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as an Instrument to Support
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GREETING FROM THE COMMITTEE

In this era, sustainable development becomes ultimate goal of all development programs throughout the nations over the world. People start to realize that the development today should be able to fulfill recent needs, without compromising the needs of future generation. It is difficult to pin down the concept of sustainable development since it encompasses many different subjects and disciplines. Nonetheless, this concept is highly related with sustainable spatial planning in term of land allocation, regarding the limitation of available land, and increasing of the demand. In this context, land consolidation, as a part of spatial planning, has important role in arranging, revitalizing and allocating current spaces, without abandoning future needs. In Indonesia, rearrangement and revitalization of land tenure and land use through land consolidation has many advantages on spatial planning, both in urban and rural area. Land consolidation can be implemented in many aspects of spatial planning, such as city revitalization, vertical land consolidation for urban area, land consolidation for agriculture area to support food self-sufficiency, post-disaster land reconstruction and disaster mitigation, and land arrangement for certain area such as border zone, coastal area, riverbank area, and small and outer islands.

One of the consequences of globalization is the change of urban and rural area throughout the world, including Indonesia. Globalization boost up urbanization, leaving problems of traffic congestion, the emergence of slum areas, and the degradation of quality of life on social and spatial aspects. On the other hand, globalization also changes the rural area: it is abandoned, massive agriculture land conversion is inevitable, and it also loses its capabilities as urban buffer zone. Nonetheless, this condition seems inevitably. Statistic shows that by 2045, urban population is predicted as 82% from total number of population in Indonesia. This condition indicates that sustainable spatial planning for urban area is crucial. Land consolidation for urban renewal is needed to achieve inclusive city, and to improve capabilities of the city to adjust with those changes, whether from spatial perspective or social and economic. With the current state of urban growth, land consolidation is needed to readjust land utilization, use, tenure and ownership, specifically in developing country such as Indonesia.

Limited spatial allocation for settlements, reinforced by the need of settlement area as one of the consequences of urbanization, triggers the emergences of slum area and squatter settlements in urban areas. Vertical land consolidation (VLC) is one of the alternative solutions to provide proper settlement area with this limitation. VLC is one of the effective tools to deal with urban expansion, and should be integrated in spatial planning, both technical and juridical.

One of the parameter of sustainable development also requires sufficient national food production. Food resources are crucial to ensure food security for a nation. This condition can be achieved through agricultural intensification by implement efficient technology, or by agricultural extension through agricultural expansion. Food security requires sufficient agricultural area, both in its quality and its extent. The biggest threat of agriculture land conversion is shifted into commercial area, and commonly occurred in almost all part of the world. Land conversion is closely related with urban sprawl. As consequences, the need of land around the city increased dramatically. Sprawl is characterized by urban growth that tend to be irregular (spotted), heading to the suburb, with the tendency of discontinuity as the result of land subdivision, and affecting agricultural area. In regard with sustainable development, shifting of land use change from agriculture to non-agriculture area should be considered by the government. The Government Regulation Nr.1/2011 on conversion of agricultural area into non-agricultural for sustainable agriculture area has been affiliated those needs. It is also emphasized in the Regulation of the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency Nr.19/2016 on the Establishment of sustainable agricultural area for area that has not yet has spatial planning. Regarding this, land consolidation in agriculture area can be implemented as a tool to protect agriculture land conversion to achieve food security. By implementing land consolidation, agriculture area can be re-designed and re-adjusted to improve efficiencies on food production, increase farmer's income, and prevent conversion.

Not only for urban and rural re-adjustment, land consolidation can also be implemented for specific purpose such as post-disaster reconstruction. Located within 'ring of fire' zone, Indonesia has high risk to experiences natural disasters such as earthquake, volcanic eruption and tsunami. Tsunami in Aceh in 2004, or Mt. Merapi eruption in 2010 giving best examples on how land consolidation can be implemented to reconstruct land after disaster, and to revitalize spatial planning function to be more adaptive on disaster mitigation. Land right reconstructions were carried out together with land consolidation, resulting more efficient spatial arrangements which also adaptive for disaster mitigation[1].

Indonesia also characterized by an archipelago nation. It has 13.466 islands that have been registered in the United Nation, and among 92 of them are functioned as outer islands, marking the outermost regions of Indonesia, and have strategic functions for the state's sovereignty and national security. Moreover, from that total number of islands in Indonesia, 2.342 of them are inhabited islands. As consequences, Indonesia also has vast coastal area, with more than 99.000 km of coastline, stretched from Sabang to Merauke.

[1] Land consolidation for post-disaster reconstruction has been done in Indonesia. After Aceh tsunami in 2004, the Government successfully implemented land consolidation in Desa Lambung, Kecamatan Meuraksa, Kota Banda Aceh. During Merapi Eruption in Yogyakarta, 2010, land consolidation also has been implemented in several affected villages in Kecamatan Cangkringan, Kabupaten Sleman, such as in Desa Kepuharjo, and Umbulharjo. These success stories proved that land consolidation effective to be implemented for post-disaster reconstruction and disaster mitigation.

Small islands, however, with its distinctive characteristics, need spatial planning adaptive for global warming and climate change. However, re-adjustment of specific areas through land consolidation such as coastal area, small islands, state-border area and outermost islands is considered important for sustainable spatial planning to ensure national security and state's sovereignty.

In conclusion, as part of land management and spatial planning, it is important to set up agenda able to accommodate land consolidation for various purposes. National Land College, in collaboration with Directorate of Land Consolidation, Ministry of Agrarian Affairs and Spatial Planning, commit to hold an international conference as a way to achieve that. International Conference of Land Consolidation as an Instrument to Support Sustainable Spatial Planning is a forum to disseminate ideas, findings, policies and empirical experiences related to land consolidation for urban renewal, vertical land consolidation (VLC), sustainable agricultural area, post-disaster reconstruction, and specific area such as state-border, riverbanks, small islands, outermost islands, and coastal area. Exchanges and sharing of knowledge and experiences within experts, academia, researchers and practitioner are expected will be useful for the decision makers to set up programs and policies related to the topic.

By this conference, we hope that sharing ideas, findings, critical thinking and experiences from participants with different backgrounds and expertizes can contribute to the development and improvement of land consolidation in Indonesia for better living improvement for everyone. Lastly, we hope you enjoy this program, and bring back many advantages from what we learn from this conference.

Regards,
LCSSP Committee/
National Land College, Nov 2017

CONTENTS

Sub Theme 3: AGRACULTURAL LAND CONSOLIDATION TO SUPPORT NATIONAL FOOD SCURITY

Sub Theme 4: LAND AND SPATIAL PLANNING FOR SPECIFIC AREA (POST-DISASTER, COASTAL ZONE, STATE BORDER, SMALL ISLAND AND OUTER ISLAND

Sub Theme 1

Land Consolidation in Land and Spatial Planning Studies

COMMUNITY-BASED PERI-URBAN LAND COSOLIDATION BY PEOPLE FOR PEOPLE IN KAMPUNG BUBAKAN, KANDANGAN VILLAGE, BAWEN SUBDISTRICT

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Abstract

A city in the process of development will always continue to growth. The increasing number of people automatically increasing the land needs and peri-urban becomes a part of the cities. Semarang–Solo Toll road construction forced the people to move and conduct new settlements in designated area. The procedures of land consolidation basically has been used by a large of area and adopted by the state through the reduction of land fragmentation. Neverthless, people in that area create and develop their own unique strategies, which is considered to be an effective distribution system. This indicates that formation of traditional land consolidation until today can be identified its existence. For that, we need to know the analysis underlying the implementation of traditional land consolidation in Peri-Urban area in Kampung Bubakan through its society and physical aspects. The methodology used in this study are statistic through the calculation of land also the visualization of before-after 2D spatial land plot model that aims to create and overview and systematically description about traditional land consolidation. The result obtained from this study are some findings 1) The explanation of the land consolidation problem roots; 2) Knowing characteristics of toll-affected communities; 3) Traditional land consolidation sketch and calculation; 4) Forming the concept and strategies of unique traditional land consolidation implemented by the people. These findings can be used as reference and key instrument for applying land consolidation in similar area or society.

Keywords: Traditional Land Consolidation ; Residental ; Peri-Urban ; Concept ; Bubakan Village.

1. Introduction

City is the complex interaction between human and environment in which they live (Alnsour, 2016; Natarajan, 2017; O'Brien, 2014). The city will always continue to growth, that can be interpreted as increasing concentration of population and develop human activity from time to time that does not occur separately (Alnsour, 2016). The growth of the city is usually followed by urban development that has an impact on increasing urban activity, population growth, and land requirements (Ning & Qi, 2017; Skog & Steinnes, 2016; Tian, Ge, & Li, 2017). The growth of the city also has an impact on infrastructure development (Xie, Fang, & Liu, 2016). Currently, Indonesia is being intensively of tol road infrastructure construction. Jokowi since 2014 has successfully operated 176 km of toll roads construction and in the end of 2017 there will be and additional 568 km to be complemented and operated (Simorangkir, 2017a). One of development of toll roads in Java is the construction of Semarang–Solo toll road which is the part of toll road project. The progress of Semarang–Solo toll road construction is now almost done and leaving two more jobs, namely 4 (four) and 5 (five) parts (Prabowo, 2017; Simorangkir, 2017b).

More toll roads are built to connect cities and its surrounding areas (Chung, 2002). On the other side, toll road construction as a part of infrastructure development has an impact on physical environment. The most visible thing is the occurrence of land use changes where the land and its settlement that used as a toll road having its own compensation. Construction of Semarang–Solo Toll Road, especially section II Ungaran–Bawen has changed the face of space in Kandangan Village. The landscape of Kandangan Village has changed significantly since 2011 due to construction of toll roads. The land acquisition process has forced community settlements to move and conduct other areas to live. This resettlement is the forerunner to the formation of a new settlement called Kampung Bubakan, whoce entire community is affected by the 2nd section of Ungaran–Bawen Toll Road in 2011.

The process of land acquisition in Kampung Bubakan involves the land consolidation that done traditionally by the community itself. Land consolidation activites seek to restructure the existing of land resources (Long, 2014). Land consolidation is a land management program that is considered to overcome the problems and accelerating urban development. Land consolidation arranges land ownership so that it can be well organized and improve the use of the land due to irreguler land become regular and rectangular (Idham, 2004; Parlindungan, 1984). The process of forming the settlement is done by community itself without any interference from government. Communities and local elites took the initiative to rebuild their settlements. They independently arrange the land and as a group they consolidate rural settlement lands.

This study attempts to examine the procedure and concept of Kampung Bubakan community in the process of land use arrangement through simple land consolidation. The method used in this study is statistic calculation to identify land use change and spatial plot model visualization both before and after traditional land consolidation by Kampung Bubakan community. Results in this study divided into five parts, 1) Knowing the characteristics of community affected by toll roads construction and the roots of land consolidation problems; 2) Establishing traditional land consolidation concepts and strategies adopted by community; 3) Visualizing model of land changes between 2011 and 2017; 4) Explaning the result and study findings; 5) Conclusion.

2. Material and Methods

In this section, methodology of the study describe the state of land consolidation strategy by Kampung Bubakan community with the help of data that has been collected through mix method approach, divided by quantitative and qualitative incorporation. The underlying purpose of the approarch is to facilitate the establishment of a systematic strategy of the calculation for land plots. This study develops an analytical framework for understanding the reasons for consolidation strategies adpoted by the context of society.

2.1. Study Area

The scope of the study area in Kampung Bubakan RT 01 RW 03, consisting of 43 families with 163 total population. This Kampung is a new settlement resulted by the formation of the community resulting from the construction of toll roads, which developed by the community into a large area that formed a new settlement center that attracts the growth of social economic activities. Administratively, Kampung Bubakan is located in Bawen Subdistrict, Semarang Regency, but functionally the existence of Kampung Bubakan inseparable from the existence of Semarang City, where most of the population have livelihood in Semarang City. The emergence of residental areas in Kampung Bubakan is an anticipatory step from the government to control the physical growth at toll road. As a peri urban area, this region is unique, because it consists of urban and rural characteristics. The development of peri-urban area is characterized by changes in rural life activities to urban areas (Budiyantini & Pratiwi, 2016). Kampung Bubakan has been established for 5 (five) years after the relocation of settlements due to the construction of Section II of Ungaran–Bawen Toll road. Kampung Bubakan formerly a agriculture land that is only owned by 3 (three) residents, but now its designation has been functioned as land building by all communities of Kampung Bubakan.

2.2. Social Economic Analysis

In the early stages, an explanation of the socio-economic characteristics of affected communities by deepening the question of the community perseption in the context of land consolidation to minimize bias in its application, and how the tolerance between communities and the root causes of the consolidation process is not in accordance with the established provisions, according to people's preference for fair land consolidation.

2.3. Statistic Analysis of Land-Plot

Changes in land owner, that visualized in Kampung Bubakan in 2011 and 2017 that presented in map model, and features with statistic analysis in Land-plot that presented in table. Statistic descriptive is adopted in analysis, which is an attempt to describe the various important societal characteristics of organized data (Santoso, 2003). Finally, changes in land consolidation from each owners are described. The results of statistical analysis can answer the usefulness, effectiveness and impact of land consolidation in Kampung Bubakan.

2.4. Traditional Land Consolidation Strategy Analysis

Forming the concept and strategies of unique traditional land consolidation implemented by the people. The analysis is divided into the determination of the selected land sharing concept, the stakeholders involved during the process, and the land

consolidation stage implemented by the Kampung Bubakan community. The result of data processing is presented in chart, so it can be eaily known pattern that formed.

3. Result and Discussion

This study attempts to find the concepts and strategies undertaken by Kampung Bubakan community in the process of establishing new settlements through simple and traditional land consolidation activities. The first analysis activity is to know the characteristics of Kampung Bubakan community and the new settlement that formed. Secound is an analysis of concept and strategy used by communities in land consolidation process, and the last is spatial analysis to identify changes in land use both before and after tradisional land consolidation.

3.1. Kampung Bubakan Community Characteristics

Kampung Bubakan is a newly formed settlement for 5 (five) years due to the relocation of settlement affected bt the Section II Ungaran–Bawen toll road in Geneng Neighborhood (RW III), Kandangan Village, Bawen District. This Kampung is actually categorized as an unplanned sattlement, Kampung Bubakan has a various slopes that do not have adequate drainage systems that are particularly susceptible to landslides (Anderson, Holcombe, & Renaud, 2007). Although peri-urban area, Kampung Bubakan is still dominated by rural activities. As a region that categorized as rural-area, Kampung Bubakan is a social unit that reflects the strong relationship between environment and people, has a historical background, and sociopolitical relationship (Robinson, 2003; Yang, Xu, & Long, 2016). This indicates that Kampung Bubakan is characterized by strong cohesion and coordination among individuals in community groups and high mutual coorporation.

The total population in Kampung bubakan consists of 43 families which are all affected by the toll roads construction. Based on economic perspective, mayority of Bubakan communities work as laborers, especially for young age groups and among women, and rarely worked as farmers in the fields, only a few group who owned a agriculture land. The average community of Kampung Bubakan is classified as KS II (middle to lower society) with their income and the result of compensation from the process in land payment from the toll construction project. They can not freely choose where they will build their new home. Low preference for land tenure causes communities to jointly buy land on moderate sclopes (25% - 40%).

The limitation of the residental land selection is the main factor in traditional land consolidation by communities of Kampung Bubakan in 2011. Land changes from the built up area into new settlements. Uniquely the concepts and strategies only undertaken by mutual agreement between the community and Local Champion and tend to ignore all environmental legislation policy in Indonesia.

