using frequency method. And then the data is integrated and analyzed based on related theoretical reviews. The image of the thoughts as well as the discoveries that have been found can be referred to Table 3.

Unplanned Settlement Form in Polonia Village Medan

In studying the settlement form in Polonia Village Medan, an approach using figure ground method is used. By using that method, researcher blackens the area covered by mass and whitens the area not covered by mass. The purpose of using figure ground method is to make the identification of the settlement in Polonia Village on macro scale easier. Based on this figure ground method, it is identified that the areas covered by mass are more dominant (73.89%) or more in number compared with the areas not covered by mass. This is the result of residence areas keep on increasing from time to time that the open space outside the areas is decreasing. The open space form at Polonia Village is used by residents in accordance with the needs and wishes as well as the taste of each individuals or society without the requirement to refer to rules. With the method, it is also identified that roads development tends to start from the area oriented towards river. The condition happened because of the river was used as the society's life source. And this resulted in high density residence area at the riverbank. The form of unplanned settlement in Polonia Village is identified to solve the research problems. The form of settlement in Polonia Village is identified and reviewed based on the theories stated by some experts regarding the form of a settlement. The study can be viewed in Table 4.

CONCLUSION

Settlement of a society is basically formed through a really long process. It also needs a lot of time, from decades to even possibly uncertain length of time. Therefore, the settlement history of a society is very important so the settlement can develop sustainably. In other words, the formation process of the settlement in Polonia Village is influenced by the development of the settlement itself. That is why it needs to be known and studied. In general, the residences and roads distribution pattern in each neighborhood in Polonia Village is included as organic pattern.

Table 1. The Formation Process of Unplanned Settlement in Village Polonia

No	Times	Pattern	Discoveries
1	1920-1940	<p>Description:</p> <p> : The area of Anggrung Forest</p> <p> : Babura River</p> <p>The condition of the subdistricts of Polonia in 1920s</p> <p>Description:</p> <p> : The area of Anggrung Forest</p> <p> : Residential Area</p> <p> : Babura River</p> <p>The settlement began to grow oriented towards the river</p>	<ul style="list-style-type: none"> • In 1920s, Polonia Village was still an area of Anggrung Forest. • In the beginning, the society occupied a residential area located in the neighborhood 10 with the territory still under forest conditions. Their residences were built oriented towards the Babura River because it is their source of life and transportation pathway.
2	1940-1960	<p>Description:</p> <p> : The area of Anggrung Forest</p> <p> : Residential Area</p> <p> : Babura River</p> <p> : Road</p>	<ul style="list-style-type: none"> • As time went by, the area on the riverbank became increasingly congested because of increasing population, and with that, people began building their residential area far from the river. • At this period, streets started to take shape gradually, and the community were not concerned with environmental or land lot restrictions when they built their residence area. This is because they were staying there illegally. However, as the time passed, around the 1960s the community had to have ownership letter of the land they inhabited.
3	1960-1980	<p>Description :</p> <p> : The area of Anggrung Forest</p> <p> : Residential Area</p> <p> : Babura River</p> <p> : Road</p>	<ul style="list-style-type: none"> • During this period, residential areas in Polonia Village kept on increasing and more roads were formed. The increase of residential area is due to the increasing number of immigrant who chose to stay in the village.
4	1980s	<p>Description :</p> <p> : Residential Area</p> <p> : Babura River</p> <p> : Road</p>	<ul style="list-style-type: none"> • In the 1980s, residential areas in Polonia Village Medan grew even more, resulting in even more roads were constructed. • Forest areas are slowly reduced and there are several sections that had been changed into agricultural land. • In this period as well, a few residents who occupied land in the region already had ownership letter. In addition, the residents were still not concerned with environment or land lot area boundary.
5	1990s until now	<p>Description:</p> <p> : Settlement Function</p> <p> : Public Facilities Function</p> <p> : Commercial Function</p> <p> : Trading Function</p> <p> : Road</p> <p> : Babura River</p> <p> : Green Area at Babura riverbank</p>	<ul style="list-style-type: none"> • Around 1990s, residential area grew continuously, causing some areas in that region became more populated. As the result, the Government began making policy about environmental areas boundaries in Polonia Village Medan, thus environmental areas boundaries were formed. • In this period as well, aside of settlement function, there are several more functions existed in Polonia region, namely trading function, public facilities function, education function, health function and commercial function. • Even more roads are formed and the roads condition is also getting better, making it easier for the residents to travel from one place to another. • The outer areas surrounding residential areas are used for farming, as children's playground, as a gathering place for people to chat with neighbors, and also as a place to hold a celebration. • In the case of land ownership, only a part of the residents who already has letter of land ownership. The ones that don't have letter of land ownership are because of financial limitations that hinder them in requesting these letters.

