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Convex Hull, Thinning, Thickening, and Pruning. Of all these operations, basically a morphological operation against a binary image is the erosion or dilation of objects in the binary image. The process of erosion is required in the computer vision process to bring up features, as Khalefa (Khalefa, 2011) did in finger print repair.

Mulyana (Mulyana, 2016) defines a mode filtering as a non-linear spatial filtering using mode operation against nine cells in a 3 x 3 kernel. Filtering mode in binary imagery is intended to reduce black spots on a white background, Or white patches contained on the image object is black.

Filtering mode calculates the number of white pixels and the number of black pixels from the filtered pixel area and compares them and assigns a value to the filter center according to the largest number of pixels. If more black pixels, then the pixels on the filter center will be blackened, if more white pixels then pixels at the filter center will be given a white value. This effect is like the effect of erosion on the object.

Zhou, (Zhou, 2010) explain that dilation is a morphological process to widen the image object. This process is done by comparing each image pixel with the input of the structuring-elements center value by superimposing the structuring-elements with the image so that the structuring-elements center is precisely the position of the processed image pixel. If there is at least 1 pixel in structuring-elements equal to the object pixel value (foreground) the image then the input pixel is set to its value with the foreground pixel value. If all pixels-related are the same as the background value, then the input pixel is set with the pixel background value. The process is performed on all pixel inputs.

Zhou, (Zhou, 2010) also explain that erosion is the process of eroding the edges of objects. This process is done by comparing each image pixel with the input of the structuring-elements center value by superimposing the structuring-elements with the image so that the structuring-elements center is precisely the position of the processed image pixel. If all associated pixels are the same as the foreground value, then the input pixel is set with the foreground pixel value. If at least 1 pixel in structuring-elements is equal to the background pixel value of the image then the input pixel is set to its value with the pixel background value. The process is performed on all pixel inputs.

2. RESEARCH METHOD

Mulyana (Mulyana 2017), experimented for binary image filtering using high-pass filtering with zero total coefficients. The selected filter is a high pass filtering filter with a zero coefficient with a core value of 8 and a neighbor value of -1 for filters with positive cores. For filters with negative cores, the selected filter is a high pass filtering filter with zero coefficient with core value -8 and neighboring value 1. This study proves the effect of dilation and erosion resulting from filtering on binary image.

Sur (Sur, 2016) and Makandar (Makandar, 2015) describe Low-Pass Filtering as a filter where the central cell with surrounding cells has very small differences. The nature of low pass filtering is essentially to adjust the pixels that are filtered against neighboring pixels. So as to produce the effect of blurring and smoothing and can also do noise cleaning on grayscale image like process done by Mezher, (Mezher, 2016) and Sarage (Sarage, 2012).

Initial suspicion of this research is that if filtering is done to binary image that has only two values 0 and 1, the effect of adjustment to filtered pixels against its neighbors will result in extreme values of 1 or 0 in accordance with its filter, no longer a value-adjusting effect that is close to the pixel value Neighbors.

Based on these initial estimates, a high pass filtering filter designed with a value constraint adjusted to the binary image value is 0 and 1. If the resulting

value of the filter is 1 or more, then the pixel will be set to a value of 1, whereas if the resulting value is less than 1 then the pixel will be set to a value of 0. Since the pixel value is only 0 or one, the filtering process designed will only result in a change in value from 0 to 1 or from 0 to 1, or in other words, this filtering process produces dilation and erosion effects If applied to binary imagery.

Filters are designed with the aim that the dilation effect and the resulting erosion effect will follow the positions of values 0 and 1 that fill the filter cells. Filters are designed to allow the results of the filtering process to follow the effects of morphological processes with structuring-elements.

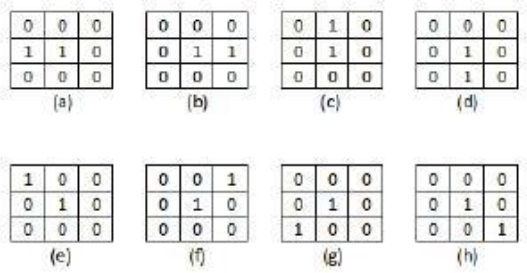

Fig. 1. (a) left side filter; (b) right side filter; (c) up side filter; (d) below side filter; (e) up left corner side filter; (f) up right corner filter; (g) below left side corner filter; (h) below right side corner filter

The filtering process is done by conventional linear operation and correlation between the local area of a bitmap cell with the kernel. This operation is tailored to its morphological needs. In the filtering process required a filter g (x, y) in the form of matrix size m x n, in general the matrix used is a 3x3 matrix that each cell contains the weight value. This matrix is called a filter, mask, or kernel, and some call it a window. Each point (x, y) of the image f (x, y) in filter with filter g (x, y) yields h (x, y), Sutoyo (Sutoyo, 2009) and Roopashree (Roopashree, 2012).

Shareef, (Shareef, 2012) classifies the convolution operators of Srivastava-Attiya (Srivastas, 2007) and Umar, (Umar, 2007) which are recursive sums of linear functions in the form of multiplications between cells opposite their position to the matrix core . Simply put, the convolution process can be formulated as in equation (1).

$$h(x,y)=f(x,y)*g(x,y)=\sum_{k=1}^{m}\sum_{l=1}^{n} f(k,l).g(x-(k-m),y-(l-n)) \quad (1)$$

The correlation operator is a recursive quantifier of linear functions in the form of multiplication between cells corresponding to the matrix core. Simply put, the correlation process can be formulated as in equation (2).

$$h(x,y)=f(x,y)*g(x,y)=\sum_{k=-m}^{m}\sum_{l=-n}^{n} f(k,l).g(x+(k-m),y+(l-n)) \quad (2)$$

Note:
X, y, k, l are free variables having discrete values, where x and y are the coordinates of the pixels being processed, k and l are the coordinates of pixels in a local area affecting the results of h (x, y)
H (x, y) is results at the coordinates x, y
F (x, y) is function f which processes x, y pixels following its neighbors
G (x, y) is filter function to process x, y pixels
m, n are neighboring point boundary that affects the point being processed.

In the process that produces dilation is done on the image with a white object with a black background. The resulting dilation effect is due to the presence of a white pixel present on the opposite side of the pixel destination which is converted to white. The purpose of this selection is if a black pixel is found, with a white neighbor on the opposite side of the filter cell position of 1 being specified, and then the pixel is converted to white. Conversely, if found white pixels with neighbors in the opposite position is white too, then the pixel will not be changed. Whereas in black

pixels that do not have white neighbors in opposite positions with cells valued 1 on the filter will remain worth 0 or black.

Fig. 2 shows example of binary image with a white object, shown in Fig. 2 (a). The result of dilation is shown in Fig. 2(b). Visible object widened. Fig. 2(c) show black pixels around red-colored objects. These pixels are the result of a dilation of the background pixels into object pixels

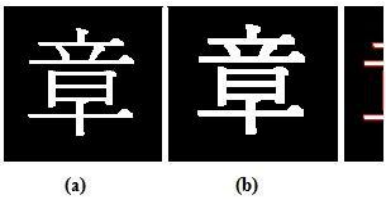

Fig. 2 (a) Binary Image; (b) Dilation Result Image; (c) Compare Dilation Pixels

The process of dilation on a white object against a black background indirectly will result in an erosion effect on the black background. Based on the process, then if the image is inverted to be black objects and white colored background will produce erosion effects on objects with the same filter. But since the convolution process will check for the equivalence of a neighbor's pixel of value 1 with the opposite position of a neighbor cell of value 1 on the filter, the resulting erosion effect will be in the opposite position given that the added value 1 is dilation against the background of value 1. Based the linear operation performed to produce an erosion effect on the object is a correlation operation.

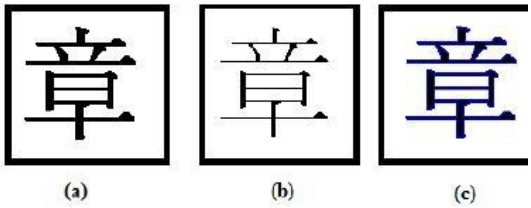

Fig. 3 (a) Binary Image; (b) Erosion Result Image; (c) Compare Erosion Pixels

For example, in Fig. 3. shown a binary image with a black object, which is shown in Fig. 3. (a). The results of erosion are shown in Fig. 3. (b). Visible object eroded. Fig. 3. (c) show black pixels around objects that are colored blue. These pixels are the result of erosion from the pixel object to the pixel background.

Some of the basic morphological effects that will result from the design of these filters are the effects of erosion or dilation on a particular side, ie on the upper side, lower side, left side, right side, or on any of the four corners of the object contained in the image Filtered binaries.

This morphological effect occurs because when a pixel is being filtered, the convolution operation or the correlation of the pixel's neighboring pixels yields a value of 1 or more due to the encounter of a value 1 in pixels that correlates or is convolved with filter cells of value 1.

Grading 1 on the filter core to ensure that the filter pixel is worth 1 then the cell will remain 1 even if all neighboring cells after correlation or convolution operation produce a total of 0. Since if the core filter is 0, then none of the neighboring pixels 1 are correlated or convoluted with filter cells of value 1, will result in a value of 0 though

The limitations in this substitute filtering design of morphology are limited only to the basic operation of erosion and dilation on the specified side of the object contained in the binary image. If erosion or dilation is required on a combination of certain positions, these base filters may be combined into other low pass filter forms.

3. RESULTS AND DISCUSSION

The eight filter designs for this morphology were tested on a binary image with a sidewise object corresponding to the purpose of the filter for this morphology. The object has straight sides on the left, right, top and bottom, as well as the left side top, top right, bottom left and bottom right. As shown in Fig. 4 which is the process of erosion and dilation resulting from the upper left corner filter as shown in Fig. 4(e). Fig. 4(a). Is a binary image with a white object and a black background, Fig. 4(c) is a binary image with a black object and a white background. Fig. 4(b) is the result of dilation, which is indicated by the addition of red color from the background color that originally black. Fig. 4(d) is the result of erosion which is indicated by the addition of blue color of the color of the original object black.

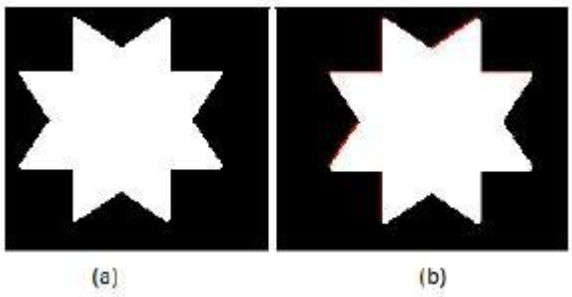

Fig. 4 (a) Binary Image With White Object And Black Background; (b) Dilation On Left Side Is Indicated By The Red Pixels; (c) Binary Image With Black Object And White Background; (d) Erosion On Left Side Is Indicated By The Blue Pixels

The left-side filter as shown by Fig. 1(a) causes the left side to be left erosion or dilation while the left side tilted on the left is subject to erosion or dilation. The other side is not eroded or dilated.

The right-side filter as shown by Fig. 1(b) causes the right side of the right to erode or dilation while the sloping side that tends to the right is affected by the erosion or dilation. The other side is not eroded or dilated.

The upsides filter as shown by Fig. 1(c) causes the upright side to be eroded or dilated while the sloping side tending to the top is subject to erosion or dilation. The other side is not eroded or dilated.

The bottom-side filter as shown by Fig. 1(d) causes the lower straight side to be eroded or dilated while the sloping side tending to the bottom is subjected to erosion or dilation. The other side is not eroded or dilated.

The upper-left-corner filter as shown by Fig. 1(e) causes the left and right sides to the left and the top side and the left side to be eroded or dilated, while the upward and downward sides are also affected by the erosion or dilation. The other side is not eroded or dilated.

The upper-left-corner filter as shown by Fig. 1(f) causes the right side and the top and the oblique side to the right of the top to be eroded or dilated, while the upward-sloping side is also affected by the erosion or dilation. The other side is not eroded or dilated.

The bottom-left-corner filter as shown by Fig. 1(g) causes the left and the lower left side and the oblique side to the lower left to be eroded or dilated, while the downward and left-facing sides also experience the erosion or dilation. The other side is not eroded or dilated.

The bottom-right-corner filter as shown by Fig. 1(h) causes the right side and the bottom and the sloping side at the bottom right to be eroded or dilated, while the downward and right sides are also affected by the erosion or dilation. The other side is not eroded or dilated.

The conditions that occur in each filtering using the designed filters are shown in Table 1. Each rows of table 1. are filtered out by the designed filters as in Fig. 1. Each column represents erosion or dilation on each side of each filter use on each line. Thick value is a thick erosion and dilation on the side represented. Thin value is the occurrence of thin erosion / dilation. The value of Not indicates no erosion / dilation.

The conditions that occur in each filtering using the designed filters are shown in Table 1. Each rows of table 1. are filtered out by the designed filters as in Fig. 1. Each column represents erosion or dilation on each side of each filter use on each line. Thick value is a thick erosion and dilation on the side represented. Thin value is the occurrence of thin erosion / dilation. The value of Not indicates no erosion / dilation.

Erosion / dilation with the thick category occurs because all pixels on the side are eligible for erosion / dilation, because it connects so as if the erosion / dilation that occurs thick.

Erosion / dilation with thin category occurs because of the small number of pixels on that side are eligible, but because

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DASHBOARD APPLICATION FOR ENVIRONMENTAL SECURITY SYSTEM

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Abstract

The purpose of this research is to implemented web-based environment security system to neighborhood watch program (Siskamling) in certain neighborhood area (Rukun Tetangga or RT), by analyzing and designing website of Environmental Security system Dashboard in order to assist RT and to help security guard in securing environmental neighborhood, The System will reducing the paper usage in news delivery and Help citizens to report anything. Based on the results of the design and Analysing the System, System would provide the Reports and news features that are needed by RTs, residents and security guards to know any reports and schedules of existing patrons and work, and the news would be distributed to citizens via email.
The research method used in this research is the SDLC method of collecting data through literature study. While the system development method used is object-oriented system development method or UML (Unified Modeling Language) which includes Use Case Diagram, Activity Diagram and Class Diagram.
The system is expected to help security activities within the RT environment to become more easier and faster in delivering the news and the reports, so it can be more efficient in the use of papers to support maintaining the environment.