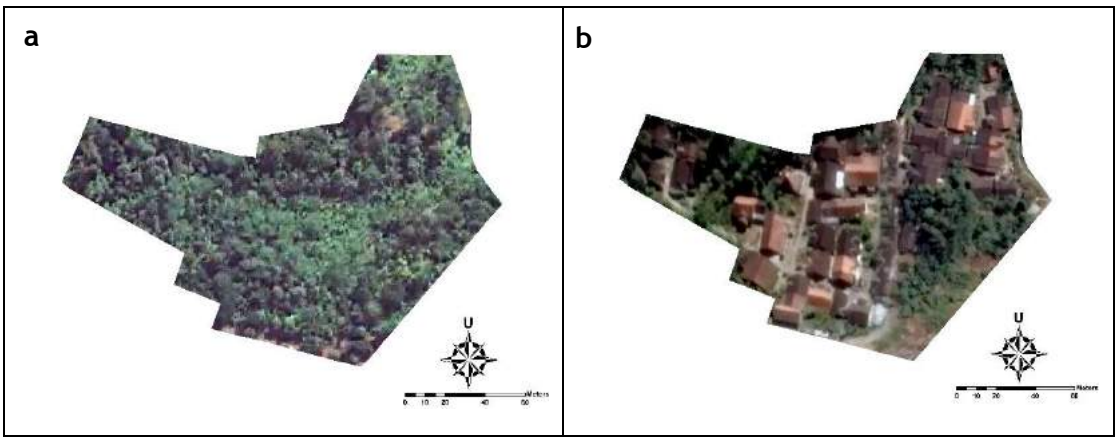

Figure 1. (a) Land use of Kampong Bubakan in 2011; (b) Land use of Kampong Bubakan in 2017

3.2. Concept and Strategy of Kampung Bubakan Land Consolidation

The same process soil consolidation with the land adjustment process in Kampung Bubakan will generally be divided based on accessibility factor and topography. Accessibility is one of the factor that makes a land more valuable, areas with good road accessibility have a value of land above average. Accessibility is used to refer to the ease with which the land uses and transportation systems enable individuals to reach activities or destinations (Du & Mulley, 2012). The value of accessibility is measured by looking at the distance of the land location to the road. While the high topography tend to have the potential to landslide disaster, difficult access to the location, that cause less in demand. Accessibility and topography during the consolidation process will affect the extent of land plots that will be obtained by landowners, where areas with easy access or close to the road network will obtain smaller landholdings compared to areas that do not have access to the plot location. As with accessibility, the more flatter the topography of the area in Kampung Bubakan, the smaller the land the landowner will acquire. This is considered fair by most of the population. In contrast to the consolidation system that has been applied to other areas, the determination of the land area also takes into account the extent of residential shelter previously owned by each resident. This is because, the private sector PT. Trans Jateng has considered the replacement of land, buildings, and each tree in the house. A key factor in the land consolidation strategy undertaken in Kampung Bubakan is the role of local champion where the involvement of communities through participation in the process of consolidation of traditional land is able to fulfill the wishes and the results are considered fair by them (Liu, Müller, Rommel, & Feng, 2016).

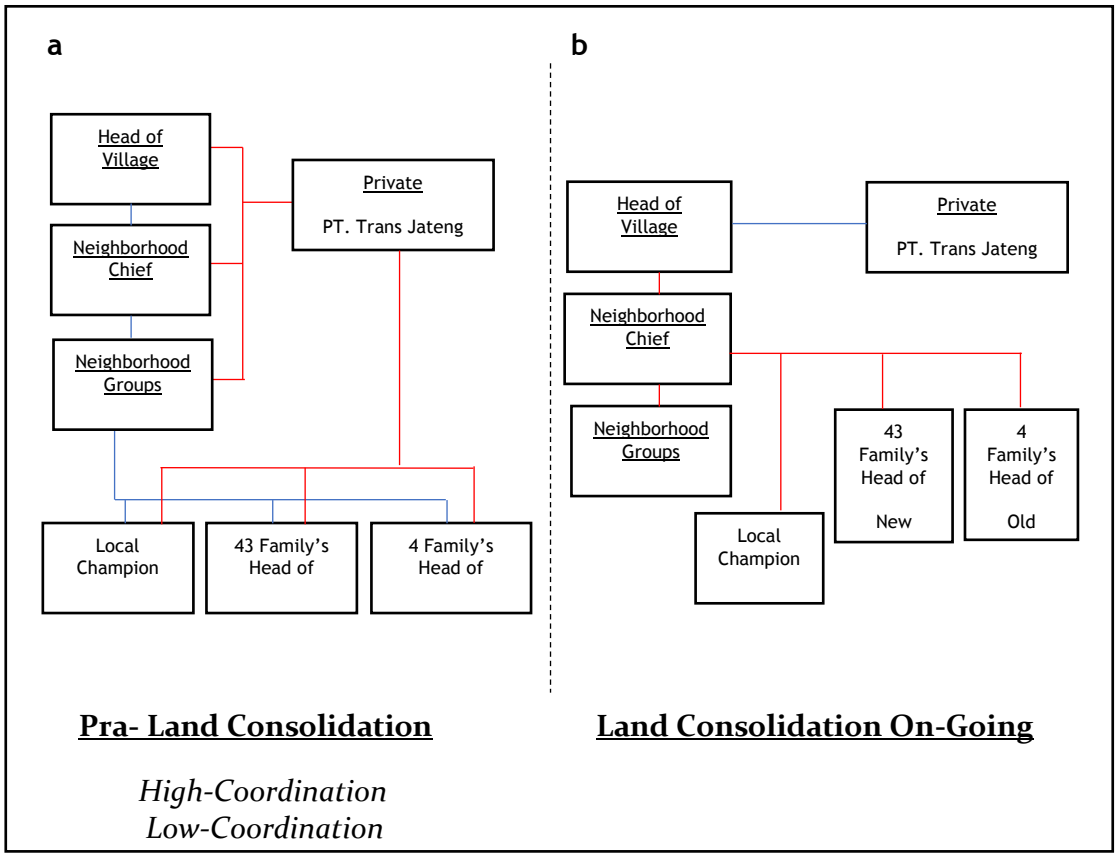

Figure 2. (a) Pra-Land Consolidation; (b) Land Consolidation On-Going

In pre-consolidation of land, the private sector coordinates to all parties, that are the village head, the neighborhood chief, and the neighborhood groups to convey information to the residents, while the private sector provides reimbursement of funds to residents affected by toll roads. The replacement is in the form of land compensation, building on land, and trees. So that the private sector is inactive at the time of pre-consolidation or during the consolidation in Kampung Bubakan, and there is no government involvement in the process.

During the consolidation, the private sector is no longer involved in the community but only to the village head to ensure the control. At this stage, it is evident that communities independently form a team of land plots allocation. If the process is accepted, there are a strong human factors to contend with (Burton, 1983). Mr Purnomo as neighbourhood Chief (RW III) divides plots of land in accordance with accessibility and topography, then each community is entitled to choose the desired plot of land with the condition that the land divider can only choose at the end (sacrificing himself). It is highly visible that the important role of LC (Local Champion) is to prepare newly redesigned soil and design designs adapted to different landowners. New designs of land sharing are based on different criteria and regulations, although they should depend on the country's laws and technical guidelines (Janus & Markuszewska, 2017).

The process of dividing the land in Kampung Bubakan looks very easy and simple. The division of land plots is entrusted to one person through a joint discussion process. The high cost of formal consolidation process, especially if land consolidation involves additional infrastructure and new residential development, new efforts are made to lower costs by introducing acceleration schemes (Burton, 1983). The absence of government involvement and community independence in the consolidation process shows that legislation in Indonesia provides an opportunity to facilitate the consolidation process in accordance with the community desires. For more details, this is the stage of land consolidation applied by Kampung Bubakan community.

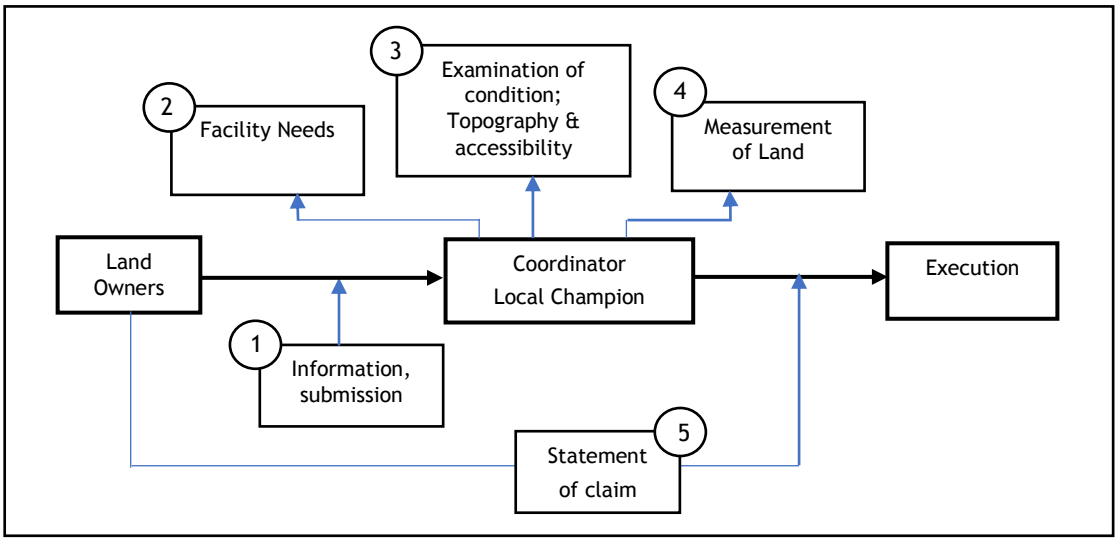

Figure 3. Land Consolidation Process in Kampung Bubakan

3.3. Calculation Result of Traditional Land Consolidation in Kampung Bubakan

Land consolidation is considered as a land management program that can overcome problems. Therefore, formulating a common agreement becomes a challenge that needs to be given more attention. The success of this program is the arrangement of land ownership, so the land is more organized. With the arrangement of ownership, the existing barriers can be more easily to overcome (Idham, 2004). It has been elaborated, the process that took place in Kampung Bubakan was very simple and easy to perform, the process being conducted was a process of discussion and deliberation together to get an agreement on the fair share of land plot. From the 4 plots of land owned by Mr. Sutikman, Darto, Yusuf Basri and Mundari which is moor land are positioned as inputs in the process and carried out a consolidation of land consisting of 43 Head Families (Figure 4.)

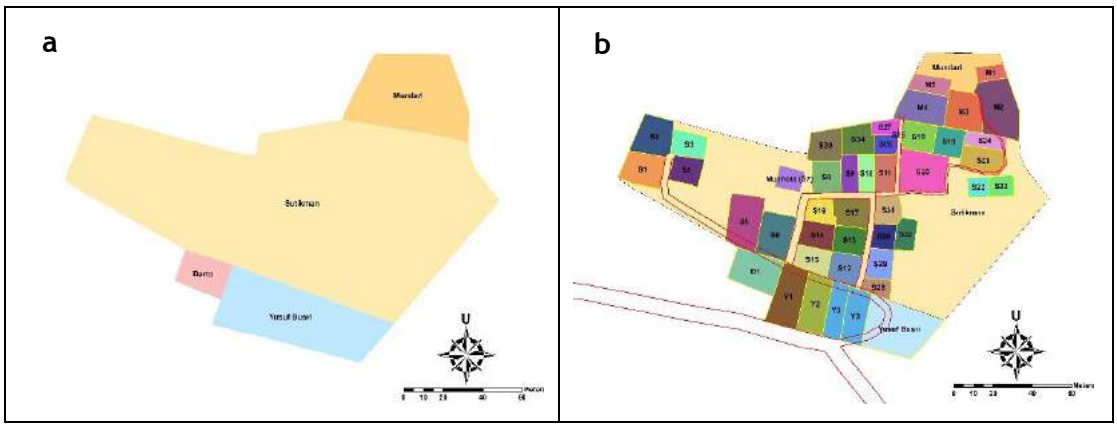

Figure 4. (a) Land use of Kampong Bubakan in 2011; (b) Land use of Kampong Bubakan in 2017

Table 1. Calculation of Traditional Land Consolidation by People of Kampong Bubakan

Land Owner	Input Size 1 (m^2)	Output Plots	Input Size 2 (m^2)	Land contribution (%)	Output Size (m^2)	More or Less Size (MLS)	Benefit (IDR 250,000.00 / m2)
Yusuf Busri	2283	YusufBusri	847	15	720	-1563	IDR 390,750,000.00
		Y1, Y2, Y3, Y4	1436	15	1221	1221	-IDR 305,250,000.00
Darto	441	D1	441	15	375	-66	IDR 16,500,000.00
Mundari	2084	Mundari	522	15	444	-1640	IDR 410,000,000.00
		M1, M2, M3, M4, M5	1562	15	1328	1328	-IDR 332,000,000.00
Sutikman	13817	Sutikman	6400	15	5440	-8377	IDR 2,094,250,000.00
		S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S30, S31, S32, S33, S34	7417	15	6304	6304	-IDR 1,576,000,000.00

Nb: out plots totaling 43 plots and the rest of the land are used for roads, drainage and mosque

The results show that the old land owners did indeed decrease the size of the land in size of output after the land consolidation, while the new landowners experienced an increase in output size. However, when viewed in terms of benefits received by old land owners get the payment Rp 250,000.00/m2. While new landowners are required to replace the land by paying the land price (so the benefits are negative). This indicates that the new landowners get the benefits of new land tenure while the old land owners get a compensation in the form of money. To support Kampung Bubakan settlement activity, the community was handed over to the public utilities (include facilities and infrastructure) of 2.794 m^2 for the construction of musholla, road network and drainage network. The land consolidation process is very simple, and easy to do by the community. The main key of success of land consolidation are social cohesion and high social capital in Kampung Bubakan. They prefer to trust their own community leaders rather than outsiders to petrify themselves in the process of dividing the land plot, due to convoluted. This process is legitimate and can be implemented if it is still within a relatively small scope and with a small number of land consolidation members.

4. Conclusion

Land consolidation is a policy that supports development and has a function to accelerate the distribution of facilities and infrastructure. However, in Kampung Bubakan as a peri-urban area with dominant rural characteristics, the community has their own method to consolidate of trasitional land from people by people. The process of land consolidation has a driving force in the form of development toll road infrastructure section II Ungaran–Bawen that forced people to move and conduct their old land and form new settlements. The result of land consolidation of traditional land by the community shows that the concept and strategy that used by people is very simple and easy to do. The basis of the process that used is mutual trust between stakeholders and the role of local elite (Chief of Neighborhood/Group of Neighborhood) which becomes the key determinant of the sucessful land consolidation process in Kampung Bubakan.

This traditional land consolidation process is considered as effective method by the community because the process is too fast, cheap and not complicated and the results are fair according to their perception. Although the process is not in accordance with the rules of land consolidation based on the law, but community feels considerable benefits, which is proved by their fair result perception on land plot division. Some of the reasons underlying community of Kampung Bubakan used this simply method of land consoludation are because of high cost of the formal consolidation process, convoluted process, and relatively take a long time. The existence of concessions in the legislation on land consolidation in Indonesia causes Indonesians to have the opportunity to simplify the land consolidation

process in accordance with their wishes, although the process as not perfect as its rules that has been established.

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ECO-FRIENDLY URBAN DEVELOPMENT BY LAND CONSOLIDATION IN JAPAN MANAGEMENT METHOD OF PRIVATE IMPLEMENTATION

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Abstract

This paper explains the system of land consolidation (LC) in Japan and analyzes management methods for successful eco-friendly urban development by private implementation. In Japan, LC project consists of three elements: 1. Land re-plotting; 2. Provision of infrastructure; 3. Self-financing by selling reserve land. This integrated system covers project effectively. As for the implementing body, besides the government sector, the private sector (organized by landowners) is one of the main implementers in Japan. One characteristic of private implementation is that residents have authority over the decision-making for the project. However, there are not many cases in which landowners take voluntary action through an LC project. Generally, such projects are hindered because of difficulties in raising funds from the project itself. In that sense, the case of the Nagakute Nanbu Area project was successful. The area is located in Nagakute City, which adjoins a central industrial city named Nagoya City. The new town development, cultivated by farmland and forests, aimed to preserve natural resources from the planning stage. Through the project, landowners engaged in natural resource conservation and its related maintenance. As for the analysis, this paper focuses on a management method by private implementers. Data was collected from project reports and interviews with stakeholders. Finally, this paper mentions some challenges to applying eco-friendly urban development by private implementers in other project areas.