Table 2. Residences Distribution Patternin Village Polonia Medan

No	Village	Pattern
1	Village 1	Organic
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Commercial Function Settlement Function Public Facilities Function Road
2	Village 2	Organic and Linear
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Commercial Function Settlement Function Public Facilities Function Road
3	Village 3	Organic and Cluster
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Trading Function Settlement Function Public Facilities Function Road
4	Village 4	Organic and Linear
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Commercial Function Settlement Function Public Facilities Function Road Babura River Green Area at Babura riverbank
5	Village 5	Organic and Cluster
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Commercial Function Settlement Function Public Facilities Function Road Babura River Green Area at Babura riverbank

Table 2. Advanced

No	Village	Pattern
6	Village 6	Organic and Cluster
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Settlement Function Road Babura River Green Area at Babura riverbank
7	Village 7	Organic and Grid
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Commercial Function Settlement Function Public Facilities Function Road
8	Village 8	Organic and Grid
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Settlement Function Public Facilities Function Road
9	Village 9	Organic and Grid
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Commercial Function Settlement Function Road
10	Village 10	Organic and Grid
		<p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Settlement Function Road Babura River Green Area at Babura riverbank

Table 2. Advanced

No	Village	Pattern
11	Village 11	<p>Organic and Cluster</p> <p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Settlement Function Public Facilities Function Road
12	Village 12	<p>Organic and Cluster</p> <p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Trading Function Settlement Function Road
13	Village 13	<p>Organic and Cluster</p> <p>Keymap</p> <p>Description:</p> <ul style="list-style-type: none"> Commercial Function Settlement Function Public Facilities Function Road Babura River Green Area at Babura riverbank

Table 3. The Image of Society's Thoughts in accordance to Creating Physical Environment in Polonia Village Medan

No	Society's Thought	Discoveries
1	Image of the society's occupation	<ul style="list-style-type: none"> The occupations of society in this area are private employee in small companies and small commerces. Because of the minimum income, the society builds rectangle residences as that kind of residence is low-cost.
2	Image of the society's level of education	<ul style="list-style-type: none"> The highest education level for the society in this area is senior high school. As the result, the society often takes the quickest option in making a decision for example in housing position. They usually don't think about the impact that can occur in the future which results in the forming of high density and low density residence area.
3	Image of the society's length of stay	<ul style="list-style-type: none"> Most society in Polonia Village already lives in the area for more than ten years. That means their houses is inherited from their family and are not built as they wished. In addition, some societies have stayed for over 40 years at the area. In other words, they built and positioned their houses as they wished and thought without obeying any rules.
4	The reasons the society chooses to live in Village Polonia	<ul style="list-style-type: none"> Society in Polonia Village chooses a place to live based on their families and close friends. They live in this area because they were invited and were influenced to want to live there, and even though the land is illegal, they still want to stay. Furthermore, there are some societies who are motivated to live in this village because it is close to their workplace. So they can go to work in a short time travel and distance.
5	Image of the tribes and religions that influence the residence formation	<ul style="list-style-type: none"> The forming of the residences in this village is not based on tribes and religions embraced by the societies. They usually build their houses according to their own preferences. As a result, high density and low density of residence are formed.
6	Image of how the society build their living place	<ul style="list-style-type: none"> In positioning their houses, society tend to position them based on others' houses. They often imitate what other society did. That tendency results in the difference between high density and low density residence area.
7	Permission in building houses	<ul style="list-style-type: none"> Society who wants to live in Polonia Village needs permission from the local government. However, there are many societies received the permission from their predecessors instead and some even think permission was not needed. Society who needs permission means that they need to obey the rules to be able to stay. Meanwhile, those who don't need permission means they built their houses as their will. As a result, a high density and low density of residence are formed.
8	Places where society gather	<ul style="list-style-type: none"> Local society has a gathering place which located in front of their houses. Small food stalls are also often being used as gathering places. By having a gathering place, social relationship between the societies is firmly formed without differentiating between tribes and regions.
9	Image of land ownership	<ul style="list-style-type: none"> Partial society of Polonia Village has letter of land ownership for the land they live at. In result, they have full policy of the land and their houses.
10	The reason society stays even though it's with unclear land ownership	<ul style="list-style-type: none"> The reason why society stays in Polonia Village with unclear land ownership is because of limitation in economic aspect. With their potluck income, they are just able to live in this village. Moreover, the long-formed-social relationship motivates them to stay in this environment.
11	Image of the presence or absence of land usage	<ul style="list-style-type: none"> Most society in Polonia Village doesn't use their land as road. However, there are some who lets 1-2 meters of their lands being used as road. This proved that the society has a quite high concern for common need.
12	The beginning of road forming	<ul style="list-style-type: none"> In the beginning, the roads in Polonia Village were formed with the cooperation of local society. They built the roads because they thought these roads will ease them in their activities and travels. As the time flows, the government starts fixing and reforming the roads which results in nowadays roads.
13	Places where celebrations are held	<ul style="list-style-type: none"> When there is a celebration in Polonia Village, most society will use the road and even their neighbor's place. This happens because the houses there are close to each other that there is no space left to be used as celebration place.
14	Image of whether the roads are comfortable or not	<ul style="list-style-type: none"> The local residents think that the roads at Polonia Village are comfortable. The roads are considered comfortable because some social behaviors such as daily greetings among residents and some gatherings often happen there. In addition, the roads are guaranteed to be safe for the residents; the fact that crimes seldom happen in this village is the proof.
15	Image of the existence of a road when a residence is formed	<ul style="list-style-type: none"> When society built houses, the roads were already existed. With those roads, it is possible to access the village; the roads also ease the society's activities.
16	Society's perception about the Babura River	<ul style="list-style-type: none"> Society at Polonia Village regards that the Babura River, which is the borderline in the village, is important because there are some individuals that use the river as life source such as for washing, cooking and transportation.