Keywords
dashboard environment security,uml, information systems, Neighborhood watch

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1. INTRODUCTION

The purpose of this researching is to create web-based dashboard application an environmental security system to neighborhood watch program that can be accessed by residents, security guards and caretakers of RTs (The access control of the application was held by Caretaker of RTs) and provide reports of overnight guests or vacant homes without having to come to the neighborhood security guard or RT head, and can spread news reports to residents. And to simplify and save costs when there are work activities (what we call kerja bakti) and night guard. Without having to create invitation letters that are distributed to the residents. Siskamling is one of the efforts in creating an atmosphere or good condition of a safe environment. Safe in all aspect, such as safe in theft, religion, daily activities, and some aspects of ideology, politics, economy and social-culture. If further examined it will be found understanding siskamling specifically is a way or system of protection of society as a special component where the security of the environment inhabited by the community is guaranteed[1]. The Information System is a composite of all components and works together to process data and generate information. Almost all business information systems contain many sub-systems with various sub-goals, and they all contribute to the organization's main objectives[2]. Unified Modeling Language (UML) is a method of visualization and documentation of the most widely used software system design. UML uses object-oriented design concepts, but UML is not dependent on a particular programming language and can be used to describe general business needs and processes[3]. Systems Development Life Cycle (SDLC) is a framework that describes the stages in the development of information system. Some well-known models in SDLC such as waterfall model, spiral model, incremental build model, prototyping model, and rapid application development[4]. the Entity Relationship Diagram (ERD) shows the "entities" and "relationships" that connect them. Entities describe the data required by the system and relationships describe how the entity is related to one another[5]. PHP (Hypertext Preprocessor) is an unlimited multifunctional language for running a website so it can create dynamic web pages[6]. MySQL is a type of database server that is widely used to build web applications where SQL is included containing an SQL server, a client program to access servers, administration tools, and an interface program to write programs that you own[7].The class diagram used to describe the structure of the system, and describe the elements and the relationships between the systems. The elements and relationships between these systems do not change overtime[8]. Database is a collection of multiple logically related files designed to meet the needs of the organization[9]. JavaScript was introduced in 1995 as a way to add programs to web pages within the Netscape Navigator browser. Since then, this language is already in use by all graphical web browser[10].

2. RESEARCH METHOD

The methodology used in writing this research, 1. The formulation of Research Objects, The object of research from the development of environmental security system are as follows: Neighborhood area RT, RT Chairman, residents, and hansip or security guard on duty, Procedures and security activities within the neighborhood RT. 2. Data collection methods: conducting surveys and interviews: conducting observations and frequently asked questions about security activities,

activities related to the creation of an environmental security dashboard application.3.Studi libraries: do research through books that contain a variety of materials about the application of environmental security: Data Analysis Method In analyzing the data, the authors include the following diagram: 1.Diagram of UML (Unified Modeling Language),2.Diagram of ERD (Entity Relationship Diagram). 4.System Development Methods : Done by the System Development Life Cycle (SDLC) method with the Waterfall model. The stages of each of the waterfall models have the outputs needed in system design, along with an explanation of each stage: a.user Requirement: do planning by gathering information about the needs of the user to design the application through interviews and observations. b.analysis: make various descriptions of the analysis of the overall information collected at the analysis stage. c.design: design the user interface design and database design to build applications. d.coding: do coding in the process of making applications based on the results of existing designs. e.implementation: Implementation of applications to users to be used in accordance with its functions. f. testing: Testing is done by testing techniques Black-box is to test all functions in the application. g.maintenance: make repairs and maintenance of applications periodically after the implementation phase is done.

3. RESULTS AND DISCUSSION

The development of a new web-based dashboard application an environmental security system that requires several phases, The activities include : analysis, design, coding & testing, implementation and maintenance, the whole process of software development is divided into several phases as follow.

Syntax	Mean	Description
	Use case	Represents a major piece of system functionality.
	Actor	Is a person or system that derives benefit from and is external to the subject.

3.1. System Design

Table 1. Syntax of Use Case Diagram [3]

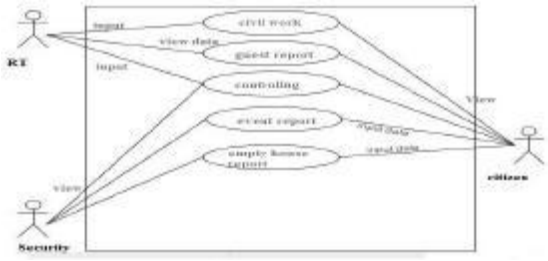

Fig.1. Usecase diagram System design

In Fig.1. the above Usecase diagram System can be viewed that head of certain neighborhood area (head of RT) can manage the data of security guard and citizen and also can enter data work devotion and patrol, while residents can only make reports of events, guests stay, empty house. And the security guard can only see the report.

3.2.Class Diagram

a class diagram created to show the relation table in the database, as well as related program files in designing the System. we make Class Diagram as follow :

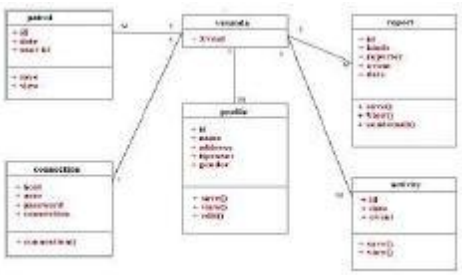

Fig.2.Class Diagram

3.3. The results from Designing to the neighborhood watch program (Siskamling)

Fig.3. View home of main program menu

The Initial Display main menu of RT where this display is similar to the appearance of residents but has different features.

Fig.4.Data Entry of citizens Profil menu

This profile display is the same in every user (citizen, security, RT) but has different features and appearance, in this menu was used to entry the citizen data for the all members of family. Included with the foto of the family data.

Fig.5.Data Entry of security Profil menu

The Menu of Data Entry for the Security Profil, this menu only can be access or entry by Head RT . to add, edit, erase the data.

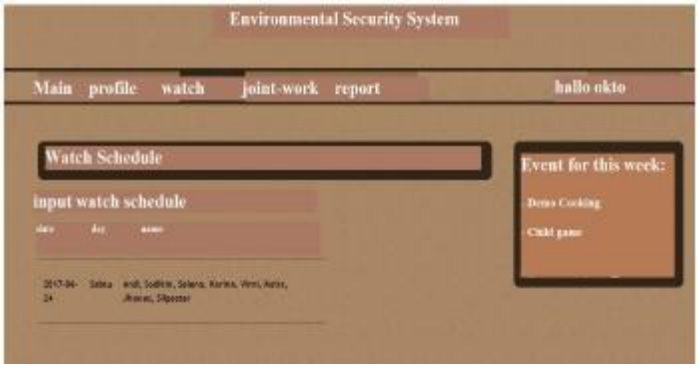

Fig.6.View of Siskamling [1] (Ronda) menu

In this menu Fig.6. is has the same display for each user/citizen but for the Head RT has different features.because this menu is to control and manage the watch schedule.

Fig.7.Input Joint work activities menu

The menu was to input Joint work only, this menu was available for The head RT only, to manipulated the data for adding,erase and print.

Fig.8. Schedule of Joint work activities menu

This Menu is the same for each user but for Head RT has different features because manipulate the schedule of Joint work together.

Fig.9. input joint-work activities detail menu

This menu was provided only for head RT to be able to manage joint work together activities in detail.

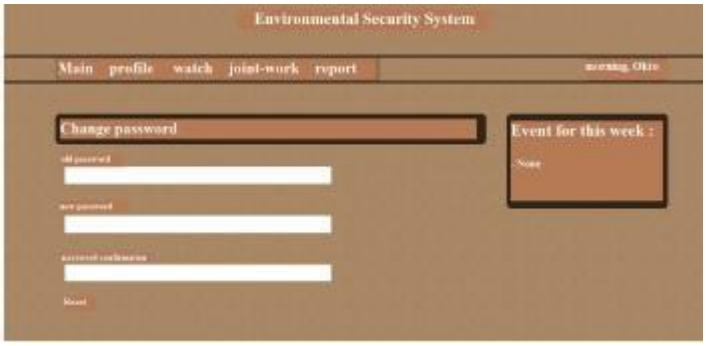

Fig.10. change password menu

Each user has the same menu for changing the password and it's recomended to always change password with in several month.

Fig.11.incident/event reports menu

In this menu the citizen could see and entry for any importen event to spread the news for all neigbours and The report of event or incident were the same for every user and only citizens can add incident reports.

Fig.12. . incident/event reports entry menu

In this menu the resident could entry or update the data of incident or event that reported by the residents.

Fig.13.Empty house report menu

In this empty house report menu the resident could inform to the head RT, if they planning to leave the house empty for several days or a certain time so the security guard could know the condition of the region.

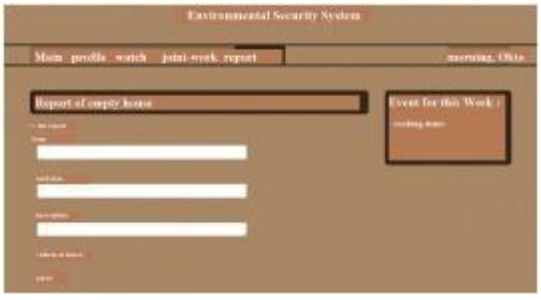

Fig.14. Empty house entry data report menu

In this menu the resident could display for empty house data report for certain priode of times for the empty houses.

Fig.15. The guests stay menu

In this menu the resident could entry the data if they had guests that will stay in their house, so the security will know if there is any things happen to the resident.

4.CONCLUSIONS

The conclusions that can be taken from the results of research are connected with the purpose of research: 1. Security issues in neighborhood RT and Environment can be reduced by applying this application. 2.The environment safety dashboard system is designed with Simple Web base and easy menu so that it can be used anywhere by head RT or residents for the communication within environment. 3.The Distribution of news and information about activities or events in the RT environment can be easily delivered. 4.The security report for empty house which the owner is out of home or going out of town will be easier. 5.The application requires internet connection to be used for all neighborhood, even for all RT in Indonesia.

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Urban Spatial Design Based on Transit Oriented Development Concept

Case Study: Palmerah Area, West Jakarta

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Abstract

This research is conducted as a respond to Jakarta provincial government policy to adopt Transit Oriented Development (TOD) concept as an approach to develop areas near transit points, particularly train stations as Jakarta's main mass transportation. Study about the readiness of area 800-meter radius from transit point is needed, particularly on how to encourage people to not using private vehicles - shifting into riding public transportation and walk/cyle to travel. Study about Palmerah area that had been previously done shows that generally, physical condition of area within 800-meter radius from Palmerah railway station has not met the requirements to be called a TOD area. This research is seeking to the principles of TOD concept and utilize it to construct a more site-specific guideline according to its physical condition and socio-cultural of the people. Using deductive-qualitative approach, this research is expected to yield an urban design guideline that apply TOD concept spesifically for Palmerah area

Keywords: TOD, urban design, transit, Palmerah

Background

Jakarta, a metropolitan with high rate of population growth and high pace of activities, is facing fundamental issues in traffic and transportation. Traffic gridlock in many places in Jakarta consumes significant amount of energy and emits pollution which has become serious problem to the city. In order to tackle this problem, Jakarta municipal government plans to develop the the city based on TOD (Transit Oriented Development). This plan is directed towards a compact-high density: walkable mixed-used area, reachable by foot/bicycle in 10-20 minutes, with aim of reducing number of private vehicles and encouraging people to use public transport in their day-to day activity, both within their neighborhood and from the neighborhood to transit point.

However, many planned TOD areas are not prepared for comfortable and safe mobility, including Palmerah-Slipi transit area. This area is a transit node between railway commuter line, BRT TransJakarta, city bus, and other means of public transportation. Despite its significant role as a transit neighborhood, it is not well planned/designed to accommodate people mobility. Early observation findings showing that the area within 800-meter radius from Palme rah Station are not planned to handle immense activities created by the transit points. Public has to deal the problems caused by traffic congestion, poor pedestrian lane quality, lacking of public spaces, poor access to main transit points/public facilities.

Research Purposes

This research aims to model an urban design guideline of areas adjacent to Palmerah railway station which can be used as direction to develop areas with similar urban settings: multi-modal transit nodes with low-medium density transformed into high density setting, shifting private motorized transportation with walking/bicycling. Output of this study will be urban design guideline of Jalan Gelora 6 which is a main passageway connecting main transit point to residential areas and local public transportation.

Scope of Research and Studied Area

The area used for this research is limited to 800-meter radius (walkable distance) from Palmerah Station. This area is divided in three *kelurahans* (regional administrative area): Kelurahan Palmerah, Kelurahan Kebayoran Lama and Kelurahan Gelora. Because the residential and local activities are taken place predominantly in Kelurahan Palmerah, data collection related population, socio-economic and cultural background for this research are conducted in this area. Kelurahan Gelora is dominated by offices and sport facilities, whereas only 10% of TOD radius area is in Kelurahan Kebayoran Lama.

Literature Review

Peter Calthorpe (1993) in his book *The Next American Metropolis* defined

TOD as "*mixed-use community within an average 2.000-foot walking distance of a transit stop and core commercial area. TODs mix residential, retail, office, open space, and Public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot, or car*." According to him, planned TOD area should have these following principles: (1) Encourage growth in regional level to be compact and transit supportive, (2) put commercials, residential, offices, and public facilities within walking distance from transit station, (3) create pedestrian friendly street network connecting local destinations, (4) provide housing with many varieties of type, density, and cost, (5) preserve local habitat and high quality open spaces , (6) create open spaces as focal point of building orientation and public activity and (7) foster land utilization and redevelopment along transit corridor.

TOD areas also have to have these components: (1) pedestrian prioritized planning, (2) transit center as a vital feature of the city center, (3) a mix use regional node consists of residential, offices, retails, and public spaces, (4) high quality development around transit points with 10 minutes' travel time, (5) local public transportation, such as buses, trams, etc., (6) Design that encourage bicycle usage, (7) reducing number of parking and good parking management in the area. Provincial regulation (Pereda Provinsi DKI no.1 year 2012) about Jakarta Spatial Planning 2030 defines TOD area as a mix use area (of residential and commercial) with high accessibility to mass public transportation. The transportation stations/terminals with high density buildings will be the center of the area. TOD area has some characteristic features including: (1) located at an intersection of two or more public transport corridors; (2) areas which have high economic value / predicted to be of high economic value in the future, and planned to be a center of activity in the city. In order to realize the TOD plan.

According to this regulation, the government creating strategies such as providing integrated public transportation with mass transportation system; planning area development to be integrated with transit change nodes; creating save and comfortable bicycle and pedestrian lanes; providing routes and space for evacuation; and align/integrate TOD area development around public transport stations, stops, shelters and mass transport nodes. The development of pedestrian and bicycle facilities are directed as follows: located in primary, secondary and TOD activity center; located in tourism area; in the vicinity of public transport stations, stops, shelters and mass transport nodes, with integration to neighboring area.

Furthermore, Governor of Jakarta also established a regulation (Peraturan Gubernur no.182 year 2012) in which explains ways to optimize space utilization using TOD concept: create variety of functions, redistribute and increase development intensity, regulate building massing, optimize pedestrian mobility pattern, integrate transit facility linkages and limit number of car parking within radius of 350 meter from MRT station, design attractive-high value areas around MRT station.

Methods

Based on theoretical review and case studies, this research is designed with

deductive-qualitative approach. Survey conducted to respondents and field observation are used to create redevelopment principles of an existing built-up area into an TOD-based designed area, particularly in Palmerah area. These principles will be further elaborated into TOD urban design guideline for areas around main transit node (in this case, Palmerah train station).

According to Shirvanis's "The Synoptic Method" (1985), the urban design guideline will contain in detail: formation of goals and objectives, alternative concepts, process elaboration into practical solutions. As the last step Shriven also wrote about evaluation process of alternative solutions, and how concept solution is translated into regulation, planning, guidelines and programs. The output of this research will be disseminated as a proposition to TOD area development stakeholders, particularly to policy makers and society.