Keywords: Integrated project system, private implementer, natural resources, financial management

1. Introduction

1.1. City planning and Land consolidation in Japan

A land consolidation (LC) project in Japan is defined as a project to improve public facilities such as roads, parks, and rivers to encourage the utilization of residential land by arranging the plots of land in an urban planning area. Early LC projects, which were developed based on the German LC method and Japanese adjustment of rice fields method, were legalized in 1954. Today, the number of implemented LC projects in Japan spans 8,500 districts nationwide. The reason they have been implemented in so many areas is because of the versatility of the method. For example, regarding topography, it is possible to adapt the method from a hillside to a flat area, even for a water reclamation plot. As for the situation of urbanization, it is applicable to both vacant lots and densely built areas.

Looking back on representative modern developments in Japan, LC has played an important role in large-scale development. This is especially true for the earthquake reconstruction following the Great Kanto Earthquake of 1923, the Nagoya Reconstruction

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Project after World War II, and the development boom of urban areas between the 1950s and 1990s. However, both the number of projects and total area of LC have been decreasing in recent years. The rate of the decrease is remarkable after 2001 (Annual Report on Land Consolidation, 2016).

Although LC projects in Japan are in a transition period, it is necessary to conduct projects by adapting to the trends and techniques of the latest developments. Also, further applicability is expected in many countries under the different social and geographical conditions.

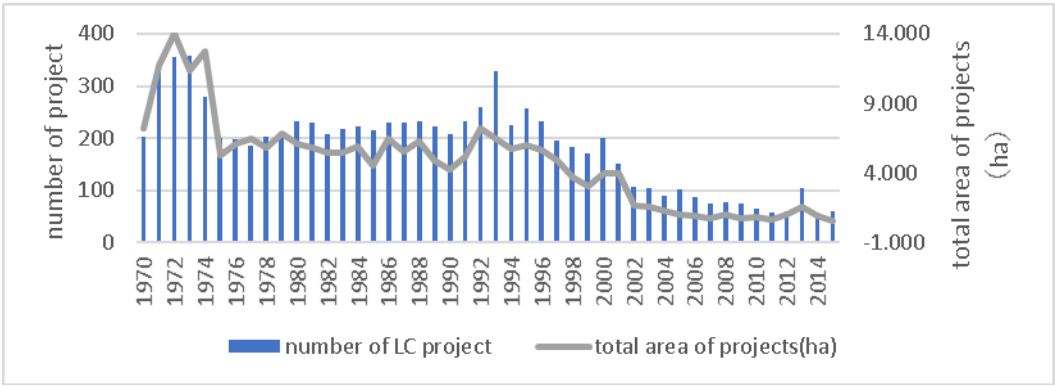

Figure 1 Achievement of LC project in Japan (1970 to 2014)

1.2. Problems of current LC from the point of view of nature conservation

The topic of this paper is environment-conscious city planning, which has received much attention in recent years in Japan. For example, the representative movement in national policy is a formulation of "Sustainable Urban Redevelopment Guidelines-Mini Assessment in Urban Redevelopment," which summarizes a voluntary environmental assessment regarding "efforts such as the reduction of greenhouse gas emissions, reduction and proper disposal of waste, and mitigation of the heat island phenomenon" on urban redevelopment operators in 2008 (Ministry of the Environment) and a formulation of "A Low-Carbon City-Making Guideline" to encourage local governments involved in urban development to reduce greenhouse gas emissions in 2010 (Ministry of Land, Infrastructure, Transport, and Tourism).

Meanwhile, at the regional level, interest in environment-friendly city planning has increased. For example, through biodiversity preservation and natural resource preservation activities, local people have tried to improve the environment and increase land value in the area.

However, there is some question about nature preservation in a LC project. Although it is necessary to conserve green spaces for urban residents, agricultural land, forests, and hilly land have disappeared because of the construction of new town in the suburbs. It was occurred especially after the war, during the period of high economic growth, which saw a

housing shortage caused by population increase. As a reflection of this problem, there have been some recent cases of design and construction using existing natural terrain and trees "as is" in LC projects. In addition, residents sometimes engage in nature conservation in the LC project area. As an example, in the Aoba Utsukushigaoka Central Area in Yokohama City, Kanagawa Prefecture, a "policy of greening" of the district plan was established, and the residents are involved (home page of the Utsukushigaoka Association).

Regarding nature conservation activities in an urban development area, there are previous studies and discussions. For example, Shimao et al scientifically analyzed the important factors that encourage organized activities by residents (Shimao et al., 1993). As for the same activities in a LC project area, research was conducted by Sawai (2016). He provides an outline and mentions the significance of the conservation of green spaces by landowners in the Nagakute Nanbu Area. However, the previous research does not provide an analysis of how to apply this management model to other LC project areas. Therefore, the purpose of the analysis in this paper is to consider two aspects of a project's sustainability: One concerns the financial management of the nature conservation activity; the other concerns an effective method to ensure the human resources for the activities.

As a supplementary analysis, the Indonesian LC project situation, which has no previous projects implemented by a private party, should be considered. However, it is sufficient to take this analysis as a reference for the promotion of landowner-oriented LC projects in Indonesia.

1.3. Research question, research method and outline of the paper

This paper considers the point at which private implementation is suitable for promoting nature conservation activities. In the case of the Nagakute Nanbu Area, Sawai points out that "The idea of natural conservation by landowners was appropriately incorporated into the plan from beginning of the project. Then, activities such as taking care of plants and offering the experience of nature to children contributed to eco-friendly city planning." Therefore, through the following two points, this paper sets an arguing point regarding the management method of an LC project:

A. It succeeds in subsidizing the activity funds from the LC project.
   This assumption focuses on the sustainability of the financial management.
B. It succeeds in organizing voluntary activities through the LC project and shifts to other organizations after the project is finished.
   This assumption focuses on the sustainability of human resources.

In this analysis, the main references are the documents of the Nagakute Nanbu Area LC project, some reports and articles on the project, and interviews with the consulting staff who worked for the subcontractor. The interviews were conducted on October 6, 2017 with

Hajime Hirano and Ryo Sawai of the Tamano Consultants Co., Ltd. Throughout this paper, excerpts from these interviews are identified as (personal communication).

The structure of this paper is as follows: Section 2 explains the basic Japanese LC system and packaged finance system, which sells reserve land to meet expenditures and conduct infrastructure provisions. This section also mentions the types of implementing bodies and the characteristics of private implementation. Section 3 introduces the Nagakute Nanbu Area LC project as a case study. It also describes some activities related to nature conservation by landowners in order to examine the stated arguing point. First, it analyses the method of disposing of reserve land to raise funds for the project. Then, it analyses forms of voluntary activity by landowners and the transition of the organization after the LC project is finished. The final section summarizes the content of the paper. It also refers to some points that are helpful for introducing voluntary initiatives by landowners for project management in Indonesia.

2. Land Consolidation Projects in Japan

2.1. Basic system of LC in Japan

As with the LC concept in Indonesia, the basic LC system in Japan consists of two functions: Land value increasing through development and the sharing of development profits with land rights holders and stakeholders. Based on this, Japanese LC has the following eight sub-systems, as shown in Fig. 2: 1. Coordination sub-system with urban plan; 2. Organization sub-system of implementer; 3. Approval subsystem; 4. Supervising subsystem; 5. Support subsystem; 6. Financial sub-system; 7. Land re-plotting sub-system - 8. Construction sub-system (1: Matsui, 2014). With reference to a project order between nos. 5–8 in Fig. 2, there are some important points in a project. At no. 5 (Support sub-system), the, a non-governmental implementer such as a private or individual implementer receives technical assistance from the local government. At no. 6 (Financial sub-system), the non-governmental implementer receives subsidies from the national and local governments. At no. 7 (Land re-plotting sub-system), all lands of the landowners are re-plotted according to the project plan. At same time, public and private land is created by the contribution of previously private land, and reserve land is sold to offset project expenditures. Then, at no. 8 (Construction sub-system), it conducts, improvements to infrastructure such as roads, drainage, and parks are conducted. The costs are paid mostly by income from the sale of reserve land. In this way, during the implementation stage, the project comprehensively conducts the conversion of plots, ensures income by selling reserve land, and implements the construction.

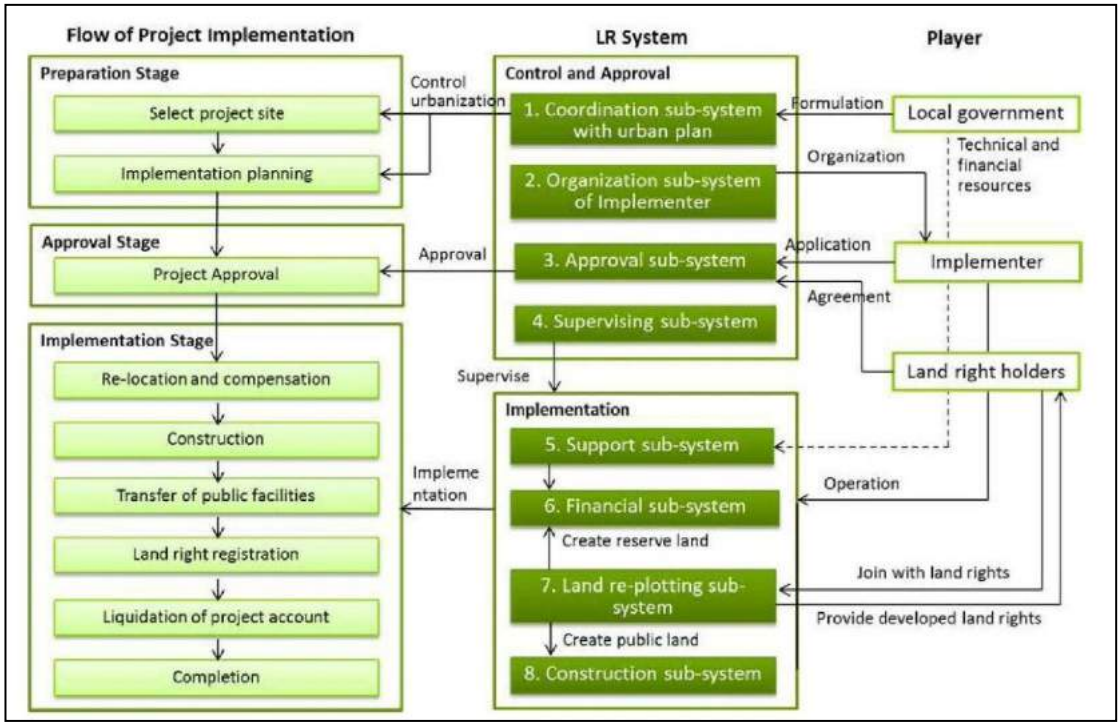

Figure 2. Overall Structure of land consolidation system (Matsui, 2014)

2.2. Private Implementation of land consolidation project

- Achievements of private implementation

This section describes the features of private implementation, which has had many achievements over the years in Japan.

Among the implementing bodies stipulated in the Land Readjustment Law, the main ones are local governments, such as prefectures and municipalities; Minister of Land, Infrastructure, Transport, and Tourism, urban revitalization organization; and government corporations; private implementer[1] organized by more than seven landowners; individuals organized by fewer than seven landowners; and land consolidation companies. With reference to the project areas approved by each implementing body since the 1970s, the number of private implementers is the largest in decades (Fig. 3). In particular, the number of areas reached 1551 in the 1970s, 1415 in the 1980s, 1440 in the 1990s, 606 in the 2000s, and 100 from 2010 to 2016 (Annual Report on LC Projects, 2016).

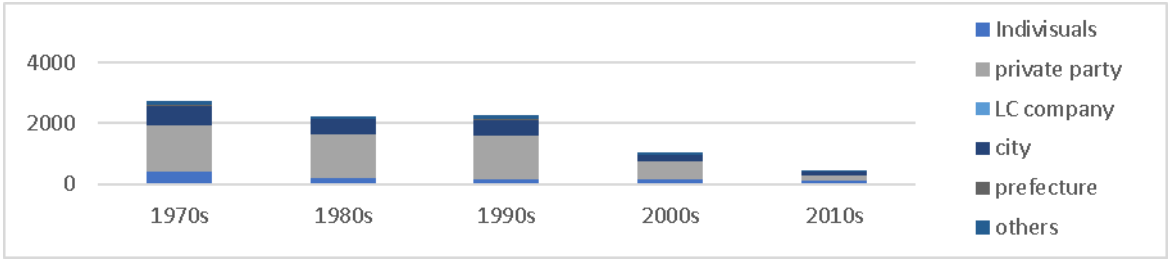

Figure 3 The number of project areas and calcification by implementation body

[1] In some cases, it is named as “corporative” in Japan.

- Things to be done by landowners during a LC project

In the case of private implementation, landowners have authority over project decision-making. In the preparation stage of the project, representatives consist of landowner volunteers. They explain the outline of the project to other landowners and obtain consent for the implementation of the LC project. After obtaining consent, seven or more of the landowners jointly apply for an approval application and establish a legal association (*kumiai*, 組合) (Article 14 of the Land Readjustment Method). When the project starts, the general assembly established by the association has the right to decide various matters, such as changes to the project plan, basic policies, and the expense budget. Because the representative association also has the role of reporting project progress and communicating with landowners, it holds information briefing meetings from time to time, to distribute news about project progress.

- Importance of the reserve land disposal method in private implementation

In the section of this paper that describes the basic LC system in Japan, it was mentioned that a reserve land is established using landowner-contributed land. In the case of a private implementation, the authority to dispose belongs to the landowner. Therefore, they need to consider effective sales methods for the project. A well-known method of disposal is to cooperate with custom home builders in order to design effective road settings, such as community roads. In other cases, they try to attract commercial facilities in order to sell large plots. Such methods are often supported by specialized consultants.

3. Analysis on Sustainable Project Management by Case Study

3.1. Outline of Nagakute Nanbu LC project

- Outline of project area and changes prior to project implementation

The Nagakute Nanbu Area is located in Nagakute City, Aichi Prefecture. The population of Nagakute City is around 56,000, and this number has increased within the past decade (Statistics of Nagakute City, 2017) because of its strategic location adjacent to a central industrial city, Nagoya City.

The area used to be occupied by agricultural land and mountain forest; it accounted for around 80% (or 78.9 ha) of the entire area (8th project plan). However, abandoned cultivation, devastated forests, and illegal dumping were regarded as problems by locals. Meanwhile, the demand for residential land in response to an urban population increase triggered the movement for a LC project. Some initiated landowners held a local briefing session in 1985 and established a private implementation pre-association for a LC project in 1993. Then, in 1998, with the consent of other landowners, they launched the LC project.

Picture 1 Bird's eye view of the area before and after project (taken by Nagakute Nanbu LC Corporative)

In planning the project, the concept of "Town Designed to Invite its Residents to Walk Around" was established by the landowners, who aimed to achieve an environment-friendly community. Specifically, the plan included a water park, pocket park, and green road.

- Nature conservation activities during LC project

The activities started with the idea of establishing a community that takes care of nature with the residents' help after the LC project is completed. A flower-planting event was held by some landowners for the first time in 2009. Over time, this evolved into other activities and attracted new residents in the LC project area. Such activities can be classified into the following four categories: 1) Activities related to green space conservation; 2) Activities related to biological conservation; 3) Activities related to green space maintenance and management; 4) Activities related to regional cooperation. Specific details of these activities are shown in the figure in the appendix (personal communication) (see Appendix A).

Picture 2 . (From left side) Conservation of village-vicinity mountain activity.
Picture 3. Biology conservation activity.