Table 4. Unplanned Settlement Form at Village Polonia Medan

No	Theory	Pattern	Discoveries
1	SpiroKostof (1991)	Organic	<ul style="list-style-type: none"> Building mass in PoloniaVillage has unsymmetrical rectangular form and the position between each building is mostly irregular. As the result of the irregular configuration of building masses, the roads and the open spaces are formed with irregular dimension too. The irregular open spaces form a relation of interdependence between physical environment and social environment.
		<p>Description:</p> <p> : The Area is covered by building mass : The Area is not covered by building mass </p> <p> : Babura River : Green Area at Babura riverbank </p>	
	SpiroKostof (1991)	Linear	<ul style="list-style-type: none"> There are some residential areas formed along the streets in Village Polonia. The residential areas which are arranged lengthwise grow naturally and form a linear pattern. The residents who live along the streets in PoloniaVillage take advantage of their house position to be used for entrepreneurship such as opening a store for business to help increasing their economy.
		<p>Description:</p> <p> : The Area is covered by building mass : The Area is not covered by building mass </p> <p> : Babura River : Green Area at Babura riverbank </p>	
2	Fernandez (2011)	Main Corridor	<ul style="list-style-type: none"> The primary road is a straight bold line that connects one road with another and one alley with another. PoloniaVillage has many branches of roads, and those branches gather toward a main corridor, that pattern shows a main circulation access. Starban Street is used as the main corridor that connects the roads; meanwhile Gg. Bilal, Gg. Murni, Gg. Bersama as and other alleys are used as the branches of the main corridor. Starban Street is used as the main connector in this village, because of that, many residences are occupying along the road. As a result, a high density and low density of residence are formed
		<p>Description:</p> <p> : Main corridor : The branches of main corridor </p>	
	Fernandez (2011)	Irregular Grid	<ul style="list-style-type: none"> The roads formed in PoloniaVillage form a grid pattern with irregular distance. This grid pattern can occur because the residences are positioned by the residents as they like. With the grid pattern, PoloniaVillage can be divided into units which can be counted and it gives an impression of certain texture.
		<p>Description:</p> <p> : The roads make a grid pattern : Building mass </p>	
3	Besussidkk (2010)	Leapfrogging Development (a scattered pattern but a high density area can be found in it)	<ul style="list-style-type: none"> In this PoloniaVillage, as the time flows, the total population is increasing and affects the residence. As a consequence, it also affects the shape of the residence that might occur. In this PoloniaVillage, the residences which are occupied by the society spread wholly but unevenly in the area. As a result, areas with high density residences and low density residences are formed.
		<p>Description:</p> <p> : The Area is covered by building mass : The Area is not covered by building mass : High density residence area : Low density residence area </p> <p> : Babura River : Green Area at Babura riverbank </p>	