Referring to aforementioned Synoptic Method, this study will include these following processes:

1. Data collection and site observation: physical and socio-economic condition
2. Data analysis, identifying opportunities and challenges
3. Constructing goals and objectives, based on discovered evidences, local participation in the process.
4. Composing alternative concepts (in deductive-qualitative process). Theoretical data and understanding of precedent studies are reviewed to examine how similar cases are solved. This review is taken into consideration while forming Palmerah urban design guidelines.
5. Elaborating/developing the alternative concepts. This stage emphasizes on reviewing, re-analyzing, and criticizing and categorizing alternative options to create/choose the best option.
6. The last stage is to collate these concepts into presentation, explaining the chosen alternatives, and formulate an urban design guideline for Palmerah area as the output.

General Description of Research Location

The site is located in Kelurahan Palmerah, West Jakarta. Kelurahan Palmerah is consisted of 17 RW (*Rukun Warga*, unit of neighborhood consisted of several *RT*s) and 176 RT (*Rukun Tangka*, smaller neighborhood unit, consisted of several family units). Extending of 233.15 km^2, this area has a density of 2,540 persons/ km^2. There are 3 *RW*s located within 800-meter radius from Palmerah main railway station.

Palmerah station has become a major railway station since colonial era, serving on Batavia-Kebayoran line. Line from Batavia (colonial government & residential area) to Paal Merah (now Palmerah) started to operate in 1899-1900 and is still actively operating until now. Area neighboring this Palmerah station has gone through increased density and land-use changes. Palmerah station position becomes vital as its increasing service. Currently this station serves the commuter line connecting Tanah Abang (one of the busiest commercial districts in Jakarta), Serpong, Parung, hingga Maja (three satellite towns of Jakarta). It also serves local low-cost trains to Rangkasbitung (another satellite town). In order to cope with the increasing number of services and passengers, this station has

been renovated, extended, and equipped with modern buildings and facilities in 2015, leaving the old building still intact as a heritage building.

DISCUSSION

Zoning and Land-Intensity Plan Review

Palmerah TOD area covers Kelurahan Palmerah, Gelora, and Kebayoran Lama. Existing functions in the area includes office, service and retail, housing, social service, blue and green open space. According to zoning plan on Jakarta provincial regulation (*Pereda Provinsi DKI Jakarta* year 2014) indicates that land use and activity has barely changed from current existing conditions (2017). However, there is significant increase in terms of intensity, mainly the area along secondary artery and primary collector roads. Zoning guidelines indicate that there will be significant increase quantity and frequency of human mobility, both people moving inside the TOD area and people transiting.

The challenge to cope with increasing people mobility, is the need to upgrade both quantity and quality of pedestrian routes. More people also opens some opportunities to create facilities which can improve area's economy. This is parallel to what Caltrop's (1993) TOD principle about the need of core commercial area; which can be offices, restaurants, retails, services and entertainments.

Observation of Vehicle and Public Transportation Mobility

This area is served by several public transportation systems: railway, city bus, smaller bus and mini-bus, TransJakarta feeder bus and TransJakarta BRT line (stops at Slipi) which commonly known as busway. From Slipi stop, busway users are channeled via pedestrian bridge at Slipi intersection (in front of Jakarta Design Center, just at the inlet to Palmerah Barat street) whereas Stasiun Palmerah bus stop are serving other buses: Kopaja B-86 and Metromini S-608 (Kebayoran Lama - Tanah Abang route, and Lebak Bulus – Grogol route), busway feeder (corridor 9, Kebayoran Lama - Tanah Abang route, and Lebak Bulus – Grogol route)

Meanwhile there are several buses (Metromini S608 and S615) and shuttle cars (Mikrolet/Angkot M09, M09A and M11) serving local transportation within the area, passing secondary artery road (Jalan Palmerah Utara) and primary collector road (Jalan Palmerah Barat) which connect Tanah Abang and Kebayoran

Lama. *Figure 4* illustrates the absence of connection between Palmerah railway station to other public transport routes.

Figure 4. Jalan Gelora 6 - pedestrian passageway connecting Palmerah railway station and Palmerah area

Analysis on Outspread of Socio-Economic Activity and Connectivity of Public Transportation Systems

Figure 5. [Left]Outspread of social, cultural, economic and trading facilities

Figure 6. [Right] Several public facility (social and commercial) in vicinity of Palmerah station

(Source: Google Map, edited by author; photos by author)

Public facilities are evenly scattered all over Palmerah TOD area. For example, education facilities are usually located in the center of residential area, less than 500 meter from public transportation service on secondary collector road (Jalan Palmerah Utara and Jalan Palmerah Barat) which means that the education facilities can be reached by walking from public transport routes (met the requirement on national standard SNI 1733-2002). However, from observational study, many people choose to use motorcycle for their everyday transport.

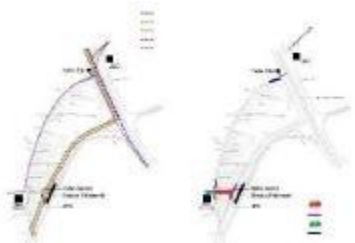

Figure 7. Public transport routes and nodes (Source: Jakarta city map, edited by author)

There are also many public facilities which have city – and even national importance in the area neighboring Palmerah railway station. Occasionally these places hold events which gather a vast amount of people, up to ten of thousands of people. Offices, markets, and retail places are also contributing to the high density in this area. Due to these conditions, it is important to find ways to cope with the ample mobility of people.

Analysis on Building Density and Its Relation to People Mobility

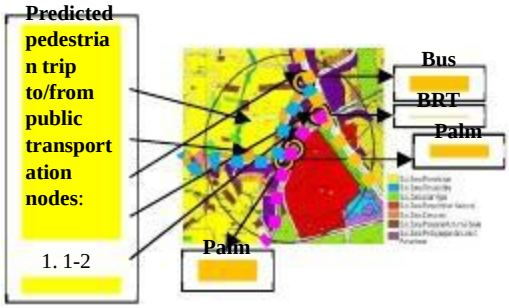

Figure 8. Zoning Plan showing land use and density in area near Palmerah railway station.

Jakarta Zoning Plan in masterplan 2030 shows that in Palmerah TOD area, residentials range from low to high-density (*See Fig.9*). Most of the residential land use has low density, meanwhile, residential on Jalan Tentara Pelajar (secondary artery) and Jalan S. Parman (main avenue) are directed towards high density housing. Mix-use function is usually located along primary and secondary collector. Offices, trading and service providers area located along primary and secondary artery, with high density. In the future, area near Palmerah railway station will become much denser, it needs good anticipative planning concept to cope with the density increase.

People Mobility Between Transit Points and Activity Centers in TOD Area

From observation on site, there are daily waves of pedestrian moving to/from Palmerah railway station. This can be up to 50 people / minutes when people get off the train and crowding the road via pedestrian bridges, to the left side towards Jalan Sentara Pelajar (to Palmerah area) and to the right side towards Jalan Gelora 1 (to government offices and Gelora Bung Karno sport center)

Most of passengers getting off to Palmerah area usually continue their journey with bus or online motorcycle taxi. Many people are entering Palmerah area through Jalan Gelora 6 street to take shuttle cars (*mikrolet*) which are waiting for them at the end of the street, or from this street directly to commercial area, offices, or residential within the area. Gelora 6 street nodes are incredibly dense with pedestrians as it connects different transit points and activity centers. The density is worsened by informal market that fills the street space every morning from 5.00 AM to 9.00 AM. (*See Fig. 5*)

After learning about people mobility between two main transit nodes (Slipi BRT station and Palmerah railway station), Gelora 6 street and Jalan Palmerah Utara, especially the segment very close to

Palmerah main market are selected to be priority area to revitalize.

Urban Design Guidelines Proposal

Palmerah as transportation node holds an important potation in Jakarta public transportation system, particularly in West Jakarta. It connects commuters from Banten province to Jakarta city public transportation. Furthermore, many significant activities take place Palmerah station area which generates people mobility to/from the main transit points. However, existing condition of Palmerah TOD area (within 800 m radius from Palmerah railway station) is very chaotic in many aspects, including circulation and accessibility, the informal commercial activity (informal market and street vendors), land use and city facility. In order to improve such condition, TOD principles need to be incorporated in the planning

Urban Design Guidelines Goals

- Lessen car and motorcyle rides (both private and public), and encourage people to travel by walking/cycling from main transit points to other public transportation options (*mikrolet* and metromini buses) on Jalan Palmerah barat, both within Palmerah area or to other parts of the city.
- Reduce traffic congestion on Jalan Gelora 6, Jalan Palmerah Utara and jalan Palmerah Barat.
- Redesign/revitalize the main connecting passageway (Jalan Gelora 6) into pedestrian walkway with shopping street concept.
- Design aims to improve physical quality of public spaces and at the same time improving area vitality, while putting safety, comfort, pleasure and ease of social-interaction for pedestrians and diffables into consideration.

Figure 9. Motorized vehicle routes for Palmerah TOD area (Source: Jakarta City Map, edited by author)

Segment 1

Segment 2

Segment 3

Design Concept

- Refer to Zoning Plan in Jakarta Masterplan 2030 in order to anticipate future development in the area.
- Jalan Gelora 6 is the main focus for revitalization. This street has the capability to be developed into public-uses: very close to the transit point (within 5 minutes walking distance). This street is envisioned to service the offices, commercial and residential within TOD area and the adjacent neighborhood.
- The redevelopment of Jalan Gelora 6 will heavily consider and should contain commercial activity currently existing on site.
- Jalan Gelora 6 is designed to be a full mall with shopping street concept: removing all motorized vehicle access, and giving parking/loading facility only for residents/tenants

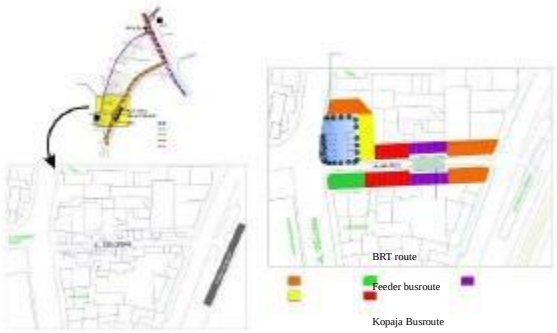

Figure 10. Proposed Urban Design Guideline for Palmerah TOD areaon Jalan Gelora 6 (Source: Jakarta City Map, edited by author)

Figure 11. Illustration of design of Jalan Gelora 6 (Source: Author)

- Other redevelopment target will be pedestrian lanes connecting transtit points (Palmerah station bus stop, Slipi BRT stop, and Gelora bus stop)
- Clearing the pedestrian lane connecting the Palmerah Station to Palmerah area from other activities by moving all existing street vendor around Palmerah railway station and Jalan Tentara Pelajar.

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FINAL ACCOUNT ON CONSTRUCTION CONTRACT WITH MUTUAL TERMINATION AGREEMENT

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Abstract

The Final Account is the conclusion of the contract value including the necessary adjustments and stating the amount to be paid by the employer to the contractor. This includes all work that is payable to the contractor according to the contract. A construction contract usually ends in two ways. Firstly, it will end when the work is done and the responsibilities of two parties are met. Second way to end the contract is when a default by one or both of the parties occurs, and the contract is terminated. Other than these two common ways, a contract can also end with mutual termination agreement by both of the parties. This could happen when the employer and the contractor met a condition that forces them to end the contract without a default. Although the termination of the contract is mutually agreed, preparing a Final Account in this condition is not an easy matter. If a non-standard contract such as FIDIC, JCT, or NEC is used, problems will arise in preparing the Final Account. There will be grey areas where both parties claim their rights because of the lack of rules in the contract clauses. This study is aimed to identify key aspects of a Final Account which confer high risk of starting a dispute, how to accommodate it in the contract, and how to prevent this condition from happening in future construction contracts. By doing literature studies from various sources such as standard contract and books, and doing a case study of a project with aforesaid condition, this study concludes that there are two key aspects that need more attention when making the conditions of contract. Those two key aspects are final progress claims and retention. The difference between literature and actual settlement happens in the retention aspect. This difference causes a 5% difference in the contract amount between settlements, a huge amount considering this only caused by different settlements made in preparing the Final Account. Furthermore, all of this problems could be avoided by using a standard contract used and accepted worldwide.

Keywords: Final account, Construction contract, Termination, Mutual agreement.

1. INTRODUCTION

A construction contract usually ends when either of the two conditions are satisfied. The first one is when the responsibilities and goals from both parties, the employer and the contractor, is achieved and completed according to the contract. The second condition is when one or both parties breach the contract and a default occurs. The right to terminate a construction contract due to a default generally arises only when a material or substantial provision of the contract has been breached or a party has failed to perform a material obligation. The rights and liabilities of the parties are controlled by the common law and by the terms of the contract, which anticipate and provide the termination of further performance upon default. According to common law, a minor deviation in performance or a failure to meet an objective that does not pertain to the subject of the contract is not grounds to terminate for default. While such a deviation or failure in performance may give the non-breaching party a corresponding right to damages, it does not raise a level of significance that would merit a complete termination of the contract. Determination of the significance of a breach depends upon the importance of the event or act to the purpose of the contract as a whole or to the basis of the agreement between parties [1].

The end to every construction contract will be marked by the issuance of the certificate of practical completion. Following the issue of the certificate of practical completion, the project manager or the engineer should ensure that the Final Account process for the completion works is concluded with the contractor as quickly as possible. The Final Account is a reconciliation of the tendered works and the scope of the works finally instructed; it also contains an account of variations to the contract issued during the course of the project. The Final Account process involves consideration of claims for additional monies and time made outside of the contract. The project manager or the engineer, who will make a recommendation to the client for any awards, will consider these claims for consequential loss. The project manager or the engineer has a duty to monitor the legal liability of the client throughout the construction work [2]. On those conditions, preparing a Final Account is relatively easy to do. This is because there are standards and common practices that are used on a construction project. Each party's right and responsibilities are clearly stated in the condition of contract or minutes of meeting collected from the pre-tender and clarification meeting.

Contracts may be terminated, in the sense that they no longer continue to enforce unfulfilled obligations on either party, in a number of ways. Most obviously, the contract may be performed, either fully or in a manner that is sufficiently significant to terminate the contract (with the possibility of a claim for damages by the innocent party, in the latter case). Alternatively, the parties may agree to terminate (or abandon) a contract. In such a case, the agreement to terminate must be supported by a consideration. The contract may be brought to an end by an event that activates a term in the contract that provides for this result, the classic example is the failure of a condition precedent. The contract may be frustrated by the occurance of an event unrelated to the parties; it may be brought to an end by the operation of a rule or law, other than the doctrine of frustration. Finally, the contract may be brought to an end by the breach of a basic, or a fundamental term, the so called condition, or the threatened breach of such a term (anticipatory breach), coupled with an act of termination by the innocent party [3].

The author, in the work of preparing Final Accounts, met one

project with a mutual termination agreement. Just as parties have the power to make a contract, they are also able to "un-make" it. In legal parlance, exercising this power may be described as rescission, cancellation, mutual termination, or some other synonym. However it is termed, this event means that the parties have agreed that each is to be relieved from any further performance obligations. In lay terms, they have called the deal off. The legal requirements for such arrangement are generally the same as the requirements for a contract, a manifestation of mutual assent, a consideration, a lawful purpose, and the compliance with any formal requirements [4]. This condition rarely happens, and there are no rules or clauses in the conditions of contract, minutes of meeting, or common practices that discuss how to prepare a Final Account on this condition. After the conclusion of the termination is mutually agreed, the process of preparing the Final Account begins. Problems arise when both parties starts to debate on several aspects in preparing the Final Account. Debate happens because those aspects have not been discussed or stated in the contract documents. This problem makes preparing the Final Account harder and more time-consuming. In reality, preparing a Final Account on a mutual termination agreement construction contract is not easy to complete. Even though the board of directors and stakeholders have decided to end this contract in good terms, on the project level many problems still occur. This particular problem has not been described in literature. There were several projects with similar problems, but they could be settled and the project continued.