- Achievements of LC project

The project term lasted 17 years, from 1998 to 2015. As a visible result of the project, the number of households in the area increased from 163 to 1,446, and the population increased

from 239 to 4,207. Because of the population increase, a new elementary school was opened in 2008, and a new nursery school was opened in 2014.

Looking at the natural environment conditions in the area, almost 9%[2] (or 9.4 ha) of the area is maintained as parks and green spaces. However, the usage of the natural environment in the area changed drastically compared with the previous situation. Forests and wild lands, which local people could not use in the past, have been developed into parks and green spaces where residents can relax, experience biodiversity, and play (personal communication). In this way, it can be said that the attractiveness and value of the area has improved as a result of the landowners' activities.

3.2. Analysis of point A: financial management of reserve land disposal

This section and the next section examine the two hypotheses raised in Section 1.3 to consider a project's sustainability. Augmenting point A is "It succeeds in subsidizing the activity funds from the LC project." Consequently, the research analyzed how the funding of nature conservation activities was subsidized by the LC project and how the funding was utilized.

Table 1 shows that the income from reserve land disposal reached 13.9 billion yen and accounted for about 67% of the total. It can be said that most of the funds for nature conservation activities were also obtained this way.

Table 1 Classification of amount of LC project amounts (yen)

National subsidies	4.300,000,000
City subsidies	2.200,000,000
Reserve land disposal	13.900,000,000
Others	400,000,000
Total	20,800,000,000

- Strategic method for reserve land disposal

Mizuno, the chairman of the private implementation in the Nagakute Nanbu Area, notes that the following efforts were effective (Mizuno, 2006) Classifying the block of land into three land uses: A center district for commercial facility, an eco-residential area, and an industrial area. Then setting up reserve lands at the project planning stage; 2) Establishing reserve land sales committee by the chairman, director, and deputy director in order to grasp the end user's orientation; 3) Changing the project plan according to a market survey performed by the committee. As a result, businesses such as a supermarket, drug store, and book store were started in the center district. Newcomers began to live in houses in the eco-

[2] According to the Land Readjustment Law, it is required to save a green space park area of at least 3% of the project area and 3㎡ per person in the planned population.

residential area, and a large-scale building supply store opened in the industrial area. It can be said that the project succeeded in the sale of reserve land by establishing the appropriate reserve land in each area.

However, it should be noted that this fund-generating method was not planned for nature conservation activities (personal communication). When the LC project was launched, the Japanese economy was in a downturn, and it was predicted that the financial management would be difficult. Therefore, a policy for effective reserve land disposal was set up by the landowners. However, the policy succeeded in securing more profit than expected, resulting in a surplus. Because of this, it was possible to subsidize nature conservation activities.

3.3. Analysis of point B: Organization of landowner activities and sustainability

Arguing point B is "It succeeds in organizing voluntary activities through the LC project and shifts to other organizations after the LC project is completed." Therefore, this section considers the organization process of the landowners' nature conservation activities through LC project management and the transition into other associations after the project.

Regarding the organization of landowner activities, as mentioned in Section 3.1, there were landowners who undertook nature conservation from the beginning of the LC project. Therefore, those landowners established the division of nature conservation activities and began those activities during the project. However, since 2009, when the LC project came to an end, the problem arose of how to continue the activities after the project finished. Then, they examined the possible transition to other organizations. As a result, the transition to a general incorporate association (*Ippan shadan hojin,* 一般社団法人) "Nagakute Minami Satoyama Club" was established. There were about 13 members, including the landowners at the outset, which increased to about 50 members in 2017 (personal communication). Currently, funding for the activities is covered by a commission fee of 2 million yen from the Nagakute City for green space management work.

Besides the activities of the association, there was a characteristic effort related to daily activity. One example is the creation and operation of a "green space management manual," which visualized their activities and rules. This manual summarized the results of the survey during the LC project. In addition to the basic policies of activities, it included content such as tree inspection methods and a list of precious flora and fauna. It was used as reference material by the members.

3.4. Examination of the LC project management and its applicability to other LC projects in Japan

Effective financial management in the Nagakute Nanbu Area succeeded in subsidizing nature conservation activities. However, this occurred mainly because of the unexpected

surplus income. Therefore, the same method might not be appropriate for application in other LC project areas. In fact, there is a possibility that reserve land sales depend on the economic and geographic situation.

Regarding the sustainability of the organization in terms of human resources, the nature conservation activities were realized because landowners proposed and began action on their own. This relied heavily on the spontaneity of the landowners. They even addressed the need for a transit organization after the LC project, based on their understanding of the other landowners and residents.

The above analysis reveals some important issues by considering the applicability of nature conservation activities by landowners to other LC projects in Japan. One such issue is how to maintain the landowner's initiative in a long-term project. In the case of the Nagakute Nanbu Area, their goal to create a community that takes care of nature with the residents' help became ambiguous at the midpoint of the project. At that time, it became necessary to clarify the purpose and content of the activities.

Another issue is the importance of local government support. In the case of the general incorporated association in the Nagakute Nanbu Area, the funding was subsidized by a government commission fee. Concerning the financial sustainability of an organization that does not have internal revenue sources such as land after an LC project, it is important for such organizations to cooperate with the local government.

4. Conclusion

Section 1 raised the problems of current LC from the point of view of nature conservation. By reflecting on a previous LC project, especially during a high-economic-growth period, the disappearance of green spaces was exposed. On the other hand, there are some recent movements that tried to conserve natural resources in a LR project area. Also, landowners and residents in the area participated in activities that promoted nature conservation. As a case study of conducting nature conservation activities in a LC project, this study used the example of the Nagakute Nanbu Area, in the Aichi Prefecture, and set assumptions with two aspects of sustainability: One was the financial management method; the other was human resource management.

Section 2 introduced the basic concept of LC in Japan and explained its project flow. Then, it focused the characteristics of private implementation. This was because private implementation is an effective method that considers landowner-oriented project management, even though there is no such precedent in Indonesia.

Section 3 provided an outline of the Nagakute Nanbu LC project. One characteristic of the project was that landowners had some ideas about nature conservation activities and began those activities during the LC project with the goal of creating a community that was familiar with nature. Also, the paper analyzed the assumption. First, the financial

management of reserve land disposal was effective at the planning stage. Therefore, it succeeded in subsidizing voluntary activities such as events designed to experience and commune with nature. Then, the paper referred to the maintenance of a nature conservation organization. It examined how activities by the landowners transitioned to a general corporate judicial person. As a result, it revealed that the organization succeeded in attracting new members for nature conservation activities in the LC project area. Nowadays, their activities have funding from the city government as a commission fee for green space management work. The end of Section 3 described the applicability of these methods to other LC projects within the country. Regarding the sustainability of financial management by landowner activities during an LC project, the subject has not been addressed in the paper. That is because the sale of reserve land depends on the economic and geographic situation. Still, there is a need for an examination that focuses on many samples and data to consider the effective financial management of a LC project. On the other hand, the sustainability of a nature conservation organization has a relationship with LC project management. The transition of the landowners' activities succeeded because they tried to attract new residents to participate after the LC project term. Finally, the paper summarized some critical points of private implementation management based on its applicability in other areas. These are important for clarifying the purpose and contents of activities to maintain a basic vision of those activities and the support needed from outsiders, especially local government.

Appendix A. Voluntary activities in Nagakute Nanbu area

Theme	Purpose	Activities
Greenspace conservation	Experience nature	Rice-planting Pruning trees
Biological conservation	Conservation of natural habitat Experience biodiversity	Raising firefly Insect watching
Greenspace management	Continual use of greenspace	Checking growing condition Inspection of dangerous places
Regional cooperation	Strengthening local community	Round-table talk Making and distribution of local brochure Updating blog

Appendix B. Land classification of before and after the project

Items		Original (Before project)		Original (Before project)	
		Area (㎡)	Ratio (%)	Area (㎡)	Ratio (%)
Public facility lands	Road	25,824.49	2.63	194,587.30	19.82
	Park	652.87	0.07	30,003.14	3.06
	Green space	0	0	64,473.71	6.57
	Drainage	12,313.23	1.25	22,302.00	2.27
	Sub-total	38,790.59	3.95	311,366.15	31.72
Private lands and non-administrative lands	Private land	825,382.86	84.07	541.346.80	55.13
	Non-administrative lands owned by municipality	38,504.29	3.92	25,801.77	2.63
	subtotal	3,887.15	87.99	567,148.57	57.76
	Reserve lands	0	0	103,332.01	10.52
	Difference between registration and measurement	79,168.99	8.06	0	0
Total		981,846.73	100.00	981,846.73	100.00

Appendix C. Land contribution rate in Nagakute Nanbu LC project

Total average (%)	For public facilities land (%)	For reserve land (%)
9.86	28.90	10.96

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APPLICATION OF LAND CONSOLIDATION AS AN INSTRUMENT FOR TRANSIT ORIENTED DEVELOPMENT IN URBAN AREAS

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Abstract

Transit Oriented Development (TOD) is widely considered as an environmentally friendly way to develop urban areas, especially for metropolitan area. This concept encourages the use of mass public transportation and non-motorized transportation which contribute on reduction of carbon emission which also believed as one of transportation solutions for metropolitan problems. In many developed countries, TOD is applied almost in every major city. However, the application of TOD has never existed in Indonesia, although recently several plans of TOD have emerged in Indonesian cities. The success of TOD is highly depend on the use of suitable strategies and effective supporting instrument, beside it is consistently developed according to its concept and principles. One of instruments to support realisation of TOD in urban areas is by performing land consolidation. Land consolidation have been applied worldwide for different purposes and undertaken on both developed areas and new development areas. Its application for TOD on urban areas, which mainly characterized as developed and built up area, includes horizontal and vertical land consolidation. Application of land consolidation within designated TOD area also plays as financial instrument to defray TOD public facilities and infrastructures. The purpose of this study focuses on possibility and future challenges on utilization of land consolidation for TOD realisation. Literature study was the main method carried out for this paper in combination with author participation in various focus group discussions, meeting, and workshops held by different stakeholders regarding TOD. The result of this study concludes comparison and synthesis on how TOD can be realized through land consolidation in Indonesia with specific case study of Tokyo Metropolitan Area and Jakarta Metropolitan Area. Concern on what and how to address existing problems and future challenges on realisation of TOD by utilizing land consolidation as a financing instrument is specifically highlighted in the discussion.

Keywords: Land consolidation; transit oriented development (TOD); spatial planning; urban areas; metropolitan.

1. Introduction

According to UN Habitat, 60% world population will live in the city by 2030. The development of urban areas, however, comes both with positives and negatives effects. The negatives effects of urban growth as commonly understand are low density-sprawl, traffic congestion, air pollution and greenhouse gas emissions, and also lack of mobility for marginalized people (World Bank, 2015). Consequently, cities cannot be sustained by depending on mobility of private vehicles, therefore public transportation will be one of the most fundamental services provided in the city.

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Transit Oriented Development (TOD) is widely considered as an environmentally friendly way to develop urban area, especially for metropolitan area. Studies have shown that TOD, which typically characterized by higher density and mixed-use developments located around a transit station, are one of the most effective means of addressing the negative externalities o rapid urbanization (World Bank, 2015). This concept encourages the use of mass public transportation and non-motorized transportation which contribute on reduction of carbon emission. TOD is believed as one of transportation solutions for metropolitan area. In many developed countries TOD is applied almost in every major city or metropolitan area.

To date, the application of TOD is still non-existence in Indonesia. Transportation systems in Indonesia are highly dependent on the use of private motorized transportation. In addition, we acknowledge that spatial planning and transportation planning is still not fully integrated. The understanding of TOD is also different from one stakeholder to others. However, some plans of TOD application has emerged recently in several major Indonesian cities, as an example is Jakarta Metropolitan Area, the biggest metropolitan area which serve as the capital city of the country. An attempt to guide stakeholders to the same understanding of TOD has been done by the central government by issuing Ministerial Decree of Agrarian Affairs and Spatial Planning on Transit Oriented Development Guidelines and regulates how importance its integration into spatial planning documents. Aside from developing according to its concept and principles, the success of TOD is also highly depend on the use of suitable strategies and supporting instruments. One of instruments to support TOD in urban areas is by application of land consolidation.

Land consolidations practices have been applied worldwide for different purpose and several similarities and differences. Basically the application of land consolidation can be undertaken on both developed area and new development areas. The application of land consolidation for TOD on urban areas which mainly are developed area will include both horizontal and vertical land consolidation.

The purpose of this paper will focus on the opportunities and the possibility use of land consolidation on TOD in urban areas. Therefore several background, concepts, and lesson learned of both TOD and land consolidation will be served as part of the literature study before arriving at the result and discussion as the last part of this paper.

2. Material and Methods

2.1. Definition and Concept of Transit Oriented Development

Concept of Transit Oriented Development (TOD) was introduced in 1993 by Peter Calthrope through his book "The New American Metropolis" by reviving or rebranding of an old concept (Carlton, 2007). TOD has been generally accepted as a concept of mixed-use community that encourage people to live near transit services and to decrease their

dependence on driving (Still, 2002). Not only seen as an environmental sustainability movement, TOD is also believed as regional growth catalyst. To help a quick understanding of the TOD concept, Carlton (2007) has summarized the key component of TOD, as follow: 1) growth on a regional level to be compact and transit-supportive; 2) place commercial, housing, jobs parks, and civic uses within walking distance of transit stops; 3) create pedestrian-friendly street networks that directly connect local destinations; 4) provide a mix of housing types, densities, and costs; 5) preserve sensitive habitat, riparian zones, and high-quality open space; and 6) make public spaces the focus of building orientation and neighbourhood activity (Carlton, 2007).

Many subsequent definitions, guidebooks, and manuals followed. But everything since has built on Calthrope's synthesis of ecological, aesthetic, pedestrian, anti-sprawl, regional, and equitable planning principles as widely applied in North America and Europe. The purpose of TOD is to provide more socially, environmentally, and economically sustainable communities (van Lierop et al, 2017). According to them, building denser, mixed-use development with the aim of decreasing reliance on the automobile is one way to reduce negative effects of urban sprawl which increased congestion on regional highways. By doing this way there will be improvements on both social and economic prosperity of communities (van Lierop et al, 2017).

According to Institute for Transportation and Development Policy (ITDP), TOD means integrated urban places designed to bring people, activities, buildings, and public space together, with easy walking and cycling connection between them and near-excellent transit service to the rest of the city which translates as inclusive access for all to local and citywide opportunities and resources by the most efficient and healthful combination of mobility modes, at the lowest financial and environmental cost, and the highest resilience to disruptive events. There are 8 principles of TOD which stated on the TOD Standard by ITDP, namely: 1) walk, developing neighbourhoods that promote walking; 2) cycle, prioritize non-motorized transport networks; 3) connect, create dense networks of streets and paths; 4) transit, locate development near high-quality public transport; 5) mix, plan for mixed uses, income, and demographics; 6) densify, optimize density and match transit capacity; 7) compact, create regions with short transit commutes; 8) shift, increase mobility by regulating parking and road use (ITDP, 2017).

Meanwhile, Ministry of Agrarian Affairs and Spatial Planning of Indonesia has recently published Guidelines on Transit Oriented Development initiated by Directorate General of Spatial Planning (Ministerial Decree of Agrarian Affairs and Spatial Planning No. 16/2017). There are 5 main scopes of the guidelines, comprises: 1) TOD principles; 2) consideration and determination on location of TOD area; 3) development of TOD area; 4) institutional arrangement of TOD area. In this ministerial decree, transit oriented development is defined as a concept of area development inside and surrounding transit node to add value which focus on integration among mass public transport networks and among mass public

transport networks and non-motorized transportation networks, and also usage reduction of motorized transportation accompanied with mixed-use development and density of land utilization from medium to high. The development is suggested between radius of 400 to 800 metres.