This is proved by the residences which have an irregular pattern and its arrangement with other residences which is also irregular. In addition, roads in Polonia Village have straight irregular geometric patterns that form a grid pattern in the village. Society's thought in Polonia Village also has an important effect in forming the surrounding physical environment. The evidence is irregularly formed residences as the result of the society building the residences just according to their wish and limited knowledge without any rules to follow; they also didn't think about the future impacts which will result in irregularly formed residences. Some society gives away some of their lands to be used as roads for common needs. As the society's thoughts are also involved here, it means that the society also takes part in forming the environment to develop the settlement in this Polonia Village. Related to the settlement form in Polonia Village, there are 6 kind of patterns found in the village, which are (1) Organic pattern, proved with the form and arrangement of the residences which are irregular and open space that are formed irregularly as a result of the irregular residences. These residences are formed naturally without any planner or decision maker involved; (2) Linear pattern, proved with the residence that are formed along the side of the road in Polonia Village. In other words, the residences positions follow the shape of the roads because the roads function as transportation access; (3) Cluster pattern, proved with the residences that are arranged as some groups. In general, the residences are grouped based on tribes or family name; (4) Center corridor pattern, proved with the roads that become the main corridor or access for activities and the alleys and small roads which become the branch road. Those branch roads gather toward the main access or road; (5) Irregular grid pattern, proved with the roads in Polonia Village which form grids with irregular length. This pattern divides the village into some countable units; (6) Leap frogging pattern (a scattered pattern with some high density area), proved with the residences that are distributed wholly in the area with some high density residence area can be found. The amount of population in Polonia Village highly affects this pattern.

REFERENCES

- Amiany & Sahay, N. S. (2011). *Kajian Permukiman Kembali Penduduk Sungai Kahayan Di Kota Palang Raya*. 6(1). ISSN 1412-3388.
- Besussi, E., Chin, N., Batty, M. & Longley, P. (2010). *The structure and Form of Urban Settlements*.
- Castles, S. (2002). Migration and Community Formation under Conditions of Globalization. *IMR*, 34(4), p. 1143-1168.
- Eusuf, M. A. (2014). Impact of Outdoor Environment to the Quality of Life. Malaysia: *Procedia- Social and Behavior Sciences* 153, p. 639-654.
- Eyuce, A. (2012). Independence of Traditional House Form and Settlement Pattern. Turkey: *Intercultural Understanding*, 2, p.17-24.
- Fernandez, R.F. (2011). *Physical and Spatial Characteristics of Slum Territories Vulnerable to Natural Disaster*.
- Joko, T. (2002). *Arah Perkembangan, Bentuk, dan Struktur Fisik Keruangan Kota Pangkalan Bun-Kumai Kabupaten Kotawaringin Barat Provinsi Kalimantan Tengah*. Program Studi Magister Teknik Pembangunan Kota. Program Pascasarjana Universitas Diponegoro.
- Kabir, A. & Parolin, B. (2011). *Planning and Development of Dhaka – A Story of 400 Years*. Australia: 15th International Planning History Society Conference.
- Katsamudanga, S. (2007). *Environment and Culture: A case Study of Prehistoric Settlement Patterns in the Eastern Highlands of Zimbabwe*.
- Kostof, S. (1991). *The City Shaped Urban Patterns and Meanings Through History*. London: A Bulfinch Press Book.
- Kvetina, P. & Koncelova, M. (2013). Neolithic LBK Intrasite Settlement Patterns: A Case Study from Bylany (Czech Republic). *Journal of Archeology*, p.1-7.
- Mahmud, S. & Duyar-Kienast, U. (2001). Viewpoint Spontaneous Settlements in Turkey and Bangladesh: Preconditions of Emergence and Environmental Quality of Gecekondu Settlements and Bustees. Great Britain: *Cities*, 18(4), p.271-280.
- Medan Dalam Angka (2015).
- Mckay, J. (1986). A Review of Rural settlement Studies for Tanzania. *East Africa geographical Review*, 6, p.37-49.
- Mookodi, D. (2001). Settlement and Land Use Between the 11th and 17th Centuries in Easter Botswana. *Journal of African Studies*, 15(1), p.91-107.
- Oktay, D. (1998). Urban Spatial Patterns and Local Identity: Evaluation in a Cypriot Town. *Open House International*, 23(3), p.1-7.
- Portela, M. C. (1992). *Settlement Patterns in Unplanned Area Case Study San José de Chirica, Ciudad Guayana, Venezuela*.
- Shrestha, B.K. (2011). Street Typology in Kathmandu and Street Transformation. *Urbaniziv*, 22.
- Sarkar, A. (2010). Analysis of Human Settlement Patterns Using RS and GIS in the Plains of West Bengal. *eTraverse*, 1(1), p.1-16.
- Scott, M. J. (1996). Human Settlements in a Changing Climate: Impacts and Adaptation.