This study is specifically done regarding a construction project with private company as the employer, using QS consultant to help them control and manage the project, and using a lump sum fixed price or unit price construction contract. On most projects, a quantity surveyor is engaged by the employer to prepare a cost plan at the conceptual stage and a bill of quantities at the design stage of the project lifecycle. The quantity surveyor's role at the construction stage is to check the validity of progress and the variations claims made by the main contractor [5]. Preparing a Final Account is also one of the quantity surveyor's job on the construction stage when the project ends.

In this study, the author aims to identify the reason for this project to come to a stop and the mutually termination agreement to take place. This study also aims to get the key aspects on preparing the Final Account on this condition, and how to accommodate those aspects in the contract document, so that any future debate arising from a similar condition could be avoided. The last aim is to find a way to prevent this condition from happening in future construction projects.

2. RESEARCH METHOD

Briefly said, the study for this research is divided into six steps: firstly, conducting a literature study, secondly, making settlements based on literature, thirdly, confirming the results with an expert, fourthly, is collecting needed data from a sample project that will be studied, fifthly, doing a study by applying the settlements based on literature to the actual data from the project. The last step is to make a conclusion from applying and comparing the results based on literature to the actual result from the project.

The literature studies is focused on preparing a Final Account based on four conditions:

1. The goal of the contract is achieved, when the responsibilities from both parties based on the contract is met.
2. Default by employer, when the employer is breaching the contract.
3. Default by contractor, when the contractor is breaching the contract.

4. Mutual termination agreement, when both parties agreed to stop the contract before the goals of the contract is achieved without any default.

Each condition the will be reviewed with respect to the six aspects that are closely related in preparing Final Account and determining the final Contract Price. Those aspects are:

1. Final Progress
2. Variation / Change Order
3. Claims
4. Repayment of Advance Payment
5. Retention
6. Time for Completion

Final progress is the determination of the overall project's percentage of completion status, which include a narrative description of work completed to date and materials stored on-site [6]. A variation order is a change to the contractor's original scope of works, this could result in additional works, deletion of works, change in quality of the works and other changes to scope of the contractual work. Some variations may result in claims, but not all do. For example, if the color of a wall is changed from white to an uncommon yellow shade, a simple variation order can be issued for a change of rate. The variation becomes a claim when there is a delay or disruption to the works as a result of the variation. For instance, the yellow paint takes time to procure, resulting in delay, or productivity is reduced in some way owing to the change in color (unless the productivity issue is already included in the new rate). In such cases, the contractor will start asking for additional time and/or money, in other words, there is a claim. To conclude, variations have the potential to become claims if they delay or disrupt the project [7]. By definition, the word "claim" is used to define a legitimate request for that adjustment in the case of a change. In daily usage, however, the word often connotes a dispute or a demand [8]. Advance payment provisions are used in construction contracts to assist the cash flow of the contractor at the early mobilization stage when significant costs can be incurred in setting up the site, bringing in large items of plants and equipments etc. Therefore, having an advance payment means that the contractor does not have to pay for all of this mobilization from their own funds [9]. On a construction project, the employer generally has the right to retain a percentage, usually 3 to 5 percent of the value of certified works due in each payment certificate up to the practical completion, to form retention fund. The retention fund is available to the employer to meet valid claims by the contractor, including claims for defects. If there are no outstanding claims, typically half of the retention fund will be released on certification of completion, and the remaining balance on certification of making good defects or expiry of the defects liability / notification period, whichever is later [10]. For the duration of a specified period after taking over by employer, the contractor is responsible for completing any outstanding work and remedying any defects that may arise. This is referred to in the silver book of FIDIC as the defects notification period. The defects notification period under the silver book is the time during which the employer may notify defects or damage to be remedied by the contractor [11]. When parties of a contract want to ensure its completion or performance by a certain date, it is usual to expressly specify time for completion in the contract [12].

After doing literature study, the settlements for those aspects and conditions were obtained. The settlements were then arranged in a table form so it can be easily read and understood when confirming the result to the expert. The expert is the chairman of the Quantity Surveyor organization in Indonesia called *Ikatan Quantity Surveyor Indonesia (IQSI)*. The interview with the expert is done by confirming the results from literature studies and eliciting the expert's agreement, disagreement, or inputs and

corrections for the results.

At the same time as the literature study and the settlements collection, the data needed for the application and calculation from the sample project was collected. The sample project is a construction of a high rise building that will be used as an apartment. This project consists of two towers, each twenty-three stories high with two basements. The employer for this project is a private company that hired a QS consultant for controlling and monitoring their project. Data collected from the project are related to the 5 aspects to be reviewed, as stated before. Beside that, the actual Final Account for the project was also collected.

After the data collection was finished, a study on the reason behind the mutual termination agreement of this project was done. The study focused on the series of event that happened on the project that leads to the termination, and was performed by referring to the contract used for the project. After the concluding the results, the next step was to compare the settlements based on literature and the actual condition for each reviewed aspects. From this, the key aspects of preparing a Final Account that need more attention were identified. After the key aspects were identifed, calculations were done to derive the impact from different settlements used for the sample project.

3. RESULTS AND DISCUSSION

The first thing achieved study is the settlements for each and the aspects to focus in. study was done from various sources, such as standard contracts, paper, and books. After the literature study was done, it was discovered that the settlements from each conditions and aspects was already arranged in the FIDIC contract [13]. Only one aspect, retention, uses a different source, because its definition was not clearly stated and might still cause a debate between both parties. After the settlements were obtained, the results were arranged in a table form and given to an expert to elicit responses and inputs. The expert's comments were only regarding the retention aspect. Based on literature, the retention that has been deducted belongs to the employer and will not be paid back to the contractor. The expert commented that there maybe an option to be considered, in which the retention is divided equally between the employer and the contractor. This input is based on common sense and common practices, and is not stated by any literature. So the initial settlements were used for the study.

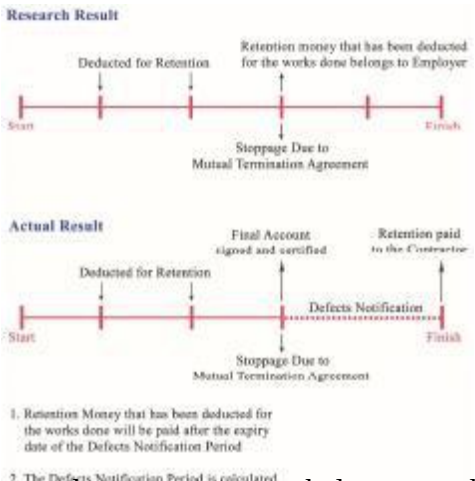
3.1.Key aspects and settlements

After getting results from the literature studies, the case study of the project was done by comparing the settlements of each aspect: between settlements made from literature studies to the actual settlements made on the project. After comparing the settlements of each aspect, the only difference between settlements was found in the retention aspect. The comparison of different settlements can be seen on Table 1.

Table 1. Settlements based on literature and actual condition

Condition	Settlements
Actual Condition	Retention with the value of 5% of the Contract Price is p d to the Contractor
Based on literatur condition	Retention that has been deducted belongs to the Employ

We can see the difference in settlement based on literature and the actual condition. The illustration of the comparison in Table 1 can be seen on Figure 1. From the table and the illustration, we can see that the difference between the settlements is whether the retention is paid



back to the contractor or belongs to the owner. The settlement based on literature states that the retention that has been deducted from the works done belongs to the employer. This is based on the definition of retention: retention is a deduction that was enacted by the employer to the payment for works done by the contractor. This deduction is to ensure the contractor is doing the works stated in the contract until fully completed [14]. Retention will be paid back to the contractor after the works completed 100%. In this case, the contractor has not complete the works 100% according to the contract, so the retention should belong to the employer. On the other hand, the actual settlement for this aspect is the retention will be paid back to the contractor after the defects notification period, which in this contract is stated to be 12 months. The defect notification period in a normal contract is calculated from the time when taking-over certificate is issued. In this case, the defect notification period is calculated from the signing of the Final Account document. The difference of 5% from the contract price is a significant value. The fact that the retention value was stated in percentage means the value will adjusted by the contract price. If the contract price is higher, the retention value will also get higher.

Apart from the difference in settlement, there is one more key aspect of preparing the Final Account. The other key aspect is claims. In the studied case, a mutual termination agreement should not happen in the first place. The cause of this termination is the late payment from the employer. Referring to FIDIC, there are clauses that state conditions for both parties to be deemed default. This late payment is one of those conditions in which default was done by the employer. In the actual contract used, there were no clauses that mentions employer's late payment, so when this happens, the employer is not at default. However, after discussing about the contractor's cash flow and other matters, both parties agreed to terminate the contract. This brings us to the claims aspect. Both retentions and claims are the key aspects of preparing the Final Account.

Fig. 1. Illustration of difference in settlement based on literature and actual condition

Figure 1 illustrates the difference of the settlements based on the timeline. In literature, the contract between employer and contractor ends and is settled at the time Final Account is made. The actual case study had a different timeline. Although the Final Account had been settled, the money due to the contractor that should has been paid is still deducted by retention. The retention was then paid when the defects notification period was over. So in the actual case study, the connection between the employer and the contractor did not end with the issue of the Final Account, but still continued until the end of defects notification period.

3.2.Accommodating key aspects of the Final Account

A standard contract such as FIDIC accommodates many possibilities and conditions that could happen in a construction project. The range of literature that was used in this study mainly refers to FIDIC.

Under a situation in which a standard contract can not or is preferred not

to be used, to avoid getting into trouble in the preparation of Final Account under a mutual termination agreement condition, the key aspects should be accommodated before the problem arise in the construction phase. The best time to accommodate the key aspects can be seen on Figure 2. From the figure, we can see that the time to accommodate the key aspects is in the pre-contract phase, specifically in the tender phase. In the tender phase, a tender document is given to the tenderers, one of which contains the conditions of contract. In the conditions of contract, the points that accommodate each key aspect should be stated in the clauses.

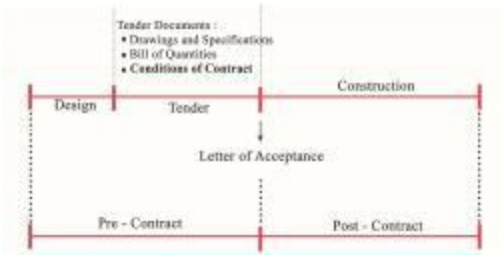


Fig. 2. Time to accommodate the key aspects in Final Account

The points to accommodate for each key aspect on the contract clauses are:

1. Retention

   In the retention clause of the conditions of the contract, the definition of retention should be clearly stated. A retention is a deduction that is enacted by the employer to the payment for works done by the contractor. This deduction is to ensure that the contractor is doing the works stated in the contract until fully completed. By this definition, if the works according to the contract has not been done completely, the retention that has been deducted from the payment belongs to the employer.

2. Claims

   For this aspect, the conditions for a default to happen should be completely stated in the default clause. The conditions should refer to standard contract clauses. The conditions in the standard contract is proven to accommodate many possibilities that could occur on a construction project.

4. CONCLUSIONS

A mutual termination agreement to end a construction contract can easily be avoided just by using international standard contracts such as FIDIC, JCT, and NEC [15]. A standard contract accommodates various types of conditions that may happen in a construction project. It also avoids a debate between parties when preparing the Final Account. Final Account is usually prepared and signed within 1 to 3 months. In the studied case, the process had already run for about 7 months counted from the start of preparation until the end of this research. By avoiding debate, a lot of time for preparing and processing the Final Account could be saved.

In a condition where a standard contract is not used, there are two key aspects that need more attention in preparing a contract document. Those two aspects are claims and retention. For claims, the termination clause in the conditions of contract should state various conditions that may occur in a construction project. Conditions and limitations should refer to a standard contract. For retention, the definition and terms about how retention can be paid to the contractor should be clearly stated. Retention is paid to the contractor after the works defined in the contract is completed.

A difference in settlements, whether in one or more aspects, can affect the result in a major way. The difference between literature and the actual settlement in the studied case only occured in one aspect: retention. This caused a 5% of the contract amount difference between literature and actual settlement. This is a huge amount, considering the fact that this only happened because of the insufficiency of the clause in conditions of contract to

regulate how to settle aspects in preparing the Final Account.

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SHOPPING CENTER IMPACT STUDY:

SOCIO-ECONOMIC POINT OF VIEW

CASE STUDY: LIPPO PURI MALL, WEST JAKARTA, INDONESIA

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Abstract

Shopping center has been spread out over Jakarta for the past 25 years, though Shopping Center moratorium had been published since 2014. A shopping center, especially the one with regional and super-regional scale which more than 100.000 sqm GFA, is indeed has a massive impact to the city especially the surroundings. This paper is trying to identify the economy impact from the existance of a shopping center, Lippo Puri Mall as the case study. Lippo Puri Mall is the second developed shopping center in Puri area, where there is already another shopping center with the same scale built in 1997. In order to enhance the goals, this paper is done by using both qualitative and quantitative methods. From the analysis, it can be seen that there are economic impacts from the existence of Lippo Puri Mall to its surroundings, which are the absorption of workforce from local residents, rental house or rental room growth, absorption of formal and informal business opportunities, as well as the increasing of local household economic income. As an indirect impact, the absorption of workforce is not significant, however the multiplier effect that is obtained by the local residents is exquisite. Many houses have been developed into a local restaurant, rental room or house, and rental land for vehicle parking space. In conclusion from the paper is a shopping center development could cause good impact for its surrounding, especially for economic growth that hopefully will strengthen the local resident's buying power.

Keywords: shopping center, socio-economic impact, multiplier effect, employee

1. INTRODUCTION

For the past 25 years, shopping center has been overpopulated in Jakarta, with total over than 2.7 mio of rentable area (in 2016) and over than 1 mio of rentable area (in the future)[1]. Although at the end of 2011 the government decided to make a moratorium for shopping center permit larger than 5,000 sqm of Gross Floor Area (GFA), but it seems many permit has been accomplished by the developer before the moratorium applied and built it in the later future. Some other interesting thing about shopping center is that aglomeration theory seems to applied on them, which is proven by forming shopping center clusters[2] and not only regional scale but also super regional.

The appearance of big scale shopping center will surely affect its surrounding, hence social and economic impact analysis is cumpolsary for the opening of a new shopping center that is stated in the Trade Ministerial Regulation Number 70/2013. What is more interesting is not only a big shopping center with regional or super regional scale, but a store located inside of the shopping center also obligue to the regulation. Social Impact Assessment (SIA) is now conceived as being the process of identifying and managing the social issues of project development, and includes the effective engagement of affected communities in participatory processes of identification, assessment and management of social impacts[3]. The goal of doing a social impact assessment is to comprehend a situation that will probably occur because of something new, wheter positive or negative impact[4].