2.2. Definition and Concept of Land Consolidation

As summarized on the Report of Land Readjustment Study by Directorate General of Spatial Planning, Ministry of Public Works (2015), land consolidation practices have a long history. It had been introduced for the first time by the first United States of America's president 'George Washington' in 1971 by making agreement with land owners in the area now known as Washington DC. However, the first legal framework for land consolidation for the first time was formulated in 20th century in Germany in 1902 (Hong and Needham, 2007; Lozano-Gracia et al., 2013). The initial aim of this land consolidation legal framework was to readjust agricultural land classification to build land for development by Frankfurt Mayor. After this initiative land consolidation were widely common practices for more than 100 years in Germany as an instrument for urban development (Müller-Jökel, 1993).

According to the literature study, land consolidation in Japan was familiarly recognized as land readjustment (Directorate General of Spatial Planning, 2015). Land readjustment used in English to translate *'Kūkaku Seiri'* in Japanese which later on also had been introduced in the international conference on Land Consolidation in Taiwan in 1979 under umbrella of the World Bank as it was open to be implemented in urban areas. It was actively utilized it as an instrument to reconstruct cities after earthquakes and World War II (Hong and Needham, 2007). Therefore in Japan, land consolidation known as *"Mother of City Planning"*. Later on, land consolidation is commonly used as instrument for new growth area development as part of urbanisation solution in major cities.

Although there is different terminology from one country to another including institutional and its legal framework, however urban development using land readjustment by converting property right by means of merging, sharing, relocating, exchanging, and modifying the size and shape of parcels based on the new layout plan and physical improvement together are essentially the same. During reconfiguration process, a portion of land will be reserved for sale to private developers to raise funds to finance a portion of the redevelopment costs, the benefits generated by the project are captured (Suzuki, et al., 2015). Land consolidation were extensively applied in Germany and Japan which afterward had been adopted by other European countries such as France, Netherlands, Finland, and Turkey as well as Asia-Pacific countries namely Australia, India, Indonesia, South Korea, Taiwan, and Hong Kong.

In Indonesia land consolidation is governed by Decree of Head of National Land Agency No. 4 Year 1994 concerning Land Consolidation. According to this regulation, Land Consolidation is defined as land policy on reordering land tenure, land use, and also land procurement for the interest of development to improve environmental quality and natural

resources maintenance involving active community participation. Object of land consolidation can be located either in urban or rural areas. Based on this guideline, land consolidation only can be carried out if at least 85% of the land owners which represent 85% of total proposed land to consolidate agree the project. In order to readjust land tenure and land use of land consolidation object, the participants should hand over part of their land as contribution on development of transportation infrastructure and other public infrastructure and also financing the land consolidation project. However, to date a draft of Ministerial Decree of Agrarian Affairs and Spatial Planning concerning Land Consolidation is being prepared for the most updated regulation following dynamics and needs of development.

2.3. Methods

The first step of this study, the author learns how the concept of TOD has been applied as well the best practices on application of land consolidation for realisation of TOD. Literature materials were gathered through an extensive search for free access sources utilizing for example Google or Google Scholar and academic literature provided by academics as part of study on TOD and land consolidation by Directorate General of Spatial Planning, Ministry of Agrarian Affairs and Spatial Planning and previously under Ministry of Public Works. Additional relevant literatures were selected by searching the references cited in each paper. The study later on emphasize on how land consolidation can be one of best instruments to finance TOD as part of value capture mechanism.

The third step of the study was to review and analyse policy and plan regarding TOD with case study of Jakarta Province as part of Jakarta Metropolitan Area. The sources from this third step were gathered from different methods. The sources related to Jakarta spatial plan and other policies regarding TOD were collected directly from Jakarta Province Government through Human Settlements, Spatial Planning, and Land Agency by survey activities and also through various meetings related to TOD such as focus group discussion, workshop and/or internal/bilateral meeting held by different stakeholders attended by the author. Finally, the last part of this study concludes how land consolidation can be used as one instrument to realise TOD in urban area followed by discussion that focus on how existing problems and potential challenges should be addressed.

3. Results and Discussion

3.1. Results

Many urban areas especially in developing countries including Indonesia face a massive urbanisation and insufficient urban infrastructures to accommodate needs of urban population. Among other problems are lack of urban management, difficulties on land acquisition, and limited budget of either central government or local government to finance urban development according to spatial planning direction. Therefore, one of financial

source for development can be from community who own land parcels through a land consolidation mechanism as one of spatial utilization programme.

According to Ministerial Decree of Agrarian Affairs and Spatial Planning concerning Guidelines on Transit Oriented Development, land consolidation is one of the instruments that can be performed in order to utilize urban space productively and efficiently as well as play a role as a financing instrument for TOD area. In term of transit oriented development in urban area, land consolidation is carried out through three stages: 1) inventory of land tenure, ownership, use, and utilization; 2) land provision for public interests; 3) infrastructure construction.

The following part, shows results of this study includes: a) how land consolidation/land readjustment works as land value capture mechanism; b) elaboration on lessons learned of TOD realisation through land consolidation in Japan, case study of Tokyo Metropolitan Area; and c) challenges on TOD realisation through land consolidation in Indonesia, case study of Jakarta Metropolitan Area.

A. Land Consolidation/Land Readjustment Works as Land Value Capture Mechanism

Land value capture is defined as financial and regulatory mechanisms which the process from increased land value will be spent for financing infrastructure development such as transit line and station development within TOD area (Suzuki et al., 2015). Land consolidation as also best known as land readjustment in Japan is one of instruments of land value capture, specifically development based. Beside land readjustment, air right sale and urban redevelopment schemes is instrument that can be used to finance TOD as also have relevancy with land consolidation process. These instruments have similarities with some instruments mentioned on Ministerial Decree of Agrarian and Spatial Planning concerning Guidelines of Transit Oriented Development which furthermore the applicability is also elaborated as presented in the following table. The development-based land value capture does not only work as a financing instrument but also as an urban planning and public policy instrument to promote competitiveness, environmental sustainability, and social equity through realization of TOD (Suzuki et al., 2015).

Table 1. Instruments Comparison for Implementing TOD

Land Value Capture Instruments Development-based		**Supporting Instruments of TOD and Its Potential Applicability**	
Land sale or lease	Governments sell developers land or its development rights, whose values have increased due to a public investment or regulatory change, in return for an up-front payment, leasehold	*(Not specifically specified)*	Even though it is not specifically specified in the guidelines, the local governments are able to implement land sale or lease by developing cooperation

Land Value Capture Instruments Development-based		**Supporting Instruments of TOD and Its Potential Applicability**	
	charge, or annual land rent payments through the term of the lease		with private sectors or business entities according to prevailing laws and regulations
Joint development	A well-coordinated development of transit station facilities and adjacent private properties between transit agencies and developers, where the latter usually contribute physically or financially to the construction of the station facilities, as their property value will increase due to the transit investment. Used in Japan, the United States, and other countries	*(Not specifically specified)*	Joint development is a very possible ways of realizing TOD area, the cooperation can be developed using mechanism as regulated on Presidential Decree No. 38 Year concerning Government Cooperation and Business Entities
Air right sale	Governments sell development rights extended beyond the limits specified in land use regulations (such as floor area ratios [FARs]) or created by regulatory changes to raise funds to finance public infrastructure and services	Bonus zoning	Conditional exchange mechanism of additional Floor Area Ratio (FAR) granted to community or land owners within TOD area in order to develop area for public interest. This instrument has also been used by Jakarta for realizing the TOD area as regulated on the detailed spatial plan
Land readjustment	Landowners pool their land and contribute a portion of their land for sale to raise funds and partially cover public infrastructure development costs	Land consolidation	Instrument to realize spatial utilization productively and efficiently. Land consolidation is arrangement of land tenure, ownership, use, and utilization according to spatial plan, as well as providing land for public interest both on land that has not been built and already built and infrastructure in order to improve environment quality and maintain natural resources by actively involving community participation
Urban redevelopment schemes	Landowners and a developer establish a cooperative entity to consolidate piecemeal land parcels into a single site that they then develop (such as a high-rise mixed-use building) with new access roads and public open spaces. The local government modifies zoning codes and increases maximum FARs in the targeted redevelopment areas (typically	Transfer of Development Right (TDR)	Instrument to encourage voluntary diversion of the right to build from a protected or conserved area to expected area to develop. This instrument has also been used by Jakarta for realising the TOD area as regulated on the detailed spatial plan

Land Value Capture Instruments Development-based		Supporting Instruments of TOD and Its Potential Applicability	
	around rail transit stations) and finances the infrastructure. Mainly used in Japan		
Source: *Suzuki et al., 2015*		***Source:*** *Adapted from Ministerial Decree of Agrarian Affairs and Spatial Planning concerning Guidelines of Transit Oriented Development and author analysis based on various sources*	

B. Lessons Learned of TOD Realization through Land Consolidation in Japan, Case Study: Tokyo

Tokyo provides one of the best experiences in applying development-based land value capture, especially through land readjustment in order to realise TOD by financing railway investments with the revenues from real estate development (Suzuki et al., 2015). This practice is mainly used on urban fringes and also urban built-up areas as part of redevelopment schemes, where property rights are fragmented. However, according Suzuki et al. (2015), the successes of these instruments are highly depending on strong community ties, where the consent of more than two-thirds of landowners is obtained, or adequate economic incentives. The idea of land readjustment of TOD area is landowners within the designed areas give up and reserve percentages of their land for public uses, including the transit facilities or land sales to generate funds for public investments. Although the land parcels received by the original landowners are smaller after the land readjustment, however the values of the land would be higher because the provision of a new station and other local infrastructure and service.

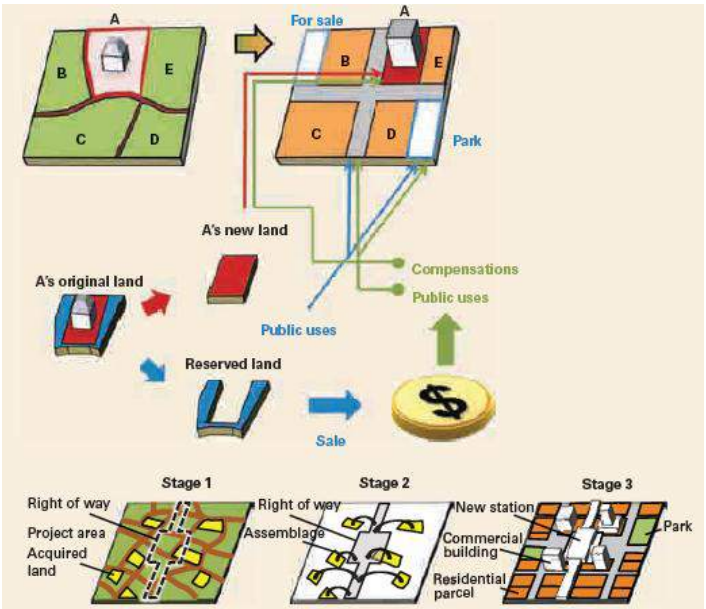

Figure 1. Integrated Land Readjustment for Tsukuba Express
Source: Suzuki et al., 2015 as adapted from Chiba Prefectural Government 2009

The implementation of land readjustment for TOD area can also be combined with zoning bonus scheme and/or with transfer of development right within TOD area as part of urban redevelopment scheme as regulated on detailed spatial planning document and zoning regulation/codes where the designated area is planned as a mixed-use area with higher floor area ratios (FAR). An illustration of how these have been done in Japan is illustrated below.

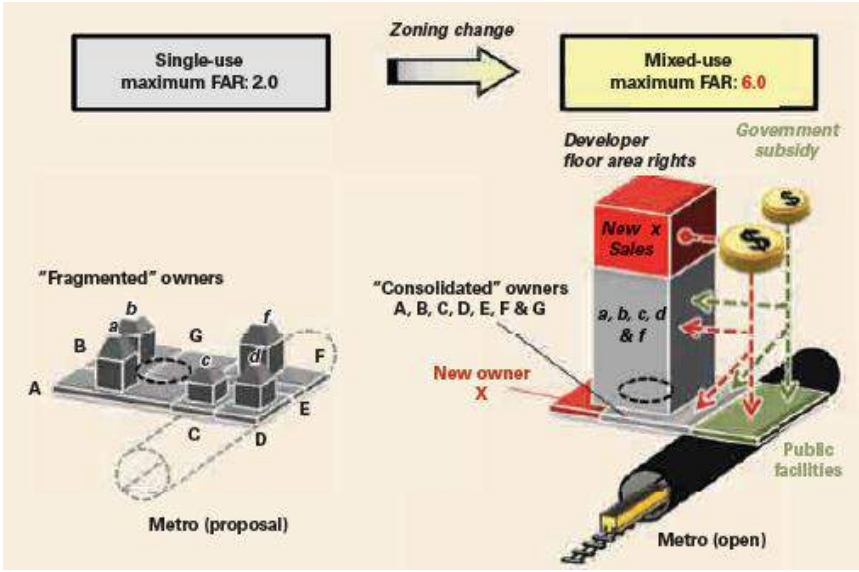

Figure 2. Urban Redevelopment Scheme for TOD Area
Source: Suzuki et al., 2015 as adapted from Ministry of Land, Infrastructure, Transport, and Tourism 2013

In Japan, land consolidation or land readjustment is one instruments of land value capture in order to implement TOD. Through land readjustment, landowners pool their land together for reconfiguration and contribute a portion for sale to finance public infrastructure. However, there are several lessons learned or success keys on the implementation of land readjustment for realization of TOD as part of urban redevelopment. According to Suzuki et al. (2015), within the urban redevelopment scheme using land readjustment involves multiple stakeholders from public, private, and semi-private entities therefore all stakeholders need to share a clear vision and take collective actions through a consensus building. In order to have a sustainable of operation, the railway agency as main operator in TOD area needs to be entitled to keep the long-term ownership and management of properties to generate continue revenues from both development and services activities around stations (Suzuki et al., 2015). According to them, by having adequate knowledge on how the value of their land would significantly increase within TOD area, major landholders or developers in designated TOD area can support land readjustment projects and more likely to invest in local infrastructure. Substantial density bonuses should be provided as incentives for private transit agencies and developers in order to encourage

them in supplying social infrastructure and services for creating high-quality built environments around a station. The contribution and benefits of using this scheme on TOD area realization is nicely summarise by Suzuki et al. (2015) on their book as illustrated in the following table.

Table 2. Stakeholders Contributions and Benefits on Urban Redevelopment Scheme for TOD Area in Japan

Stakeholders	Contribution	Benefit
Landholders (A, B, C, D, E, F & G)	Land parcel for the new building	Joint ownership of land for the new building (sections A, B, C, D, E, F & G) with higher access and better local infrastructure and service provision
Building owners	Old buildings and housing units	Ownership of the new building (sections a, b, c, d & f) with higher access and better local infrastructure and service provision
Developer	Capital and property development expertise	Profit form section X and from surplus Floor Area Ratio (FAR)
Transit agency	Construction of transit station	Transit-supportive environment/increased ridership
National government	Subsides for land assemblage and road construction	Save road and other public infrastructure construction costs
Local government	Change in zoning code (from single use to mixed use with higher FAR)	Yields higher property tax revenue; promotes local economic development; build township resilient to natural disasters

Source: Suzuki et al., 2015

C. Challenges on TOD Realization through Land Consolidation in Indonesia, Case Study: Jakarta

According to Detailed Spatial Plan of Jakarta, there are 8 planned TOD areas. Along with the spatial plan, there is a regulation regarding Transit Oriented Development stipulated as Governor Decree No. 44 Year 2017. The regulation scope of this Governor Decree is planning principles, classification, and development criteria; development mechanism; technical direction of spatial utilization; and also management aspect. In Jakarta, TOD area will be managed by an entity that is appointed by Governor as master developer. The master developer will be the main transportation operator in TOD area as usually in developed countries are also railway operator. The main operator of TOD works under supervision of Jakarta Human Settlement, Spatial Planning, and Land Agency. The main responsibilities of the master developer TOD area includes:

a. to coordinate landowners and/or building owners within planning and development area
b. to encourage acceleration of facilities and infrastructures construction TOD area in accordance to Urban Design Guidelines

c. to coordinate landowners and/or building owners, tenant and also all related stakeholders in management, maintenance, and control over TOD area
d. to monitor development execution of TOD area

In order to encourage and control TOD area growth, the local government gives incentives and disincentives to landowners and/or building owners according to planning principles of TOD area. Besides that, management of potential value added has been also regulated and more detail regulations are following this regulation, such as regulation on profit sharing or compensation on additional allowed Floor Area Ratio (FAR).