Based on the regulation can be stated that the government actually aware that there are impacts that will occur in the surrounding of a new big development, such as shopping center. Based on Urban Land Institute on Shopping Center Development Handbook (1999) shopping center is defined as *"..shopping centre is a group of architecturally unified commercial establishments built on a site that is planned, developed, owned, and managed as an operating unit related by its location, size, and type of shops to the trade area that it serves.."* meanwhile International Council of Shopping Center define shopping center as "*a group of retail and other commercial establishments that is planned, developed, owned and managed as a single property, typically with on-site parking provided. The center's size and orientation are generally determined by the market characteristics of the trade area served by the center".*

Based on Keng Neo (2005)[5] a regional shopping center will have GFA around 40,000 – 100,000 sqm while super regional shopping center will have GFA more than 100,000 sqm. Building with this size is absolutely must have an impact to the surrounding, can it be physically, socially, or economically. Lippo Puri Mall, the second developed shopping center in Puri Area, located in Puri, central of West Jakarta (Sentra Primer Barat)[6] is a super regional shopping center with total GFA around 300,000 sqm. This paper is trying to analyze what cause will likely to occur

[1] Based on survey done by Urban Planning and Real Estate Department, 2016
[2] Spatial Transformation – cooperation, competitions, or canibalism; join workshop between Urban Planning and Real Estate Department, Universitas Tarumanagara, Jakarta and Department of Architecture, Universität Karlsruhe, Germany, 2006
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[6] Based on DKI Jakarta Spatial Plan 2010-2030

from the establishment of Lippo Puri Mall to the surrounding area, that will be measured by the occurance of food stalls, local restaurants, rental house/rental room, and rental parking lots.

Therefore the real question is if the city is ready with the occurance of a big scale development? We usually see things one sidedly, barely not see the other side, which is very rare to consider. If it is a development of a shopping center, we only see from the real estate or market or investment point of view, ended up forgetting that we have to prepare facilities for everyone that make this big shopping center exist and running as it is. That is the people. That is the workforce.

2. RESEARCH METHOD

This study will be done by both qualitative and quantitative approach methods, which data will be gathered with these following methods:

a. Questionnaire was given to 30 workers in Lippo Puri Mall, which picked randomly. The goals of this questionnaire are to get brief information about the worker's profile and spending pattern. The distribution of the questionnaire was done in local restaurants or food stalls located around Lippo Puri Mall on the weekday and weekend.
b. In depth interview to some local citizens who are doing business around Lippo Puri Mall (open a food stall or local restaurant, owner of rental houses or rental rooms, owner of the parking lots, etc.). For each type of business we tried to find 5 people to be interviewed.
c. Conduct a primary survey in order to identify and map economic activities around Lippo Puri Mall.

Those data will be analyze using descriptive and comparison methods running by SPSS 17.0 and Microsoft Excel 2010.

3. RESULTS AND DISCUSSION

The writers tried to divide the discussion into 4 parts, which are physical characteristics (based on primary survey), socio-economic condition of local citizens (based on secondary data and interviewed process), workers' profile (based on questionnare), and socio-economic impact.

3.1.Physical Characteristics

Puri Indah or Puri Area is a well established residential area which is intended for upper middle class. It was a residential area with one regional shopping center (Puri Indah Mall) and could accessed only from Jl. Kembangan Baru. Outer Ring Road that crosses Puri Indah Area unfold business possibilities and commercial started to flourish once more, particularly on the side lines of Outer Ring Road. When Lippo Group started to penetrate Puri market with their megascale project known as St. Morritz Development (a superblock development which claimed to have 11 in-one functions, one of them is Lippo Mall Puri), the area become much more crowded and perhaps Puri as CBD in West Jakarta is not a gimmick anymore.

Figure 1. Existing Land Use in Lippo Puri Mall Area

Source: Primary Field Survey, 2016

As mentioned in the introduction, Lippo Mall Puri is a super regional shopping center with more than 200.000 sqm of GFA, consists of 5 retail spaces and located in the center of Jakarta CBD. From the figure above, the residential is a dominant function by area, and followed by Commercial around center, is dominated by shopping center (regional shopping mall), stand alone retail, neighborhood center), showroom, and fashion bank, (restaurant, furniture shop, travel salon, etc). Meanwhile residential area though vertical house with fairly diverse class is dominating the (apartment) started to rise (St.Moritz Apartment, The Windsor, Puri Garden Apartment, Puri Park View, The Nest and Wesling Kedoya Apartment). In accordance, international education facilities as the complement for residential area also found in Puri (IPEKA, Springfield, Tunas Muda, and Global Sevilla).

From a city point of view, the growth of commercial, city scale facilities, good quality apartments and residential area of course show a good sign of economical condition and signalling Puri to become CBD of West Jakarta. However, a good economic condition must be followed by a good quality of human power who support and ensure the sustainability of an establish living condition.

3.2.Socio-Economic Condition

Lippo Puri Mall administratively located in Kembangan District, West Jakarta. Within 1 Km radius from Lippo Puri Mall, there are 3 sub-districts: Kembangan Selatan, Kembangan Utara, and Meruya Utara. This table below will show the demographic profile of the citizen in those district and 3 sub-districts.

Table 1. Number of Population Within 1 Km From Lippo Puri Mall, 2015

No	Component	Kembangan Utara S	Kembangan Selatan	Meruya Utara S	Ke
1	Total Area (Ha)	365	361	433	
2	Number of Residents	60.02	28.91	46.03	2
	a. Man (person)	30.71	14.50	23.32	1
	b. Woman (person)	29.30	14.40	22.71	1
3	Density (person/Ha)	164,4 (mediu	80,09 (low	106,3 (low	
	Population	2,29%	0,90%	0,34%	

2015

Source: Indonesia Statistical Bureau (BPS)

From the table above, the number of density shows that residential dominate the function within the area, however it was the data from 2015 while Lippo Mall Puri operated in the late of 2014. Another perspective, with approval given to Lippo Puri Mall, in return the government expected there are economic impacts to the society, such as new jobs availibility, the utilization of local expertise and small medium enterprises. Based on Department of Population and Civil Registration, around 69,86% of the citizen in Kembangan District is in productive age, with more than 60% of the population are well educated (education level higher than high school), thus open the opportunity for local people to be hired. Employment absorption rate in West Jakarta also indicate that more than 80% of the manpower available are absorbed. With good quality and history of the employment in West Jakarta, the local government was hoping that local manpower also can absorbed well for Lippo Puri Mall, which consists of more than 50 tenants.

3.3.Worker's Profile

Based on the questionnaire, spread in surround food stall, there were 30 respondents who work in Lippo Puri Mall. The profile of the respondents mostly (57%) are women, mostly young age, which 73% between 21-25 years old meanwhile only 3% of the respondents who are above 30 years old. 93% of the respondents are working in fashion line. Meanwhile most of the respondents are quite well educated (87% are high school graduates) while the rest are higher than high school (diploma and bachelor). This condition is compatible with the minimum requirements of education level for workers in shopping mall.

The questionnaire also presented about the worker's area of residences. Where 63% of the respondents are from West Jakarta, 13% from North Jakarta and the rest are from Tangerang. However, this is in accordance with the Trade Ministerial Regulation which stated that most of the workers in a shopping center has come from the same area. The questionnaire also asked whether there is a change of residence before and after the workers work in Lippo Puri Mall and evidently they did not. Furthermore, it is known that monthly income of the workers mostly 3.5-4.5 million Rupiah (47%) and 42% are below 3.5 million Rupiah and the rest are between 4.5-5.5 million Rupiah.

Based on explanation above, it is discovered that so far a shopping center is giving a good impact economically to local residents.

3.4.Socio-Economic Impact

Socio-economic impact is measured by identify rental house or rental room growth, food stall and rental vacant land for motorcycle parking lot.

a. Rental House or Rental Room

A residence is an important facility that is needed for employees coming from another city or living in a relatively far from the workplace. Besides that, Jakarta which is known as congestion city, cause people preferably stay in a place that is close to their workplace, hence in a place with high economical magnetism, appeared rental house or rental room (kost). Map below indicates the location of rental house or rental room near Lippo Puri Mall.

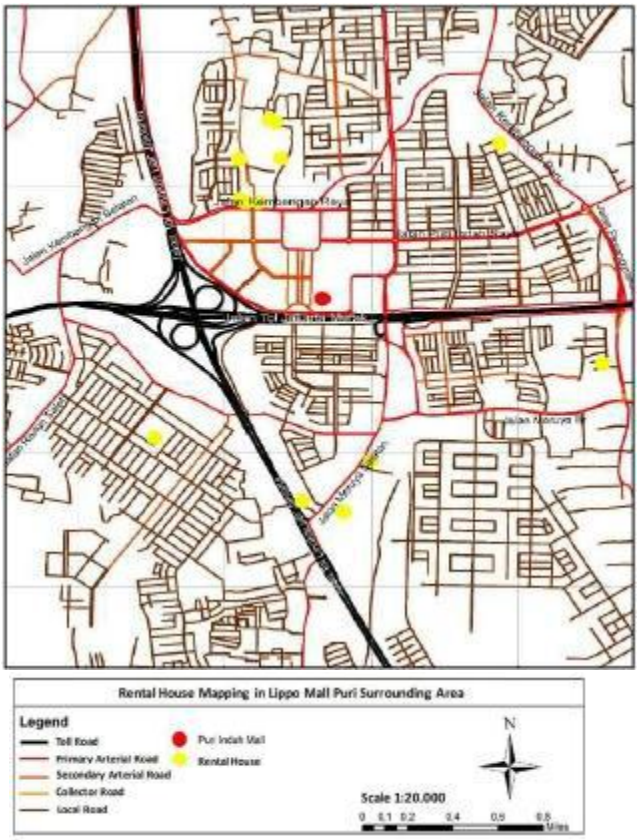

Figure 2. Distribution of Rental House and Retal Room Within 1 Km Radius from Lippo Puri Mall, 2016

Source: Primary Field Survey, 2016

From map above, can be seen the distribution of rental house or rental room around Lippo Puri Mall are distributed in an unorganized residential area. From questionnaire is known that only 10% of the respondents who were living in a rental house or rental room, while the 90% were

staying in their own house (or family owned).

Table 2. Samples of Rental House or Rental Room Characteristic Within 1 Km Radius from Lippo Puri Mall

Name of Rental Room or Rental House	Rental Room in Jalan Asem	Rental Room in Jalan Manunggal 40	Rental Room in Jl. Teknologi	Rental House in Jl. H	Rental House in Jl. Raya Kembangan	Rental House in Jl. Bugis Utama
Number of Floor	2	2	2	1	2	2
Number of Rooms	10	6	6	6	6	40
Room Size	3x2,5	3x3	3x4	10x3,5	3x4	7x3
Road Classification	Local	Local	Local	Local	Local	Local
Occupant Characteristic	Employee	Employee	Employee	Married Employee	Employee	Married Employee
Monthly Rate (IDR)	650.000	750.000,-	1.200.000,- until 1.500.000	2.000.000	800.000	0.000,-

good impact, which indicates the economic growth opportunities, since the food stall usually owned by local residents. However, when uncontrollable situation occur (such as

From figure and table above, can be seen that rental house or rental room are one of the cause that arise because of a shopping center development. As for the monthly cost for residence that has to be paid were around 500.000 – 1.500.000. This can be a additional burden for the employee and also for the city. The housing functional conversion happened in the area, might be out of control and out of local government calculation, which is not well-balanced by the growth of infrastructures and facilities.

b. Food Stall

Food stall is one of the most important facility that is needed in order to support the sustainability of a development, including a shopping center. The food stall here is the place for the employee to eat and have a rest. Unfortunatelly, not every shopping center provide a canteen for their employees or although usually they provide canteen but in incompatible size. Thus, the accretion of food stalls started as one of the impact. Actually the growth of food stalls around a shopping center also can be seen as

Source: Primary Field Survey, 2016

growing uncontrolably or located in

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No	Places For Employee to Eat	Frequency (in %)				
		Never	1-2x /months	1x per week	2-3x per week	Everyday
1	Food Stall around Lippo Puri Mall	40	27	7	16	**10**
2	Restaurant Inside Lippo Puri Mall	57	30	3	10	0
3	Employees' Canteen Inside Lippo Puri Mall	3	13	0	13	**71**
4	Lunch Box	34	3	33	13	**17**
5	Catering	100	0	0	0	0

Source: Questionnaire, 2016

Radius From Lippo Puri Mall

Food Stall Name	Pondok Makan Puri Kembangan	Gudeg Jogja
Location	Jalan Raya Kembangan	Jalan Raden Saleh
Road Classification	Collector Road	Arterial Road
Consumer Characteristic	Local residents and employees around	Local residents and employees around
Operational Hour	09.00 – 23.00	10.00 – 22.00
Food Price (IDR)	15.000 – 75.000	10.000 – 50.000

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Mall. If we see further through the map above, there were not much food stalls located right beside the mall, instead within the residential area. This table below is showing the condition of food stall around Lippo Puri Mall.

Table 4. Samples of Food Stall Within 1 Km

Information:

- Green row shows direct impact for local residents
- Red rows show possibility of direct impact for local residents
- Purple rows show no direct impact for local residents

From the table above, can be seen that employee of Lippo Puri Mall are actually using the facility from the mall management. This could be due to the mall management concerns or there are not much food stalls around Lippo Puri

From the figure and table 4 above, can be seen that food stall is not the part of the impact from a shopping center development (in this case in Lippo Puri Mall), but rather because of the existence of residential area. Since Puri is an established residential area, which has local regulation that forbid the residential change of usage into commercial and has a very specific function for every piece of their land.

c. Parking Lot

Type of transportation (or vehicle) used by employee could give an impact economically for the surrounding, which could be the possibility of business opportunity such as parking lot. From an observation, the writer can tell that parking lot is a good business that usually grows around a shopping center, especially with limited motorcycle parking space. The usage of vacant land as parking lot momentarily, could give an impact socially to the society. The environment could change: become denser, uncomfortable with the high frequency of motorcycle passing by, more polluted, etc. Thus, we need to see further what type of transportation

Source: Primary Field Survey, 2016

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mode that is used by the employees of Lippo Puri Mall.

Based on the questionnaire, 73% of the respondents were using private vehicle for everyday work, while the other 27% were using public transportation. Meanwhile, within the 73%, 92,7% of them parked their vehicle outside of the mall (informal or local parking spaces). With this, actually there is a good impact economically to the local residents also a win-win solution for the employee (cheaper parking price), the owner of the land (from land rent), and also the management of the parking lot (from parking lot rent) but not for the city. Every development arises in a city is a double-edged knife. At one point could give an advantage for some group and in the same time could give a disadvantage for another.

Illegal parking lot is actually good, if arranged by local government. But if an illegal parking lot controlled by local mafia could cause another issue because usually they also utilize road and pedestrian for parking lot (on peak hour). There are 2 illegal parking lots located very close to Lippo Puri Mall, which are located in Jl. Puri Harum 1 and Puri Harum 2 which have 5.000 IDR parking rent fee for motorcycle and 10.000 IDR for car. Operational hour of the parking lot also follows the shopping center operational hour.

4. CONCLUSIONS

Based on interviewed done to one of fashion retail branded in Jakarta, that usually open their retail shop in the shopping center, 1 employee is hired for every 20-25 sqm of retail rental space (Net Leaseable Area – for shopping center around 60% of GFA). With this ratio, for Lippo Puri Mall will be needed around 7.200 employees. That is the number of sales promotion girl and sales promotion boy that are needed for 12-hour operational assumption, while security guard, parking employee, cleaning service and other outsources are not included yet in the formula. Assumed the out sources needed for every day are 30% of total employee (will be 2.160 persons) so it will be around 9.360 employees everyday working in a shopping center gradually.