Even though several regulations are already available, however the implementation stage of TOD area in Jakarta faces a lot of problems and challenges. From a set of meetings, focus group discussions, and workshops on TOD attended by the author, there are several main problems and challenges, especially in Jakarta, that can be identified:

– Not all stakeholders have the same understanding on the concept and ideal objectives of TOD
– There is need for harmonization between regulatory components of TOD implementation namely transportation network, urban development, organization, and financial arrangements. The main regulatory issues of each these components have been mapped by KPPIP Support Facility, Coordinating Ministry for Economic Affairs (2017) as follow:

Table 3. Identification of Regulatory Issues of TOD Implementation in Jakarta

Regulatory Category	**Regulatory Issue**
Organization	1. Coordinator for TOD planning and implementation
Financial Arrangement	2. Funding for public infrastructure development for TOD (Land Value Capture) 3. Cost allocation for TOD related public facilities
Transportation Network	4. Requirements of inter-modal facility development
Urban Development	5. Securing usage right of underground/air space 6. Construction and management for commercial space in station facility

Source: KPPIP Support Facility, Coordinating Ministry for Economic Affairs, 2017

– According KPPIP SF, Coordinating Ministry for Economic Affairs (2017), a coordinator committee is needed for TOD planning and implementation due to a lot of project components and stakeholders, especially in TOD area with regional service
– There are a lot of proposed TOD area by land or property developer which do not meet the requirement of TOD principles and criteria due to promising advantages they expect can obtain without consideration of integration of transportation aspect
– There are need of a clear regulation on how spatial utilization right of land above ground and underground in TOD area, including its permit mechanism within different land ownership either public land or private land, as part of legal certainty of TOD area

management for all involved stakeholders as emphasized by MRT Jakarta during several meetings

– Institutional arrangement or framework of TOD area management should be firmly built, however it should accommodate the difference on typology or characteristic of TOD area. Figure 3 is an illustration according to study by MRT Jakarta (2017) which shows how value capture can be implemented in TOD area in Jakarta

Figure 3. Value Capture Concept within TOD Area in Jakarta
Source: Translated and adapted from MRT Jakarta, 2017

As an example, TOD area Dukuh Atas is one of the designated TOD area in Jakarta. The following is the summary of presentation of Head of Human Settlement, Spatial Planning and Land Agency of Jakarta Province on the 2nd Workshop of TOD by KPPIP SF, Coordinating Ministry for Economic Affairs in Jakarta, April 20, 2017. Dukuh Atas is located in very strategic area of Jakarta in Sudirman-Menteng corridor which will be the new centre of economic growth, national and international scale, with close proximity to Kuningan Golden Triangle Area. The area is planned as mixed-use area where commercial use meets residential use. TOD Dukuh atas will serve as a regional TOD and one of transportation hubs in Jakarta. Several transportation modes will have its station in this area such as MRT Jakarta, LRT Jabotabek, LRT Jakarta, Airport Rail, Commuter Rail, and also Transjakarta. TOD Dukuh Atas will be developed within radius of 350 to 700 metres. However, this TOD area will face a lot of challenges on the implementation due to the following problems:

– Not all transit nodes are integrated
– Some area is still under developed
– Unstructured and scattered buildings in relatively poor condition
– Disconnected pedestrian circulation between Thamrin and Sudirman corridor
– Poor condition utilities (drainage and sewerage)

– Challenge on identification of land administration information or type of property right in the area, as shown in Table 4.

Table 4. Zone Identification Based on Type of Property Right

Type of Property Right	**Percentage of Parcels (%)**					
	Southern Part of Melati Reservoir	**Western Part of Melati Reservoir**	**Eastern Part of Melati Reservoir**	**Northern Part of Sudirman Station**	**Western Part of General Sudirman Statue**	**Southern Part of Landmark**
No data	88.32	78.12	39.96	19.63	-	-
Building-use right	1.87	12.26	36.74	33.08	61.76	89.33
Other right	6.62	4.67	9.34	14.00	34.40	9.76
Ownership right	0.76	3.62	11.78	26.69	-	0.45
Utilization right	2.34	1.10	4.69	6.58	3.84	0.45
Endowment right	0.10	0.23	0.49	-	-	-

Source: Adapted from Chandra, Head of Human Settlement, Spatial Planning and Land Agency of Jakarta, 2017

The redevelopment of this area will involve a lot of stakeholders, therefore public-private partnership is highly encouraged for this area. To date, a master plan or urban design of the area is prepared where several implementation stages will be carried out, which includes:

1. Carry out traffic calming within the TOD area, as walkable area
2. Change main road of Thamrin-Sudirman corridor as "Dukuh Atas Interchange Plaza" with priority for pedestrians
3. Switch the existing main road to a new fly over, above "Dukuh Atas Interchange Plaza"

The objective of these steps is to prioritize interconnection of pedestrian circulation as close and efficient as possible as well as make connection between blocks with less dependency on motorized vehicles. As an instrument to make the vision of this area reality, the government of Jakarta Province has considered the application of land consolidation by starting the identification of property right of each parcel in the area of TOD Dukuh Atas.

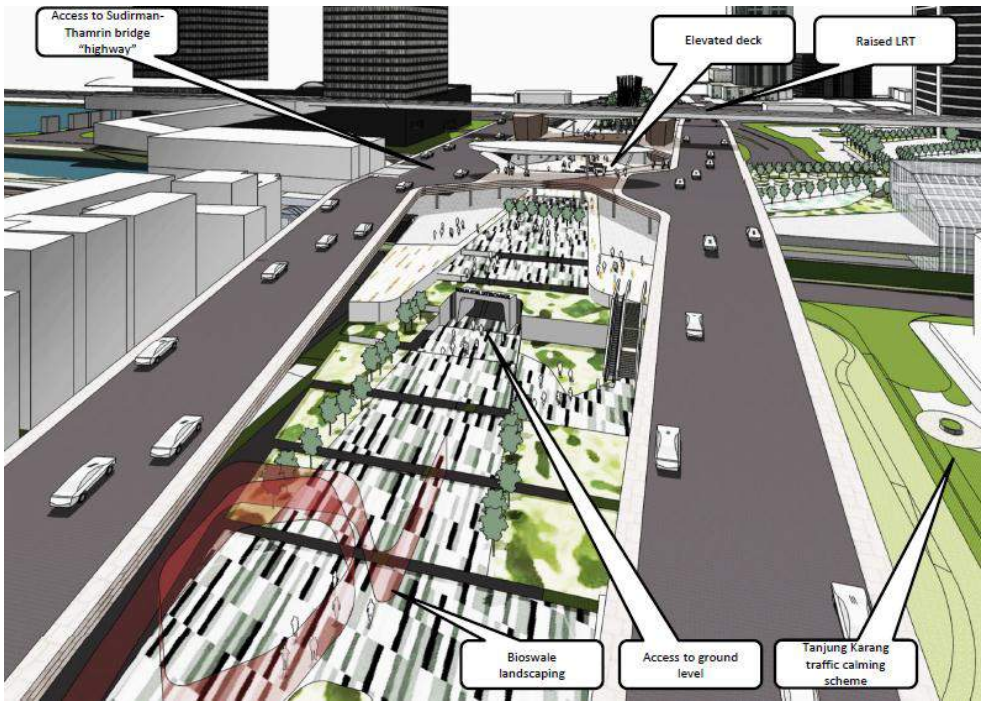

Figure 5. Illustration of Dukuh Atas Interchange Plaza in TOD Dukuh Atas
Source: Chandra, Head of Human Settlement, Spatial Planning and Land Agency of Jakarta, 2017

3.2. Discussion

Based on the study, there are some conclusion that can be drawn as well as several points that are still open for discussion along with the implementation process for the best solutions. The following points serve as the conclusion of the study:

- Land consolidation is one of the best instruments to be applied for TOD area realization in Jakarta, which is mostly built-up area where land tenures are too fragmented, as part of redevelopment of the city where land acquisition is very expensive;
- Land consolidation work as financial instrument or arrangement of TOD area by following land value concept in combination with the other land value captures which are already regulated its possibility to be applied according to detailed spatial planning document of Jakarta and supported by other regulations such as Government Decree;
- Development-based land value capture (LVC) helps "capture" property value increases due to transit investments. This revenue can be used to help cover the cost of transit infrastructure and maintenance, and agreements for development rights transfers can include provisions such as services and facilities for low-income groups. It can generate not only direct revenue from land value increases attributed to transit investments but also more sustainable long-term revenues from properties, such as retail shops, leisure facilities, parking, and residential buildings to be developed around station areas, and increased transit ridership due to TOD (Suzuki et al., 2015).

However, several future challenges are still awaits and subjects to be addressed, among others:

- The success of land consolidation is very much depends on the willingness of participation of land owners in the area, therefore promotion on how this practice will benefit all involved stakeholders should be encouraged by local governments as well as the later management of the TOD area which also cannot be separated with the foundation of public-private partnership;
- Legal basis on the spatial utilization of the area should be clearly solved including the type of the utilization right both within land under public ownership and private ownership, not only above ground, but also underground which also related to the vertical land consolidation mechanism;
- Governance framework or institutional arrangement on how the TOD area will be managed should be in agreement, there is possibility that a coordination committee is needed for a more complex area, however a more modest form can also be applied as long as the value captured of TOD area can be optimized;
- Identification of an accurate data on type property right which also represent the stakeholders of the area is very fundamental where implementing land consolidation for TOD area which for Jakarta Province is still one the most challenging problems to be solved.

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IMPROVEMENT OF IMPLEMENTATION OF LAND CONSOLIDATION FOR EFFECTIVE SPATIAL UTILIZATION IN THE FRAMEWORK OF NATIONAL RESILIENCE

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Abstract

The central issue of this paper would like to describe how to improve the implementation of Land Consolidation (LC) in order to make effective spatial utilization in the framework of national resilience. The above questions will be responded when the condition of LC regulation is still weak, public space awareness is still low, the spatial perspective of human resource in the Ministry of Agrarian and Spatial Affairs / National Land Agency tend to weaken, and institutional synergism associated with the implementation of LC is still not built. The method used is the method of policy analysis. Data were collected in document studies and interviews to key informants. The data were analyzed qualitatively by the policy analysis method developed by National Resilience Institute (Lemhannas). The results show: *first,* the LC legislation and regulation has not been adequate to implement LC that can encourage effective spatial utilization to realize national resilience. *Second*, public space awareness is still low, so the participation of the community in the implementation of LC is difficult to obtain. *Third*, the spatial perspective of human resource in the Ministry of ASA / NLA is weakening due to various programs and activities of the Ministry of ASA / BPN focused on land certification. *Fourth*, the misplaced singergism between the land authority implementing the land arrangement has not yet been developed with other agencies related to the development of follow-up to the implementation of LC. It is therefore recommended that at the policy level be revitalized the implementation of LC in Indonesia. The policy is manifested into 4 (four) strategies. First, to prepare the basis of LC implementation through legislation and regulation. Second, building public space awareness to participate in the implementation of LC through education, socialization, and dissemination. Third, strengthen the spacial perspective for human resource in the Ministry of ASA / NLA for capacity building through education, training, workshops, and habituation. Fourth, realizing institutional synergism in the implementation and follow-up of implementation through coordination and cooperation. The four strategies must be realized in concrete efforts to revitalize the implementation of LC in Indonesia.

Background

Land Consolidation (LC) is an effective effort for spatial utilization because integratedly utilizing the space by rearranging possession, ownership, use and utilization of land. After the Spatial Plan of the City /Regency (hereinafter abbreviated as RTRWK/Kab) allocates space allocation, the implementation of RTRWK / Kab can be applied through the concept of LC, especially for spaces or landscapes where the condition of land possession and land ownership are not orderly and the use and utilization the land is irregular. Strictly, the concept of LC can be applied to rearrange a condition of slum areas, coastal and mountainous conditions damaged by natural disasters. Unfortunately, the reality shows that LC has not been an important option to rearrange part of the urban area that grows without direction or develops into slum areas[1] and has not been massively used to restore

[1] Oloan Sitorus, , Limitations of Urban Land Consolidation Law as a Participatory Land Policy Instrument in Spatial Planning in Indonesia, Partnership of Indonesia's Land Policy, Yogyakarta, 2006, p. 192-198.

territorial damage due to the tsunami disaster in Aceh on 26 December 2004[2] and the destruction of cultivated land caused by eruption of Mount Merapi in 2010[3].

The implementation of LC to streamline the utilization of space has not been optimal. After LC participants get certificate of land ownership, there is no serious effort to follow up LC activities with physical development (such as the development of road infrastructure and other infrastructure), so in reality the field of LC implementation still needs to be improved. Therefore, the central issue of this paper is: "How to improve the implementation of LC in order to make effective use of space in the framework of national resilience?"

The discussion of the above central issues is used with the PISO Analysis (Parallel Input Serial Output) used by the National Resilience Institute (Lemhannas), which is a qualitative problem-solving analysis using SOM (Subject, Object and Method) Methods. In this analysis, there are three inputs, namely Principal Issues (current conditions), instrumental inputs (national paradigms, legislation, and supporting theories), and environmental inputs (global, regional and national strategic environment and opportunities and constraints). Main Input Problems that have been decomposed in SOM are analyzed simultaneously (parallel) with the 2 (inputs) (instrumental input and environmental input), so that it exits sequentially (serial) an output (expected conditions), then output concrete), which finally the problem can be overcome.

The Foundation of thought

LC in the national paradigm has a clear reference both to the ideological basis of Pancasila in this respect to humanity, social values and social justice in the Second, Fourth and Fifth Principle. The constitutional basis of LC refers to Article 33 Paragraph (3) of the 1945 Constitution. The insight of the archipelago as a visual basis means that LC can realize the unity of the nation's territory. Furthermore, National Resilience as a conceptual foundation means that LC through the arrangement of Geography Aspect helps national development to realize national goals.

Furthermore, the operational basis of the implementation of LC can be found in various laws and policies of the Government. Settings at the higher level of rules are still summarized and sporadic. More detailed settings are found only at the level of NLA Head Regulation. Sporadic law-level arrangements can be found in the following laws: (a) Act no. 5 of 1960 on the Basic Agrarian Law (more abbreviated as UUPA), especially Articles 2, 6, 12, and 14; (b) Act no. 26 Year 2007 on Spatial Planning, particularly Article 65 Paragraph (2) and Elucidation of Article 33, which states LC is one form of land stewardship; (c) Act no. 1

[2] Oloan Sitorus, et al., Land Consolidation as Restoration of Damage to Tsunami Affected Settlements in Aceh Province, Strategic Research Report Lecturer STPN, 2009, p. 4. .

[3] Oloan Sitorus, Land Consolidation in Disaster Area III of Merapi (Introducing ecotourism-based implementation in Kecamatan Cangkringan - Sleman, Paper written to fulfill Letter of Head of Regional Office of BPN Provinsi DI Yogyakarta No. 0023 / 400-34 / 1/2014 dated January 6, 2014, to be submitted to the Consolidated Land Control Team Meeting of Yogyakarta Special Region along with the Coordination Team of Land Consolidation of Sleman Regency, Hall of Regional Office of BPN Provinsi DIY, Tuesday, 21 January 2014.

of 2011 on Housing and Settlements, which in Article 1 point 18, 106, 108, 109 found the formulation of LC and regulation of LC as an instrument of providing land for housing and settlements, as well as sufficient approval obtained from 60% of land owners; (d) Act no. 20 Year 2011 on Flats, especially Article 22 stating that the provision of land for the construction of flats can be done with LC; (e) Government Regulation No. 16 of 2004 on Land Use, particularly Article 22 stating that the provision of land for the construction of flats can be done with LC; (f) Regulation of BPN Head No. 4 of 1991 on Land Consolidation and its various technical policies.