The research shows that there are positive impact for both social and economic condition of local residents. Which can be shown from the local economic enhancement surround (rental house, rental parking lot, food stalls, etc). Meanwhile, positive social impact can be seen from the absorption number of workers from West Jakarta (surrounding area where Lippo Puri Mall is located).

Based on the data and analysis above, a shopping center actually give a variety of impact economically and socially to the surrounding, both in a good and bad impact. But, if we analyze further, especially when we know the number of employees that have to be served also, other questions started to arise: who are going to served them (food, place to stay, transportation, etc.)? How does the city support their everyday work and life? How the local government is dealing with the regulation that assured their prosperity? Does the mall management think about the employees? These questions should be answered by doing further research on relation between shopping center management and their employees. And hopefully could give a brief information for local government and shopping center management in order to enhance both the city and the citizens into a better life.

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THE ENDURANCE OF *PURI SAREN UBUD'S* CULTURAL SPACES A HERITAGE AREA IN GIANYAR CITY

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Abstract

Puri Saren Ubud tourist area is built in the central area of the kingdom. The function of space in this region can be divided into three parts; the royal space which is the center of power, residential space that serves as a residence both for indigenous people and immigrants and economic activities, as well as public space as a space of cultural activity. The existence of optimization *Puri Saren Ubud* as a form of Gianyar city tourism cause some spaces has undergone physical development such as the construction of hotels, art shops, and restaurants so it eliminates the essential functions of space as a cultural space. The purpose of this research is to analyze the form of a typology of spatial and architectural design of Puri Saren Ubud area as heritage area of Gianyar City and the function of the space to the social activity at this time. The method used is a mixed method that combines qualitative and quantitative research analysis. The results of the study explained that due to the development of Saren Ubud castle as a tourist area caused the growth of facilities, following the pattern of cultural space *Puri Saren Agung* causing the pattern of cultural space experiencing disorientation to the concept of culture. Based on community perception in tourism development of *Puri Saren Ubud*, environmental harmony indicator is the indicator that gets the most attention by visitors with score 4.0.

Keywords: *Urban tourism, Typology of spatial, Community perception*

Table 1.1 The Tourism Accommodations In Ubud

Accommodation(s)	Total of Accommodation(s)	Category
Hotel	35	Star Hotel / Budget Hotel
Home Stay	207	Cottage
Art Shop	132	Art Market
Restaurant	43	Restaurant

1. INTRODUCTION

The process of morphological design of a region is a series of community activities that exist in the region. People who carry out life will continuously need a space to arrange all their activities, as a physical space need. Community life behavior is the extraction of various life activities, which all of those required a place to bridge the activity, both in the physical and non-physical form. Bali Island is a famous tourist destination with its cultural uniqueness. The uniqueness of Balinese culture is reflected in the life of its religious society. It can be seen from the lifestyle of Bali's people who always connect their life with some religious ceremonies at the temple or their houses. Besides the unique lifestyle of its people, the architecture of the holy temple is always interesting. Therefore, many tourists are interested in coming to visit the temple (*Pura* and *Puri*).

The cultural tourism industry which develops in any tourism sectors, such as hotel, restaurant, transportation, art performance, souvenirs, and others. Those things are the factors of the *Puri Ubud* tourism area's development. This industrialization process of *Puri Ubud* known as the tourism revitalization. As shown by Ubud's community who always doing a creative innovation to develop its tourism as their area's characteristic. It can be seen by the development of many new tourism products with its uniqueness to attract the visitors. One of the new tourism products named *Wisata Puri*. Ubud is one of tourism destination with a prosperous tourism potential and *Puri* is one of it. Actually, *Puri* is a place for a knight who holds the government to live. In these days, with the creativity in the tourism development, *Puri* being the main attraction for the tourist, one of the famous *Puri* is *Puri Saren Ubud*.

Source: *Tourism Agency Gianyar Regency*, 2015

The development of *Puri Ubud* as a tourism area is because the community realizes that the tourist is delighted to visit the castle or *Puri* to see the heritage of the region. On the other hand, the revitalization and the development of *Puri* as tourism area affect the pattern and regional space in Ubud itself, especially to some of the *Puri*'s heritage areas. The purpose of this research is to analyze the shape of space typology and architectural design of *Puri Saren Ubud* as heritage area of Gianyar City and the function of the space to the community activity in it.

2. LITERATURE REVIEW

2.1. Cultural Space Typology as a City

The traditional city has a form that different with the modern city. The difference reveals the way society of the are live. There is similarity of demographic and ecologic pattern in almost all cities through its local traditions (Philips, E. etc 1981 cited by Zhan, 1999). Structure of traditional cities depends on some factors, such as security and unity, limitation of space, technology, and mobility, rigid social structure, and slow development.

Traditional city focuses on symbolic and public building structures, as well as specific places. Such symbol is a palace, religious building, fortress, etc. Even though traditional cities change during its development, the changes usually could adjust its ancient structure while the

difference is quite high compared to the new structure, depending on its own development.

This theory is known as 'the religious-symbolic thesis' that the main factor of changes from villages to cities is culture expressed through symbolic-religious. A non-physical factor or also called non-material factor is very important in city development. Traditional city towards its origin and development has become very complicated because it involves symbolic factor together with physical which often used for an inherent specific meaning.

2.2. Tourism Revitalization

Revitalization is an art of architecture application with various creativity achievements to regulate and arrange something with norms of architecture and development process gradually and measured. It aims to achieve a beautiful and comfortable place together with recreation activities, education, culture, and environmental preservation. Revitalization that includes conservation and preservation is an effort of city planning to preserve tangible cultural heritage that has rich history value and architectural aesthetic. In other words, it is environmental preservation so that it will keep its original condition and prevent from destruction. The effort usually includes restoration, rehabilitation, and/or reconstruction which depends on its environmental condition. revitalization is divided into macro and micro. Revitalization process includes the restoration of the physical aspect, economical aspect, and social aspect.

3. RESEARCH METHOD

This research used mix methods that combined the qualitative and quantitative research analysis. The quantitative analysis used statistical objective through the scientific calculation of the sample of community members who lived around and visitors of the *Puri Saren Ubud* to identify the perception of that area. This statistical methods use direct observation and interview 40 random respondents. The qualitative method was used to analyze the space typology and also its traditional architectural design of *Puri Saren Ubud*, it conducts the analysis of indoor and outdoor of *Puri Saren Ubud*'s space utilization.

4. RESULT AND DISCUSSION

4.1. *Puri Ubud* Culture as a City

Puri Ubud is located in the center of Ubud City which also the center of a kingdom that is part of Gianyar kingdom a long time ago. Based on its location, *Puri Ubud* is located in the crossroad of *Kaja-Kangin* or means Northeast. Currently, there are places with different functions surrounding it, such as market or *wantilan*. Complex *Puri* is divided into 12 different areas for the embodiment of *Nawa Sanga* concept. The function of that *Puri* is as a center of government activities of the kingdom in Bali. Other functions are center of cultural activities, center of religious activities and learning, and cultural and religious ceremonies. However, *Puri Ubud* nowadays experiences changes because of revitalization activities and development of "*Puri Tourism*" so that specific spaces around puri is built with different tourism accommodations. Then, it gives impacts to cultural space in the center of Ubud City. Those tourism accommodations are: homestay; restaurant; art shop; moneychanger; bank; and stores. *Puri Saren Ubud*'s area consists of a center of the kingdom, which has land function for cultural purposes. The function of that area is divided into three areas, which are the elite or the center of commad, dwelling area which has functioned as settlements for the ethnics and society, and public facilities. This differentiation is to divide land from kingdom area, residential area and, public facilities which are the cultural space of *Puri Saren Agung*, hierarchically it gives influence to the formation of urban pattern in Ubud. Figure 4.1 below explains the details of the area division.

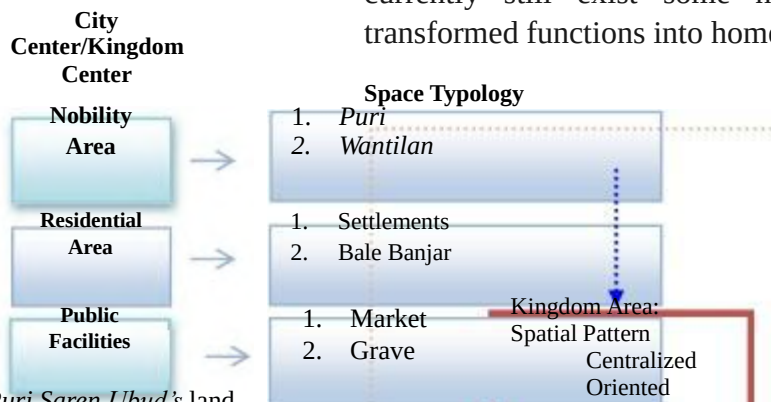


Figure 4.1 Division of *Puri Saren Ubud's* land function

Based on the division of *Puri* area, each site has a meaning that the nobility area has a *Puri* as a King's kingdom since many years ago until today, and wantilan is a meeting place for King's family. The residential area is a community settlement which spread in *Puri* area, complete with a Bale Banjar. In the downstream area, there are public facilities such as market and grave. More details can be seen in Figure 4.2 below.

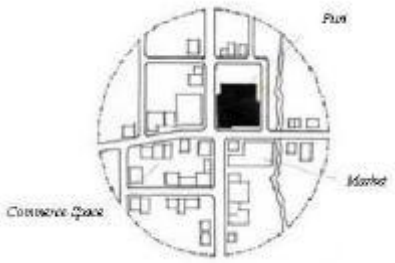
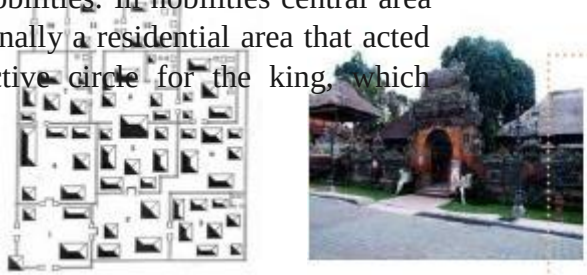


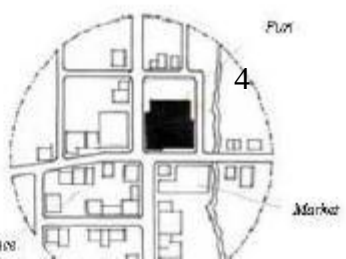
Figure 4.2 *Puri Saren Ubud Area Plan*

If we observed based on the pattern of space development, the old settlement elements became settlement unit in the City Center of Ubud and its surrounding areas that follow the artifacts as a main element of the settlement. The main element is royal palace called castle, which was originally part of the central or core power of high-ranked nobilities. In nobilities central area was originally a residential area that acted as protective circle for the king, which currently still exist some houses that transformed functions into homestays.

Figure 4.3 *Puri area as a Spatial Pattern and Space Structure*
Source: *Secondary Data Analysis, 2017*

Based on mapping concept of *Puri Saren Ubud*, can be explained that cultural values of *Puri Saren Ubud* affects the space structure which is devided to "Nine" zone called *Nawa Sanga / Sanga Mandala*. The artifacts physically showed continuity in "bipolar concept" (front-back sides). The life system people in Ubud is communal which is giving priority to family generation first. The life system in *Puri Saren Ubud* shows communal with emphasizing the happiness and the sadness, they always cooperate. For the example: *Ngeepin*, *Sekaa Memula*, funeral ceremony, construct the house, and religious ceremony. Beside communal pattern, *Puri Saren Agung* have incremental pattern; that pattern grid housing which is sorted by social status. This concept based on a planning from regulation agreement called *Bali Aga* architecture, which used until today to manage people's relationship around the *Puri.* Related to housing area in *Puri* circle, building structure and pattern are affected by cultural values of *Puri Saren Ubud* existence. Based on space typology, housing concept, and public facilities at *Puri* can be seen in picture.





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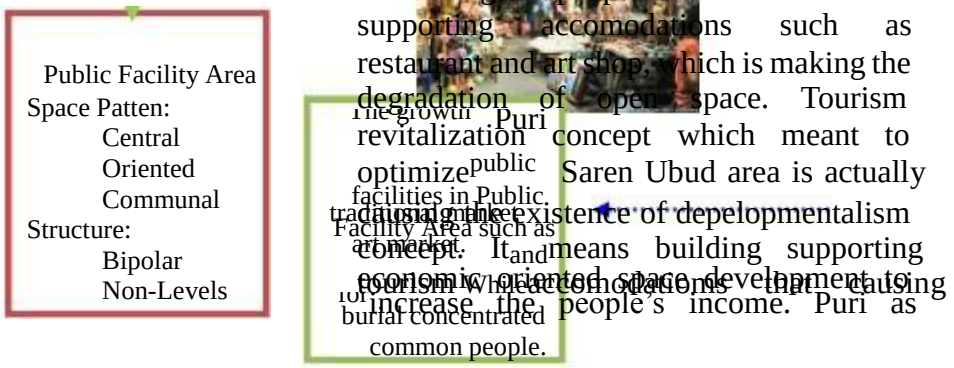


Figure 4.4 *Public Facility Area BasedStructure and Space Pattern*
Source: *Secondary Data Analysis, 2017*

Many public facilities and large lot area growing to become residence unit in the city center. These public facilities are traditional market, art market, and another space-art. Public facilities are non-strata in the space pattern concept. Public facilities like traditional market, art market, and others provided for all people regardless their strata.

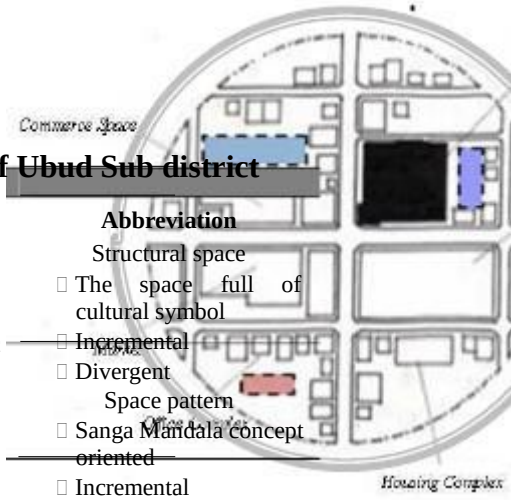
Table 4.1 Pattern Value and Structural Space in City Space of Ubud Sub district

Space substance	Traditional form	Existence form	Abbreviation
Structural space	City center Levels Whole	Bipolar City center Non-Levels Religion / Cultural Symbolic Divergent	Structural space The space full of cultural symbol Incremental Divergent
Space pattern	City center Oriented Communal	City center Oriented Communal	Space pattern Sanga Mandala concept oriented Incremental

Source: *Secondary Data Analysis, 2017*

4.2 Tourism Revitalization and Existence of *Puri Saren Ubud* Cultural Space

The rapid tourism expansion in Bali, especially in Ubud Sub-distric affects any life aspect, particularly economically. It happened along with increasing visitors coming to this place, which followed by the increasing tourism accommodations such as hotel, homestay, art shop, restaurant, etc. Those accommodations increases people's income while decreases the environment quality. The increasing number of hotels and homestay in the neighborhood is motivating its people to create the other supporting accomodations such as restaurant and art shop, which is making the degradation of open space. Tourism revitalization concept which meant to optimize Puri Saren Ubud area is actually the existence of depelopmentalism concept. It means building supporting economic oriented space development to increase the people's income. Puri as cultural space has cultural value for people has experienced socio-cultural changes. Some of those changes are development of tourism accommodation and facilities around *Puri Saren Ubud*, which destined for tourism area. The development can spread outside or inside cultural space area. That process can be seen in the picture below.