Ida Nurlinda said that LC is an important instrument for the realization of spatial planning and integrated and participative regional development[4]. The role of LC in spatial planning is in the utilization of space allocated by the Spatial Plan, in this case RTRWK / Kab. Precisely, Djoko Sujarto illustrates that LC can play a role in realizing the allocation of space allocation as determined in the Spatial Plan when LC is implemented to realize a more detailed Spatial Plan for the implementation of the development of a region[5].

Nad Darga Talkurputra said that LC is a land policy intended to rearrange irregular land areas into orderly land areas in accordance with the allocation of allocations in the Spatial Plan, relying on community participation[6]. The participation of the community referred to in the concept of LC or landreadjustment is its participation in expressing its willingness as a participant of LC itself as well as its willingness to submit land contribution (sharing contribution), which in Indonesian legislation is called Land Donation for Development (hereinafter referred to as STUP) . Without the Land Contribution land (STUP) policy or structuring of the territory it is not worth mentioning as LC or landreadjustment. Therefore, it can be said that Land Contribution (STUP) is an existential element in LC concept.

Masayuki Hayashi, expert of the Japan International Cooperation Agency (JICA), who worked at the Center for Research and Development - BPN on April 1, 1992 - March 31, 1994, pointed out the weaknesses of LC in Indonesia are: (a) the purpose of LC implementation in reality only over land rights structuring; (b) improper location determination because it only focuses on suburban and rural areas, which do not require urban development; (c) obstacles in the improvement of public facilities (lacking for improvement of public facilities), because it is considered not the domain of the land authority; (d) the improvement of incomplete improvement of land parcels because they are not designed to be usable and marketable (e) ineffective cooperation among other agencies concerned, such as planning authority, employment general, and housing and settlements; (f) the limitations of implementing bodies that are only land authorities); (g) financial-related constraints (finances), so LC can not be self-sufficient financially; (h) information and promotion

[4] Ida Nurlinda, Land Consolidation Method for Participatory Land Acquisition and Integrated Spatial Planning, Journal of Law no. 2 Vol. April 18, 2010, p. 172-173.

[5] Djoko Sujarto, Land Consolidation and Land Bank as Urban Land Management in Development Planning, Presented in Focused Discussion: "Consolidation in Urban Area Spatial Planning", implemented by Bappenas, Jakarta, 2001, p. 78.

[6] Nad Darga Talkurputra, Urban Land Acquisition Through Partnership, Paper presented at CIDES-LAP National Convention with theme "Strengthening Public Participation in Spatial Planning and Sustainable Development, Jakarta 7-8 May 1996.

limitations in the form of practical manuals for technical matters and legal procedures; (i) evaluation methods for land parcels that are deemed unfair as all participants contribute equally (area method), while construction of roads in narrow streets for a long time is only realized; (j) related to the limitations of the law because the legal basis for its implementation is only made by the Head of BPN[7].

The findings of the study by Masayuki Hayashi have not been taken seriously by the land authority. In the legal aspect of LC, for example, the research of Law Dissertation of USU, 2002, Oloan Sitorus, entitled "The Limitations of Urban Land Consolidation Law as a Participatory Land Policy Instrument in Spatial Planning in Indonesia", indicates that the weakness of the Urban Land Consolidation (ULC) subject to the Civil Code, in this case the Contract Law, has not been able to find a solution. For example, the rejection of the community in the planned location as a participant of ID cards, due to individual egoism and unreasonable reasons, can not be resolved by the regulation available. In addition, the availability of the regulation of law also has not been able to oblige the agency responsible for building the physical infrastructure of roads and other public facilities, because almost all the rules of the existing regulation are still internal-administrative that is not authorized to urge the authorities to follow up the completed implementation of ULC after arrangement of land aspects. It was also stated that the cause of the ineffectiveness of the law of ULC in mobilizing the participation of the community in the implementation of ULC originated from the limitations of the legal matter of ULC itself in accommodating the aspirations and public participation in the implementation of ULC. Such limitations include the disadvantages of the regulatory policy and the substance of the rules themselves. In terms of regulatory policy, the lack of commitment of state officials has made ULC as a participatory development tool to solve various problems of urban land in Indonesia. Furthermore, when viewed from the substance of rules or policies available, the provisions on public participation in the implementation of ULC is still not adequate. Strictly, the legal material on ULC has not been able to act as an initial push for public participation in the implementation of ULC[8].

Current Implementation of Land Consolidation

Since 1980-2014, the implementation of LC in Indonesia has been carried out at 1,010 locations, with a total area of 174,496.07 Ha, the total public facilities obtained 20,761.21 Ha, and the number of participants 241,457 people[9]. In the last 10 years, there have been interesting notes, such as: the ability of Urban LC implementation to solve land conflicts, such as in Solo and in Asahan (North Sumatra), where the concept of LC is implemented in the framework of 'Urban Agrarian Reform' (Solo) activity and is framed by implementation of Agrarian Reform to resolve conflicts of Private Plantation Land with farmers (Asahan). In addition, the concept of LC is also applied to restore the tremendous damage caused by the

[7] Masayuki Hayashi, Final Report (Land Readjustment), JICA Expert Report on Urban Land Consolidation in March 1994, Publisher of BPN Research and Development Center, 1994, p. 15-17.

[8] Oloan Sitorus, op cit., p. 222-223.

[9] Directorate of Land Consolidation - Ministry of Agrarian and Spatial Affairs / National Land Agency, Implementation of Land Consolidation, 2017, p. 23.

tsunami disaster that occurred on December 26, 2004. However, its implementation which is only on the very limited area, makes LC less significant to make effective use of space in Solo, farmland / plantation in Asahan District, North Sumatra, and restore the damage caused by the tsunami disaster in Aceh. Moreover, there is a tendency in the last 10 years to implement LC in a small area.

In order for the hope of LC as a land policy to support the effectiveness of spatial utilization in the framework of national resilience, it is necessary to deepen the problems presented by Yuswanda Tumenggung following: (a) weak legislative aspects. Since there is no regulation which comprehensively regulates Land Consolidation, technical and operational rules are defined by Regulation of Head of National Land Agency. 4 of 1991 on Land Consolidation. (b) the institutional aspect is less supportive because of the commitment of all parties (community, local government and its implementers), resulting in the inability of completion of infrastructure development such as road construction and other facilities and infrastructure; (c) the social aspect of the acceptance of the community that is not 100% to LC, due to the objection to submit Land Contribution (STUP) which is usually 14% of the participant of LC; (d) the physical aspect, ie the possibility of shifting the position of the parcel and the displacement of the plot of land which may not be accepted by the LC participants; (e) aspects of mentality, namely the lack of awareness of various parties involved in the implementation of LC which may result in the failure of the implementation of LC[10].

It can be said that the aspect of legislation is still very limited due to the complete rules only with Regulation of Head of BPN. 4 Year 1991. Social aspects of the implementation of LC can be seen from the acceptance of society that has not been high to LC, still the objection to submit Land Contribution (STUP), because the lack of awareness of spatial society so difficult to accept the shift lying of the land. Aspects of mentality and human resource capacity of ATR / BPN are less serious and weaken the regional perspective. The institutional aspect of LC implementation is the lack of commitment from all parties to complete the implementation of LC with the construction of road and other infrastructure.

Various aspects above should be considered in order to avoid the implications of increasing the implementation of LC on the effectiveness of space utilization and National Resilience. Improved implementation of LC that does not occur, implies: (a) disruption of the effectiveness of space utilization, for example, space utilization adjustment according to allocation of RTRW Kota / Kabupaten due to slowness of space utilization; and (b) spatial use which does not pay attention to the preservation of environmental function, so that urban / suburban / rural environment grows without direction. Furthermore, the ineffectiveness of spatial use will weaken the National Resilience in all its aspects: (a)

[10] Yuswanda Tumenggung, Implementation and Financing of Land Consolidation in Urban Area Spatial Planning, Paper Presented in "Focused Discussion on Land Consolidation in Urban Spatial Planning", conducted by Bappenas, Jakarta, November 2001.

Geography Aspect (ineffective of living space and life), (b) Demography aspect (quality and distribution of population does not occur due to low quality of urban and rural environments) , (c) Aspect of Natural Resources (the spread of land as an asset is difficult to achieve; (d) Ideology Aspect (togetherness is getting lost); (e) Politics Aspect (public relations-state organizers increasingly diagonal); (f) Ecnomy Aspect (difficult in productivity), (g) Social Cultural Aspect (disappearance of social cohesion and space of creativity), and (h) Security and Defence Aspect (not giving security, for example: from fire and/or theft, from terrorism and national threat).

Various issues that can be found that can disrupt the increase of LC implementation to the effectiveness of space utilization and National Resilience are as follows: (a) weak of regulation implementation of LC because its substance is only civil and kind of rules governing in detail only Regulation of Head of BPN 4 Year 1991, while the regulation of law is more authoritative only regulate in summaries; (b) low awareness of community space, so any plan of implementation of LC is difficult to be approved 100% owners of land and Land Contritution (STUP) from LC participants always low that is under ideal requirement of implementation of LC; (c) the weakening of regional perspective of human resource in Ministry of Agrarian and Spatial Affairs/National Land Agency, so that it is only accustomed to conduct land administration in the sense of land certification activities or legalization of assets; and (d) the lack of institutional synergism has been established, so that the follow-up of physical development of road and public infrastructure is always delayed, even the implementation of LC 10 years after receipt of certificate by LC participants has not been built road infrastructure and other physical facilities.

Strategic Environment

The development of the global environment that influences the implementation of LC in Indonesia is the massive implementation of Land readjustment in Japan and runs well in Korea and Malaysia. The term land readjustment itself was born in Germany. A globally evolving method remains a voluntary method, but there are solutions to landowners who refuse to participate for irrational reasons. The most influential global environment for LC implementation in Indonesia is Japan for Urban LC and Taiwan for Rural LC. The global influence on LC in Indonesia became significant when the International Seminar of 1993 and 2000 was implemented in Indonesia. At the seminar, several countries discussed the experiences of each country in implementing LC.

The development of the regional environment provides opportunities and challenges, especially the impact of democratization in the utilization of space. In the Philippines, Asia's oldest country in democracy changed its Constitution in 1987, to pay homage to freedom and democratization. In this country LC is part of the Comprehensive Agrarian Reform Law of 1988, in Article 39 governing - Land Consolidation.

The development of the national environment in all national life aspect will give effect to the implementation of LC. Geographically, the reality of Indonesian territory in Java, for example, needs more introductions of Vertical LC while outside of Java is more directed to the arrangement of coastal areas and strengthen the parcels of agricultural land. Demographically, what should be considered is the HDI of 0.629, the average school is only 7.8 years, the poor are 28.28 million, and the existence of informal workers as much as 20 million. From the side of Natural Resources Resources (SKA), the land as a place of life and the source of life, is generally already occupied and cultivated by the community. From the ideological side, LC has a strong foundation, the Second, Fourth, and Fifth Principle. The various global, regional and national environmental developments above provide opportunities and challenges. Some of these opportunities are: (a) democratization strengthens Indonesia as a democratic country to produce legal rules that support community participation; (b) the Government's commitment to improve the land institution to become the Ministry of Agrarian Affairs and Spatial Planning / NLA; (c) the stipulation of Act no. 1 of 1 on 2011 on Housing and Settlements and Act no. 20 Year 2011 on Flats that make LC as an instrument of providing land for the construction of housing and settlements and flats; (d) the Government's commitment to increase the budget for infrastructure development in national development, which will have a positive impact on the development of road infrastructure and other public facilities at LC sites. Constraints to be faced, among others: (a) the reality of the population of Indonesia with an average of 7.8 years of education so that realize the critical mass will be a serious struggle; (b) the weak quality of democracy, which always prioritizes rights rather than obligations; (c) the stigma of land-based land authentication which only conducts land certification; (d) the cooperation of Government agencies that have not been effective.

Implementation Conditions of Expected LC

The implementation of LC which is expected to improve the utilization of space in the framework of National Resilience is: (a) the availability of adequate legal regulation as the basis for the implementation of LC, either from the level of Act, Government Regulation, or Presidential Regulation, and local legislation; (b) awakening of community awareness-aware of the urgency of LC as a participatory policy instrument, so it is not too difficult to be willing to participate in LC and submit the required Land Contribution (STUP) (c) Strengthening the spatial perspective of human resources in the Ministry of Agrarian Affairs and Spatial Planning / NLA, which conducts land management simultaneous legal aspects of possession and ownership as well as physical aspects of use and utilization; and (d) realization of institutional synergism among relevant agencies, since planning and implementation and follow-up of implementation.

The contribution of LC Improvement to Spatial Utilization Effectivity are: (a) to describe spatial structure and spatial pattern more quickly, efficiently, and participatory; and (b) to integrate the legality aspects of land tenure with the physical arrangement of land uses. Furthermore, the contribution of the effectiveness of the spatial utilization to National Resilience in the form of various improvements to all aspect of National Life, such as: (a) Geographical Aspect will be effective as living space and the source of community life; (b) Demographic Aspect, supporting the improvement of the quality and distribution of the population; (c) Natural resources Aspect as it increases access to land as an asset; (d) Ideological Aspect, more likely to build togetherness and mutual cooperation; (e) Political Aspect, nourishes citizen relationships with state officials; (f) Economic Aspect, further encouraging productivity; (g) Social Cultural Aspect, encouraging social cohesion and solidarity; and (h) Defense and Security Aspect, provide a sense of security, such as a sense of security from theft and the occurrence of fire.

Therefore, the indication of the success of LC for effective spatial utilization in the framework of National Resilience is:

a. The availability of adequate legal rules as the basis for the implementation of LC, is as follows:
    1) There are several articles in the Act of Land that will be drawn up later as a hook for further regulation in the form of a lower legal rule;
    2) The enactment of Government Regulation (PP) or at least the Presidential Regulation concerning Land Consolidation as a rule that completely regulates LC;
    3) The enactment of Regulation of the Minister Agrarian Affaris and Spatial Planning/ Head of NLC which regulates the technical aspects of LC implementation in Indonesia;
    4) Provision of District Regulations at the Regency or City level that regulate the follow-up of the implementation of LC.
b. Awakening of public space awareness that recognizes the urgency of LC as a participatory policy instrument, including:
    1) Every implementation of LC gets minimal approval from the community in the designated location;
    2) The realization of the implementation of LC whose STUP is in accordance with minimum requirements for the implementation of LC;
    3) The community did not transfer their land right before the completion of LC.
c. The strengthening of spatial perspective in the authority of Ministry of Agrarian Affairs and Spatial Planning / NLC:

1) Increased implementation of LC as a land activity, both aimed at realizing quality housing and settlements as well as for realizing agricultural or plantation areas that support increased productivity;
2) Increased implementation of LC conducted on a larger scale with a minimum of 250 participants and a minimum area of 5 Ha for the implementation of Urban LC and participants at least 250 people and a minimum area of 100 Ha for the implementation of agricultural LC.
3) Improved use of LC to resolve land disputes and conflicts;
4) Commencement of implementation of vertical LC combined with the development of flats;

d. The realization of institutional synergism among related institutions:

1) Commencement of implementation of LC implemented at the initiative of Regional Government;
2) Determination of Decision Letter of LC Location by Regent or Mayor after receiving technical consideration from local planning authority and local public works authority;
3) Followed by construction of roads and other public facilities by the local public works authority in the following fiscal year, following the completion of land arrangements;
4) The completion of the construction of road infrastructure and other public facilities for a maximum of 3 years after the completion of the land arrangement by the land authority.