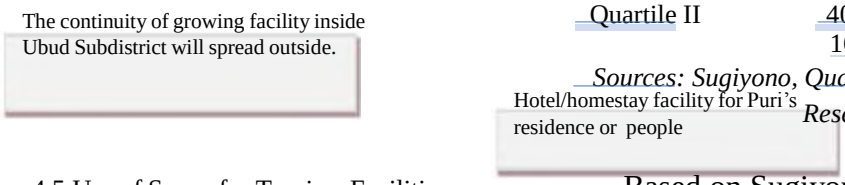


Figure 4.5 Use of Space for Tourism Facilities
Source: *Secondary Data Analysis, 2017*

Based on that condition, the tourism development concept causes disoriented to the growing facilities. When referred to economic development, tourism accommodations such as hotels, homestay, art shop, and restaurant; does increases income for people and creating more open job which gives positive impact to the people in Ubud Sub-district. However, it causes the allocated space for traditional architecture pattern becoming semi-traditional form. Based on this, in order to know the people's perception and visitor's rating towards the development of *Puri Saren Ubud area*, the authors did observation and interview as follows.

Table 4.2 Grading criteria for the respondents

Statement	Score
Very Good	5
Good	4
Pretty good	3
Not Good	2
Very Bad	1

Sources: Sugiyono, Qualitative and Quantitative Research

This model of analysis explains the respondent's statement by describing it through the use of tables, and the measurement using a Likert scale. Table 4.3 below shown the total score of all respondents:

Table 4.3.Total score of the respondents

Information	Score
Maximal	40 (respondents) x 5 = 200
Minimal	40 (respondents) x 1 = 40
Median	40 (respondents) x 3 = 120
Quartile I	40 (respondents) x 2 = 80
Quartile II	40 (respondents) x 4 = 160

Sources: Sugiyono, Qualitative and Quantitative Research

Based on Sugiyono (2008), the number of scores was analyzed using several approaches to determine how much the level of community participation:

a. If Quartile III < Score< Maximum; means very positive. (active community participation).
b. If Median < Score<Quartile III; means positive. (community perception is considered quite active).
c. If Quartile I < Score< Median; means negative (Community perception is considered less active).
d. If Minimal < Score<Quartile I; means very negative (Community perception is considered inactive).

If projected, the level of community perception can be calculated based on the following formula:

$$\text{Participation Rate} = \frac{\quad}{\quad} \times 100 \qquad (1)$$

This section will be measured on the level of community perception based on the benchmarks that exist in each indicator. Obtained data then processed using Microsoft Excel, to facilitate data processing. Table 4.4 below shows the explanation of it.

Table 4.4
People Perception about Aerial Development of Puri Saren Ubud, Gianyar

No	INDICATOR	Total (%)	Score	Information
1.	Region	139	3.475	Good
2.	Image Spatial	120	3.000	Pretty good
3.	Integration Regional	122	3.050	Pretty good
4.	Planning **Evironmental Harmonization**	159	3.975	Good
5.	Public Places Availability	139	3.475	Good
6.	Innovation	123	3.075	Pretty good
7.	Area Security	145	3.625	Good
8.	Waste Management	116	2.900	Pretty good
9.	Public Space Existance	124	3.263	Pretty good
10.	Infrastructure service	113	2.825	Pretty good
	Total	***130***		***Pretty good***

Source: *Secondary Data Analysis*, 2017

Source: *Secondary Data Analysis*, 2017

Based on table analysis above, environment harmony is the most attractive indicator for visitors. It is because *Puri Saren Ubud* still concerns about surroundings. However, waste management has not been concerned yet because there is only few developments, also hotels and restaurants that contributes to waste are anticipated. Meanwhile, the infrastructure should be concerned such as road condition, pedestrian, and green area that can support *Puri Saren Ubud* as heritage area. People perception can be seen from overall score, which in diagram shows overall score is 130%. The score is existed between median and 3rd quarter or in a positive area which in fine

$$\text{Participation Levels} = \frac{}{100\%} \times 130/200 \times 10$$

$$\text{Participation Levels} = = 65\ \%$$

It shows that criteria to develop *Puri Saren Ubud* aerial as tourism area is positive enough to support sustaining cultural space.

5. CONCLUSION

Heritage's value is a philosophy factor and a custom with wide meaning which includes the culture of the community itself. This factor could affect the shape of spatial pattern. Community in a cultural space owned a high historical and philosophy value to keep their area sustainable. Therefore, it could influence towards the development of spatial pattern through particular facilities.

The spatial pattern influenced by the cultural elements is actually an advantage for the people of Ubud Sub-district through owned the cultural space Puri Saren Ubud. It gives impact to the local community activities through local wisdom. Some of the wisdom include: 1. Rural spatial pattern is directed to strengthen social community system and the economic ability of rural; 2. Culture such as sculptures and handicradt then by itself formed specific groups for community empowerment, especially for women.

6. ACKNOWLEDGMENTS

Many thanks to the Tourism Office for the data and participation and also for our relatives who are involved to help this from the beginning. We wish to give away the benefits of this study for the heritage tourism and ourselves, either nowadays or in the future.

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CREATING EDUCATIONAL GREEN AREA THROUGH HYDROPONIC-AQUAPONIC SYSTEM (OBJECT OF STUDY: SD-SMK PERTI, GROGOL)

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Abstract:

Global Warming has been the highlighted environmental issue throughout the year. As a result, Green Area is created in order to overcome the issue. For human being, the existence of Green Area is also plays an important role for physical and mental development. Alongside with the stead of Green Area, School is also crucial on gaining physical and mental development. Therefore, a school should have Green Area in order to support students' activities for better quality of education. With the support of Directorate of Research and Community Service Tarumanagara University, a community service project is formed to create one green area in a school located nearby. Perti School, which consist of Elementary School (SD) and Vocational Highschool (SMK) in one school building area of Grogol is chosen as the object of the study. The school is situated in an area with high levels of pollution and lack of vegetations, so that this project is expected to make the school environment enable to provide fresh air (oxygen), filter out the dust, beautify the environment, become rainfall infiltration area, and prevent flood on its own. The main obstacle of the project is the lack of land that can be use to create green area. Thus, hydroponic-aquaponic system is then applied. This article is using qualitative method with descriptive details. In depth interviews and direct observations are conducted in order to collect the data needed. This project aimed as a part of real contribution to society, as well as to educate the students that even with limited land, plant cultivation can still be done, and this will also train skills and enhance cooperation between school students and colleagues.

***Keywords**: Aquaponic, Educational Green Area, Hydroponic, School*

1. INTRODUCTION

Studies have proven that green spaces can lead to a better physical and mental development (Dadvand, et.al, 2015) [1]. Green area is a zone that is specifically used for planting, either in the form of plants that are directly planted in the ground or through planting media. School is an institution that related to education. Therefore, the green area at school should more or less connected to educational activities. The green area must not only a 'passive' area full of vegetation, but also become 'educative' area where the students can learn and gaining knowledge about plantations as well as gaining social skill through teamwork activities by interacting with another schoolmates. Educational green area aims to educate students that even with limited land, permanent crop cultivation can be done with several benefits, such as: crops harvesting (vegetables and fruits), fish harvesting, creating shade shelter, and might also adding aesthetic value of the school.

One of the planting medium applied in the planning of educational green area is the hydroponic system. Hydroponic means the cultivation of plants that utilize water without using soil as a planting medium or in short, soilless(Wibowo, 2015)[2]. The technique cultivation of hydroponic is emphasising the fulfillment of nutritional needs for plants, or the familiar term: 'landless farming' (Lingga, 1984)[3].

According to Simplyhydro (2008), there is a hydroponic system that does not require nutrients from outside (other source), because it can be obtained from fish nutrition. This simple system of hydroponic is called Aquaponic [4]. This aquaponic system is then applied to the project.

The targets and objectives of 'Educational Green Area' project in SD and SMK Perti is to improve and maximize the function of green area at school with educational concept. All of the school components are expected to participate in this projects, so that the maximum result is achieved.

2. METHODS

SD and SMK Perti is an Islamic private school located at Jalan Tawakal Raya No.99 RT 007/016, Tomang, Grogol Petamburan, West Jakarta. This school sited behind Tarumanagara University and lies in densely populated area (figure 1). This school situated in a very crowded traffic urban area with lack of vegetations.

Fig.1. Location of SD dan SMK Islam Perti
(Edited Source: https://www.google.co.id/maps)

Open-air green areas of SD and SMK Perti spread around the sport field in the school's courtyard. From the survey conducted, it is found out that even though some Syzygium oleanas are planted throughout the green area, the school's circumstances still felt stale, hot, and humid especially around musholla that has direct sun exposure. With minimum amount of plantations, the function of green area in this school is not yet optimum.

2.1 Determining Green Area Location

The initial phase of planning starts from coordination with the school (Principal of SD and SMK Perti) to determine the location of the green area to be repaired. After site review and discussion were held, the location of the green area is determined. It was an area located in the west side of the field adjacent directly to SMK Perti's classrooms.

2.2 Design and Planning

The hydroponics system that had chosen to be applied to this project is the aquaponic system. The reason is because the aquaponic system is a hydroponic system that does not require nutrients from other source. The nutrients will be then earned from fish. This means that a fish pond will be made on this system.

Because the aquaponic system requires fish pond, then the bottomside of the existing vegetation area is casted and the existing plants are moved out. This area is then functioned as fish pond.

The design drawings that need to be made are the plans, elevations, and some sections (Figures 2 to 4). Some perspective drawings from the left and right side are also made in order to give clearer overview on how will the whole aquaponic system be applied on the site (Figure 5).

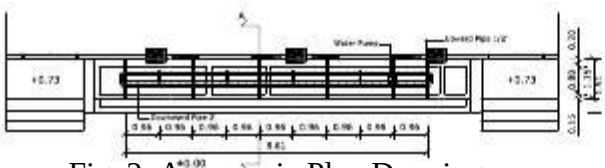

Fig. 2. Aquaponic Plan Drawing for SD-SMK Perti

Fig. 3. Aquaponic Front Elevation Drawing for SD-SMK Perti

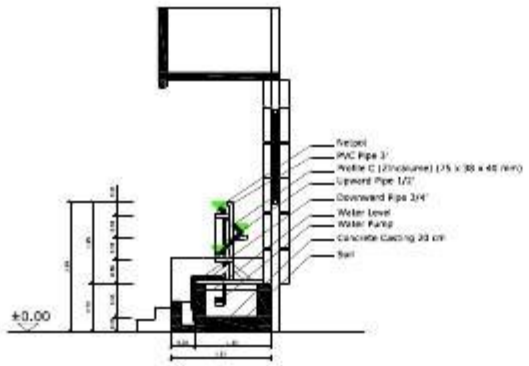

Fig. 4. Aquaponic Section A-A Drawing for SD-SMK Perti

The connecting pipe between the 3 levels of PVC pipes, will use a smaller diameter pipe (2 inch diameter) mounted obliquely following the placement of 3 inch PVC pipe on the left and right sides of the installation. And then, that 3 inch PVC pipe consisting of 3 levels is drilled to make 108 holes (each hole has diameter of circa 5cm). In each hole, a net pot will be put in.

The main principle of the aquaponic system is the water distribution of the fish pond so that it can be distributed upward through the PVC pipes, then the water from the fishpond nourishes the plants in each netpot on the pipes. Plants' nutrition obtained from the water that contained urine of fishes. The plants can then grow without the need for additional nutrients (fertilizer).

The water pump at the bottom of the fishpond is functioned to distribute the water upward to the PVC pipe at the top level (Figure 5). Then the water goes downward to the PVC pipe located in the middle level, continues down to the PVC pipe at the bottom and finally the water turns back to the pond. Water from the fishpond will be pumped back up to the uppermost PVC pipe and so on. The water circulation system will last as long as the water pump is turned on.

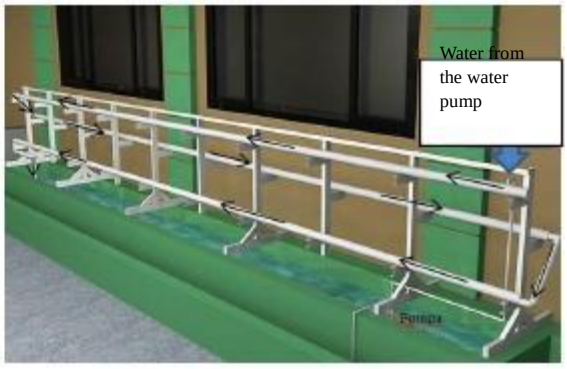

Fig. 5. Aquaponic Perspective Drawing for SD-SMK Perti

3. RESULTS AND DISCUSSION

The design and planning is then implemented on the selected area of school, and this consists of six stages:

Stage 1: *Transfering the existing plants and soil*

The location of the area to be cultivated as educational green area is an area with vegetations and plants located on the west side of the school field, near SMK classroom (Figure 6). This area will then become a fishpond, therefore the existing plants need to be removed and transfered to other location; that is front area of the school.

Fig.6. Stage 1: Existing Condition before plants and soil are removed
(Source: On site Survey, 2017)

Stage 2: *Fishpond Casting*

After all the plants were removed from the site, the area is concrete casted. And then waterproof base is applied on the bottom and pond side. This process is done manually by three people. Within five days the concrete cast is considered dry and the pond is ready for finishing process.

Fig. 7. Stage 2: Fishpond casting
(Source: Team's Documentation, 2017)

Stage 3: *Making Construction with Canal C Steel and Finishing process of Fish Pond*

The construction consists of 10 steel pillars made of Canal C Steel (Zincalum). Of the 10 steel pillars, 6 are resting on the top of the pond and 4 resting on the upper part of the pond. C canal steel is chosen because it is resistant to corrosion and also very rigid.

Fig. 8. Stage 3: Making Construction with Canal C Steel and Finishing of Fish Pond
(Source: Team's Documentation, 2017)

Stage 4: *Making Holes on PVC Pipes and the Installation Process of PVC Pipes on Canal C Steel Construction*

The aquaponic installation is using various types of pipes (Figure 9). The 3 inch PVC pipes are used to put the net pots. On the other hand, the 2 inch PVC pipes are used to connect 3 inch PVC pipes and also functioned as the disposal pipes from the 3 inch PVC pipes to the pond. The ¾ inch pipes are used to distribute water from the pump horizontally, while the ½ inch pipes are used to bring the water upward from the waterpump to the uppermost 3 inch pipe.

Fig. 9. Stage 4: Making Holes on PVC Pipes and the Pipes Installation
(Source: Team's Documentation, 2017)

The 3 inch PVC pipes are used to place the net pots into pipes. Those pipes are then arranged into 3 levels with 36 holes on each level, and that makes a total of 108 holes for the net pots placement.

Step 5: *Water and Fish Distribution into the Pond*

When the pond is ready, then the pond can be filled with water (Figure 10). The pond that has been filled with water is then left for 3 days to test the leak. After that, 100 medium-sized Nile tilapia fishes were put into the pond. This kind of fish (Nile tilapia) is chosen because of aesthetic reason: this kind of fish has attractive colors. Another advantage of having Nile tilapia in this pond is, those fishes can then also be consumed and bred.

Fig. 10. Stage 5: Water and Fish Distribution into Pond
(Source: Team's Documentation, 2017)

Stage 6: *Planting the Seeds on the Net Pots*

The prepared seeds consist of chillies, lettuce, red spinach, kale and tomatoes (Figure 12). A piece of sponge is placed into each net pot so that the seeds of the plant can be spreaded on the sponge. A snippet of cotton fabric (about 5cm long) is tied on the bottom of each net pot as a medium to absorb the water, so that it transfers the water to the sponge. With this technique, it does not matter if the quantity of water does not fulfill the PVC pipe because the capillarity effect of the cotton fabric can permeate the water up to the sponge, where the seeds are placed.

Fig.11. Stage 6: Planting the Seeds on the Net Pots
(Source: Team's Documentation,2017)

connecting pipe between the 3 levels of PVC pipes, will use a smaller diameter pipe (2 inch diameter) mounted obliquely following the placement of 3 inch PVC pipe on the left and right sides of the installation. And then, that 3 inch PVC pipe consisting of 3 levels is drilled to make 108 holes (each hole has diameter of circa 5cm). In each hole, a net pot will be put in.

4. CONCLUSION

Hydroponics is one of the plantation techniques that can be applied to create an educational green area on a limited land. Plants' nutritions are obtained naturally by utilizing the metabolism of fish (from the urine of the fishes).

Educational green area aims to educate students that even with limited land, permanent crop cultivation can be done with several benefits, such as: crops harvesting (vegetables and fruits), fish harvesting, creating shade shelter, as well as adding aesthetic value of the school. The hydroponic-aquaponic system has weakness in terms of timeline. It takes quite a long time to prepare the pond until it is ready to occupied by the fishes, and it takes also another length of time for the fishes to adapt to the pond before the hydroponic-aquaponic installation is run.

Hydroponic-aquaponic can be applied using simpler media (Reduce, Reuse, Recycle).

5. ACKNOWLEDGEMNET

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SETTLEMENT PATTERNS OF BAJO TRIBE IN BUNGIN ISLAND, SUMBAWA REGENCY

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Abstract

Bajo tribe in building houses and settled on the island of Bungin always adjust to the customs that have been valid for generations. Every youth who wants to get married is required to collect dead coral taken from the sea as a place to build a house. The process of taking this rock has been going on for a long time and hereditary, causing the area of Bungin Island is always growing and the population is increasingly crowded from year to year. This is what causes the pattern of settlements Bajo tribe on the island Bungin become irregular. The distance between one house to another is closely interconnected and increasingly decreasing the quality of the environment, both the settlement environment in the form of the problem of slum and the aquatic environment in the form of sea coral problems used by Bungin residents to build a residence. The purpose of this study is to determine the pattern of settled Bajo tribe in Bungin Island using purposive sampling method by setting specific criteria for the samples obtained according to the purpose of the study. Data collection was obtained through observations, interviews and randomly distributed questionnaires. The results showed that the pattern of settlements Bajo tribe on the island of Bungin Sumbawa regency formed as a result of the marriage of his generation that still maintain the culture of Bajo tribe.

Keywords: Settlement pattern, Bajo Tribe, Bungin Island.

1. INTRODUCTION

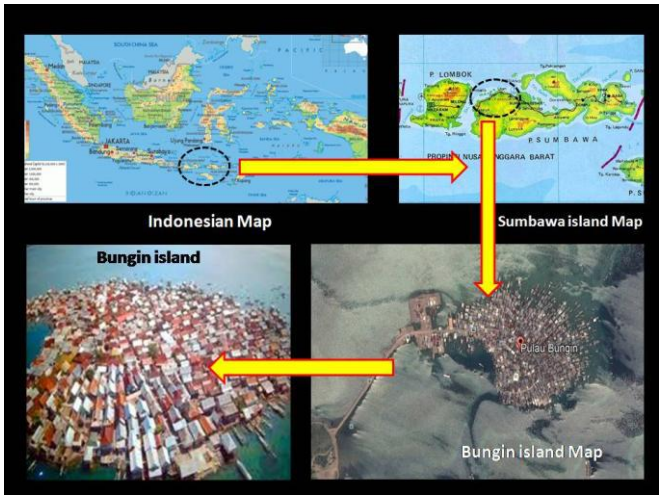
Settlements are places where humans take refuge and do their activities by utilizing an area or place as a whole. The settlements themselves become human habitation as well as places outside activities reside like social, religious, cultural and cultural activities. Settlements are formed as human reflection from natural and environmental conditions such as natural disasters.[1]

Residents who inhabit Bungin island are mostly Bajo tribes with livelihoods as fishermen. Bajo tribe has a cultural character as a marine society where the sea becomes the main orientation of marine community groups. They have a variety of sea-oriented cultures. The sea is already blended with the breath of their lives.

Bungin Island is famous as the most populated island in the world. This island is has a unique tradition where every young man who wants to get married is required to collect dead corals taken from the sea to form a place to build his house. This tradition has been long and customary for generations of people living on this island. Bungin Island is located in Alas District, Sumbawa regency, West Nusa Tenggara Province.

Settlements in the central part of the island are so dense that people who would form a place to build their house using dead corals must do so on the outer part of the island, with the size of 6 m x 12 m or more depending on the ability of the people. Usually citizens choose a new location that is still adjacent to the home of their parents or close relatives. The access road to the settlement is only located in the central part of the island with a width of 3 meters, while houses on the edge of the island can only be reached through narrow yards or using a walkway bridge made of wood or board that is located above the water.

Bungin Island is initially only 3 hectares but in 2014 has increased to 8 hectares with a population of about 3,184 individuals or 939 families. The Bungin Island grew around 30-60 acres every year [2].



Source : Bungin Island map in national and regional scope.

2. LITERATUR REVIEW

Settlements are formed because there are groups of people who have the need to live. Settlements formed by the house / residence has facilities supporting both public and social facilities that support activities in a community group settled for a long period of time. In addition to residential and habitable activities of a community group, in a settlement there are also social activities that support each other in community groups [3].

Settlements according to Law No.4 of 1992 on Housing and Settlements are, part of the environment outside the protected area, both in urban and rural areas, and also has a function as a residential environment as well as a place of activities that support livelihoods and livelihoods. [4]

According to Doxiadis (1974), the settlement is the totality of the environment formed by 5 (five) main elements namely:

1. Nature (nature), biotic environment and abiotic. Settlements will be largely determined by the existence of nature both as the environment and as a resource such as basic physical elements.
2. Human (anthropos), Settlements are influenced by the dynamics and performance of human beings.
3. Society (society), essentially formed because of the human as a community group. Aspects in society that affect settlements include: population density and composition, social stratification, cultural structure, economic development, education level, welfare, health and law.
4. Space of life (shell), space of life concerning the various elements where human beings both as individuals and as a community group carry out their life gait.
5. Network (network), which support life (road network, water supply network, drainage network, telecommunication, electricity and so on.[5]

Settlement pattern is the structure of residential group of people seen from its interaction with processed land in accordance with its activities or work.

The study of settlement patterns basically includes attempts to describe the following:

A. The essence of an or some type of residence

B. The spatial arrangements of these types of dwellings are in relation to one another, within a village or community unit

C. Relationships between types of houses with other architectural forms

D. Layout or overall village or community pattern

E. Spatial relationships between villages or communities with villages or communities

The other in a region with as wide a cephaly as possible.

3. RESEARCH METHOD

The research method used in this research is purposive sampling. Purposive sampling method is a technique to determine the sample of research with some specific considerations that aims to obtain more representative data. Representative data or information about Bajo tribe settlement on Bungin Island were collected by field observation, interview and distributing questioners to respondent. Respondents were selected based on the criteria that were set in advance which were: 1). Property owner; 2). Original Bajo Tribe; 3). Married; 4). Have a job. Respondents were selected randomly based on the location or position of the house, i.e. in the center of the island, in the outer islands and transition area (between them).

4. RESULTS AND DISCUSSION

In this study using the variables that form the pattern of settlements. For more details about the formulation of residential pattern forming variables can be seen in table 1.

Table 1. Formulation of Shaper Variables for Settlement Patterns

Settlement Patterns	Variable

Settlement pattern is the structure of residential group of residents seen from its interaction with processed land in accordance with its activities or work	**Physical Aspects** is an aspect related to the physical condition of the area both basic physical and physical built.	Area / land morphology, patterns that tend to follow: Road network Road network pattern Radial Distribution / presence of facilities
	Social Aspects The social aspect itself deals with the existing population or society and its life-order system.	Number and population density Social classes in the community Type of livelihood / occupation of the population Existing customs.
	Economic Aspects Is an aspect relating to the economic / financial system that developed in the area .	Economic Aspects Is an aspect relating to the economic / financial system that developed in the area Type of activity / economic structure that exists / buffe r the area. Economic activities seen from the facilities / economic facilities.

Source : Budi Fahtony 200

Based on the results of Physical analysis:

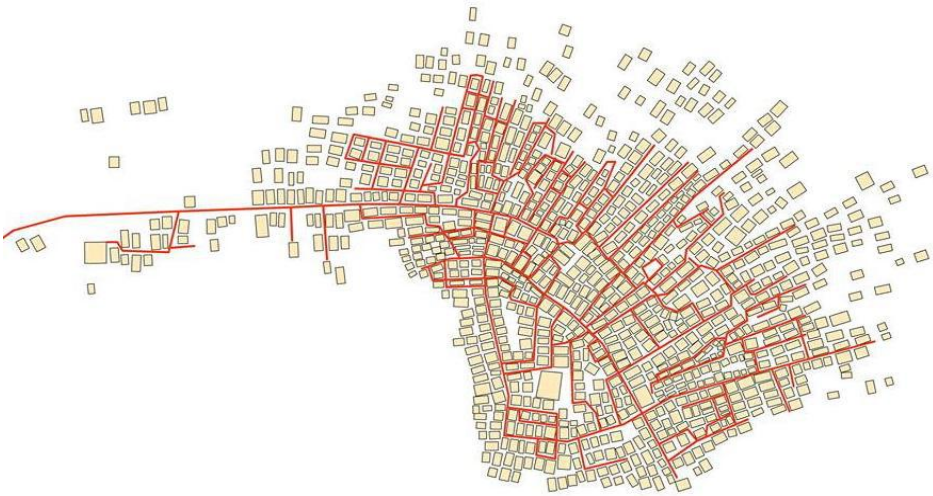
Based on the observation result, the pattern of building mass placement is not uniform. Residential buildings on the island of Bungin initially oriented toward the main road or the middle of the island. New buildings being built were always lined up behind them. This pattern is formed by the tradition that continues to be maintained by the younger generation on the island of Bungin to collect dead corals as capital in marriage. There is no concept of settlement arrangement in Bungin Island so that the people who stockpile the coral can choose a place in the outer part of the island that is still empty without considering the accessibility to the location of the house. Distance between one house and another house is only 1.5 meters and has no clear boundaries so it is used by the residents as a path. Access from the main road into the settlement is reached by foot or by motorcycle and cannot be passed by a four-wheeled vehicle. Residents who want to travel should walk to the main road and vice versa when returning back home. The existing road infrastructure on the island is still very minimal as well as public facilities.

Access to Bungin island by land is available only through one main entrance and exit through the same point. Both pedestrians and two-wheeled and four-wheeled vehicles

go through the same path with a radial circulation pattern rotating the island of Bungin. Roads between pedestrians and vehicles are not separated so often cause congestion in the event of incoming or outgoing vehicle flows, encounter with residents who are performing customary ritual activities such as Sunatan or wedding procession

The pattern of buildings mass placement does not consider the open space that is formed. Houses that is located in the middle of the island are oriented towards the main road while houses in the outer part or the edge of the island do not have clear flow orientation. The pattern of building mass placement that have no clear orientation line makes it difficult for residents of Bungin island to move from one place to another in order to reach the destination and the possibility of experiencing confusion in directing the movement (Lynch in Darjosanjoto, 2006). Visitors who come to the island of Bungin will also be confused to find a way out. Open space elements that function as a marker that ease people to enter or exit from the island area were not there.[6]

	
One of the respondent house on land. The space below the house (kolong) was used as shop.	One of the respondent house above water. The space below the house was utilized to park boat.
	
The main road on Bungin Island with residential buildings orientation towards the main road.	Very close distance between houses with very high building density.



Building Mass Layout Pattern and Circulation Pattern in Bungin Island

Table 2. Existing Condition of Bajo Tribe Settlement in Bungin Island

Source: Observation Result 2017

Based on the result of Non Physical Analysis

Settlements in the central part of the island are so dense that people who would form a place to build their house using dead corals must do so on the outer part of the island, with the size of 6 m x 12 m or more depending on the ability of the people. Usually citizens choose a new location that is still adjacent to the home of their parents or close relatives. The access road to the settlement is only located in the central part of the island with a width of 3 meters, while houses on the edge of the island can only be reached through narrow yards or using a walkway bridge made of wood or board that is located above the water.

Bungin Island is located in Alas District, Sumbawa regency, West Nusa Tenggara Province. Bungin Island is famous as the most populated island in the world. This island is has a unique tradition where every young man who wants to get married is required to collect dead corals taken from the sea to form a place to build his house. This tradition has been long and customary for generations of people living on this island.

The settlement area of Bajo tribe on BunginIsland is classified as slum and unorganized fisherman's settlement. The settlements in the outer part of Bungin Island are generally sporadic, where the settlements are shaped by the people (housing by people) and their nature of freedom to build. This is strengthened by a tradition that has been passed down hereditary on the Bungin Island, where young men who want to get married have to collect dead corals as a place to build a house.

The maritime economy in Bungin Island is a great asset for the economic growth of the villagers. The majority of the population work as fishermen, besides that there were fish cultivation using floating net and cages and and other businesses related to themarketing of marine products. One of the places that attract tourists to come to visit this island is Floating Restaurant located in the middle of the sea to the South of the island. This floating restaurant is a place of fish farm (karamba) and restaurant on top of the karamba that specializes in serving fish.

5. CONCLUSIONS

The pattern of Bajo tribe settlement on Bungin island is very dense and the distance between buildings is very tight so it can be categorized as slum and not yet structured. Houses above water generally have a cluster pattern, which is irregular and organic. In areas that have been strucuted (the center of the island) it generally use a grid pattern or linear pattern parallel to the line of the water body. The orientation of the original buildings generally faces the wateraccording to water based orientation. Subsequent developments with increasing activities to land, the buildings tend to orient towards the land and took into account the functional access and accessibility.

Access to Bungin island by land is available only through one main entrance and exit through the same point. Both pedestrians and two-wheeled and four-wheeled vehicles go through the same path with a radial circulation pattern rotating the island of Bungin. Roads between pedestrians and vehicles are not separated so often cause congestion in the event of incoming or outgoing vehicle flows, encounter with residents who are performing customary ritual activities such as Sunatan or wedding procession.

Integrated settlement development can be done by local government or private so that settlement area and utility providedfor settlement environment can be more structured and spread evenly, especially on the outskirts of the island in

the direction of Northeast.

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