Implementation Concept of LC

The policy that the Government should formulate to increase the LC to streamline the use of space in order to achieve robust national resilience is: "Revitalize the implementation of Land Consolidation". Based on that policy, 4 (four) chosen strategies are determined. Strategy-1, preparing the regulation of law in the form of Act on Land, PP or Presidential Regulation on LC, Regulation of the Minister of Agrarian Affairs / Ka. BPN on the Implementation of LC, and local regulation on LC, to establish the basis for implementing LC through legislation and regulation; Strategy 2, building participatory community-spatial awareness through education, socialization and dissemination; Strategy-3, strengthening the spatial-perspective in the Ministry of Agrarian Affaris and Spatial Planning / NLC for capacity building through education, training, workshops, and habituation; and Strategy-4, realizing institutional synergism in the implementation and follow-up of implementation through coordination and cooperation. Each strategy is translated into various efforts.

Strategy-1, Preparing the regulation of law to establish the basis for the implementation of LC through legislation and regulation, is carried out with the efforts of:

(1) the drafting of the Act on Land (legislation) between the House of Representatives with the President, containing minimum agreements varying according to need, rational grounds, restrictions on the transfer of land during unfinished certification, the obligation to follow-up the construction, and further regulatory orders in the form of Government Regulation or Presidential Regulation; (2) The President shall issue a regulation of the Government Regulation or the Presidential Regulation to follow up the provisions of the Act on Land, the complete LC type including the Vertical LC, which affirms the minimum approval arrangements on the implementation of LC to restore the area due to natural disasters, in the framework of slum regulation and the improvement of the quality of certain landscapes with the community; (3) Minister of Agrarian Affairs and Spatial Planning/ Head of NLC shall prepare regulations in the form of Ministerial Regulations that regulate more technical implementation of LC; (4) The Regional Government of a Regency / City shall prepare a Regional Regulation (legislation) which regulates LC technically according to the needs of the region.

Strategy-2, Building awareness-a participative community space through education, socialization, and dissemination. Measures that can be made, among others, are: (1) The Minister of Agrarian Affairs and Spatial Planning / NLC cooperates with Minister of Home Affairs (MoHA) and Minister of Education dan Culture to build an understanding to the community through workshops and / or other dissemination activities and the insertion of materials in the curriculum that the public plays an important role in spatial planning, including in the utilization of space effectively through LC activities; (2) Minister ofa Agrarian Affairs and Spasial Plannin / Head of NLA after coordinating with MoHA and National Planning Agency, to instruct the Spatial Planning Authority in the Region to provide informal education and dissemination of LC as an effective way of utilization of space to community and community leaders; (3) Land Office of Regency / Municipality coordinate with Land Deed Official Official (both PPAT Notary and PPAT Camat), in order not to serve the making of deed of transfer of land right during LC implementation, or strictly before given new certificate to LC participants as result of LC.

Strategy-3. Strengthen the spatial perspective in the Ministry of Agrarian Affairs and Spatial Planning/NLA for capacity building through education, training, workshops, and habituation. Measures that can be done-among others- are: (1) The Minister of Agrarian Affairs and Spatial Planning/Head of NLA in cooperation with the Ministry of Home Affairs and the National Resilience Institute R.I. (Lemhannas R.I.) to provide awareness to human resources the Ministry of Agrarian Affairs and Spatial Planning/NLA through education and training that the territory of Indonesia is a unity; (2) The Ministry AASP instructs the National Land College and the Center of Education and Training in their environment to design a comprehensive and integrated tertiary education curriculum material starting from the spirit that Agrarian and Spatial/Land as an integrated entity within the territory of Indonesia; (3) The Ministry of AASP/NLA manpower intensive to study at the best

universities in regional planning at home and abroad and assign human resources in the field of LC duties both in the center and region to study LC in Japan for Urban LC and in Taiwan for Rural LC, for The AASP / NLA human resources to have a broad insight on the various regional arrangements and benchmarking that enriches his perspective when going to design and implement LC activities.

Strategy-4. Achieve institutional synergism in the implementation and follow-up of implementation through coordination and cooperation. Measures that can be done, among others, are: (1) The Ministry of AASP / NLA in cooperation with the National Disaster Management Agency (BNPB) to agree on the rebuilding of an area that is damaged by a natural disaster must first rearrange the territory comprehensively through LC as a participatory land policy; (2) MoHA coordinates with the Ministry of AASP / NLA in coordination with to encourage Provincial and District / City Government to propose implementation of LC with Regency / Municipal budget; (3) The Ministry of Finance shall coordinate with the Ministry of AASP / NLA and the Regional Government in the Regency / Municipality to eliminate or provide significant tax relief for the implementation of LC carried out by the Government or Regional Government, since LC participants have contributed land (STUP); (4) The Land Affairs Office of the Regency cooperates with the agricultural authorities and the public works authorities in the districts to determine the routes that can be utilized in the Disaster Risk Areas (KRB) when no eruption occurs because landscapes in KRB can be designed to be ecotourism).

Recommendation

Recommendations that would need to be submitted to decision makers are as follows. *Firstly*, the Ministry of AASP/NLA needs to encourage the House of Representatives (DPR) to ensure that the Land Act is now being drafted containing the key provisions on LC and delegating the authority of complete LC regulation in the form of Government Regulation and / or Presidential Regulation on Land Consolidation. *Secondly*, in the case of the Act on Land has not been enacted and the Government Regulation on LC has not been established, the Ministry of AASP/NLA may immediately propose the Presidential Regulation on Implementation and drafting the Regulation of the Minister of AASP/Head of NLA concerning the Implementation of LC as a revision of Regulation of the Head of BPN. 4 of 1991 on Land Consolidation. Ministerial Regulation is also intended to contain various policy rules that have been arranged in various Letters and Circular Letter into the material content of Ministerial Regulation of AASP/Head of NLA. *Thirdly*, the Ministry of AASP/NLA needs to immediately build a movement "Consciously Orderly Use and Utilization of Land", as a marker of the importance of the use and utilization aspects of Spatial Planning as a concrete manifestation of the social function of land rights. *Fourth*, to reward AASP/NLA authorities who successfully implement LC in certain targets, which impact on improving the order of safe, orderly, smooth and healthy space utilization. *Fifth*, Ministry of AASP/NLA needs to massively increase the capacity of AASP/NLA Human Resource in using territorial perspective for land management in education and training institutions both at home and abroad.

PARTICIPATORY MAPPING FOR APPROPRIATE DEVELOPMENT OF PUBLIC FACILITIES CASE STUDY: LEBAK GEDE, LEBAK SILIWANGI, AND CIPAGANTI

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Abstract

In order to develop or improve the public facilities appropriately, updated information on these public facilities is required. It allows the public to participate in the renewal of such information, considering that based on data from Association of Internet Service Providers Indonesia (APJII) in 2016, the number of Internet users in Indonesia is 132.7 million people. It is time for Indonesian people to participate in providing inputs to urban development by participatory mapping of a public facility that cannot be used or used improperly. In this study the focus of activities is in Bandung by utilizing data obtained from participatory mapping of JSAG-S event that held in Saturday, August 26th 2017 at 09.25 am until 12.00 pm using Global Positioning System (GPS) and the smartphone as a receiver. The data taken are geo-tagging of non-conformities of facilities and indiscipline in the public facility uses. The research area is divided into three urban villages, namely Lebak Gede, Lebak Siliwangi, and Cipaganti. Before the data presented in to the map, it is classified into four issues there are damaged, electricity, discipline, and cleanliness. That four issues then are displayed on the map and compared in each Urban Village to determine the priority of each issue and also to determine the priority in each Urban Village. From the results of the observation, it is found that the Cipaganti Urban Village Area has the high priority scale and requiring more attention by the local government, followed by Lebak Siliwangi, and Lebak Gede Urban Village.

Keywords: **Participatory Mapping, Public Facilities, and Priority Scale.**

1. Introduction

Public facilities are an essential element in providing a liveable community, (Hildebrand Frey,1999) attributes the needs of the city to the basic human needs of Maslow's hierarchy at the basic level, the urban facilities that need to be provided are the physical needs of the community, one of which is the public facilities and public services. Such facilities are essential to support the community and its development and to enhance the overall quality of life.

Based on the 1945 Constitution of the Republic of Indonesia article 34, the state shall have the obligation to provide sufficient medical and public service facilities. Thus, it is appropriate for the government to be responsible in ensuring the continued availability of public facilities, one of which is by doing restoration or control to improve public facilities. Most public Facilities in urban areas of Indonesia are good only when it's first opening. This is due to the low of maintenance level of Indonesian public facilities. Public facilities that have been neglected or damaged must be repaired or even developed in order to be re-utilized and comfortable to use.

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Public facilities are belong to the community, so the community is also obliged to take care of the facilities. Public facilities may be damaged or uncomfortable to use due it becomes old or caused by irresponsible people. In order to improve and develop it properly and efficiently, the latest information regarding the condition of the public facilities is required.

In the era of all sophisticated technology as it today, the public is allowed to contribute in providing updated information of public facilities to the government. Based on data from Association of Internet Service Providers Indonesia (APJII) in 2016, the number of internet users in Indonesia is 132.7 million people. With internet, information can be obtained easily and quickly. Internet provides access for the public to collect updated information of public facilities, one of which is by organize participatory mapping.

In addition to assisting the government in updating the information, participatory mapping can also increase public awareness in maintaining public facilities. Participatory mapping allows people to provide feedback sporadically and can be done at any time. Location informed obtained more accurate since it is recorded in the form of coordinates to indicate position.

2. Data And Method

Participatory mapping was held on Saturday, August 26th 2017 at 09.25 am until 12.00 pm with coverage area in Cipaganti, Lebak Siliwangi, and Lebak Gede Urban Village, Bandung, West Java, and it is shown in Figure 1. The method used in this participatory mapping is field observation, specifically positioning with GPS. Basically the basic concept of GPS positioning system is resection (backward binding) with distance, that is by simultaneous measurement of distance to several GPS satellites whose coordinates are known (Abidin, 2007). The positions given by GPS are a three-dimensional position (X, Y, Z) expressed in World Geodetic System (WGS) 1984 datum.

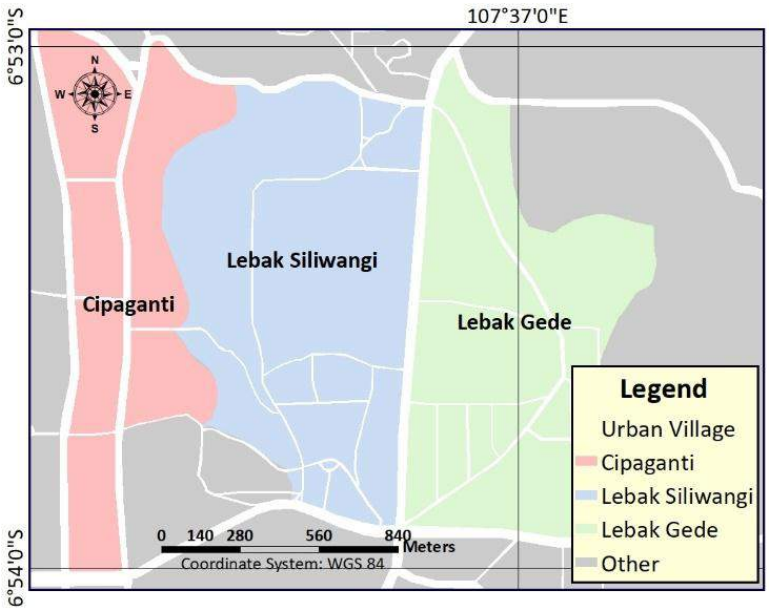

Figure 1. Participatory mapping area

Observation was made using Absolut positioning method. This method can be used for positioning that does not require high level of accuracy. According to Abidin, on the determination of the 3D Cartesian coordinates of an observer (Xp, Yp, Zp) using an absolute positioning method, the observer basically measure the distance (d) to the several satellites, minimum 4 satellites, as illustrated in Figure 2. In this case, the equation that can be arranged for the observation of the distance to the four GPS satellites are (Abidin,2007):

$$\begin{aligned}
&\sqrt{(X_P - X_1)+(Y_P - Y_1)+(Z_P - Z_1)} + c.dt = d_1 \\
&\sqrt{(X_P - X_2)+(Y_P - Y_2)+(Z_P - Z_2)} + c.dt = d_2 \\
&\sqrt{(X_P - X_3)+(Y_P - Y_3)+(Z_P - Z_3)} + c.dt = d_3 \\
&\sqrt{(X_P - X_4)+(Y_P - Y_4)+(Z_P - Z_4)} + c.dt = d_4
\end{aligned} \qquad (1)$$

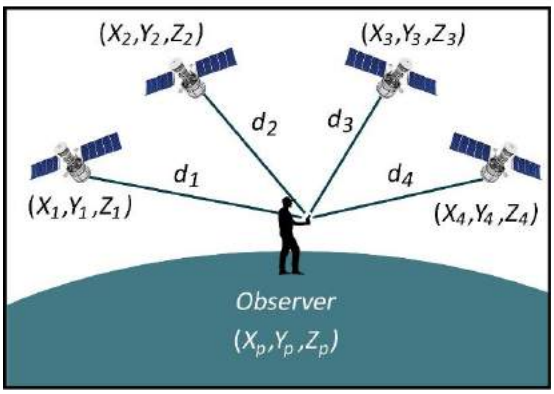

Figure 2. Positioning with four satellites

In this observation the observers are the participant of the Jalan Sehat Ala Geodesi – Srikandi (JSAG-S). They are divided into three group each responsible for one urban village area. The data taken are geo-tagging of non-conformities of facilities and indiscipline in the public facility uses. The route of this observation each group is shown in Figure 3.

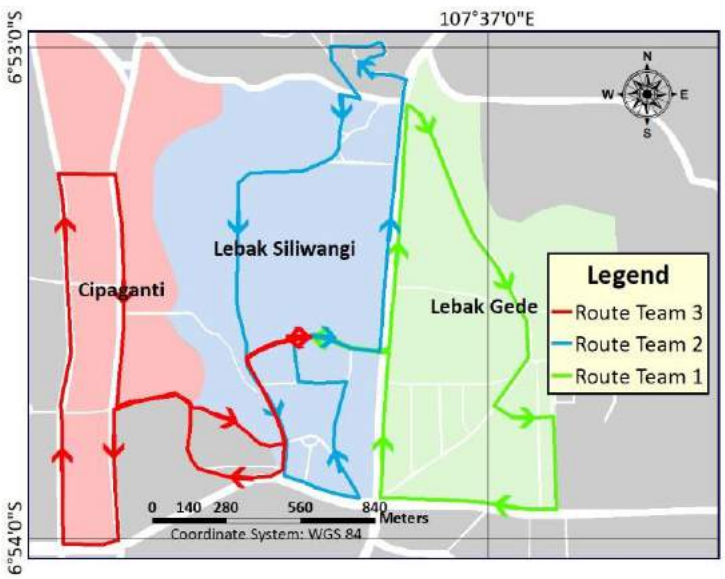

Figure 3. Participatory mapping route

The observation route for team 1 in Figure 3 is shown by green line. The route is round Lebak Gede Urban Village. From Figure 3 also shown that second team route has blue line that rounding Lebak Siliwangi Urban Village. The last group's route is shown by red line and rounding Cipaganti Urban Village. All the groups are having start from and end up at ITB.

The data obtained are then processed by correcting the data from blunder, outlier, and redundancy. The data taken outside of the observation area are also eliminated. Before the data presented in to the map, it is classified into four issues, as follows:

- Damage issue, that includes reporting relate to road damage, sidewalk damage, traffic light damage, shelters damage, and the missing zebra crossing.
- Electricity issue, that includes damage to electrical wiring also damage and disruptive electrical poles.
- Discipline issue, that includes improper traders, vehicles parked are not orderly, and billboards that are not orderly stand and dangerous.
- Cleanliness issue, which include piles of garbage, vandalism, neglected parks, fragile trees, and clogged drains.

Then that four issues are displayed on the map and compared in each Urban Village to determine the priority of each issue and also to determine the priority in each Urban Village. The result of this activity are expected to provide related information and determine which Urban city need high priority to be repaired or developed by local government along with detailed location that requires handling. The flow chart of this observation is shown in Figure 4.

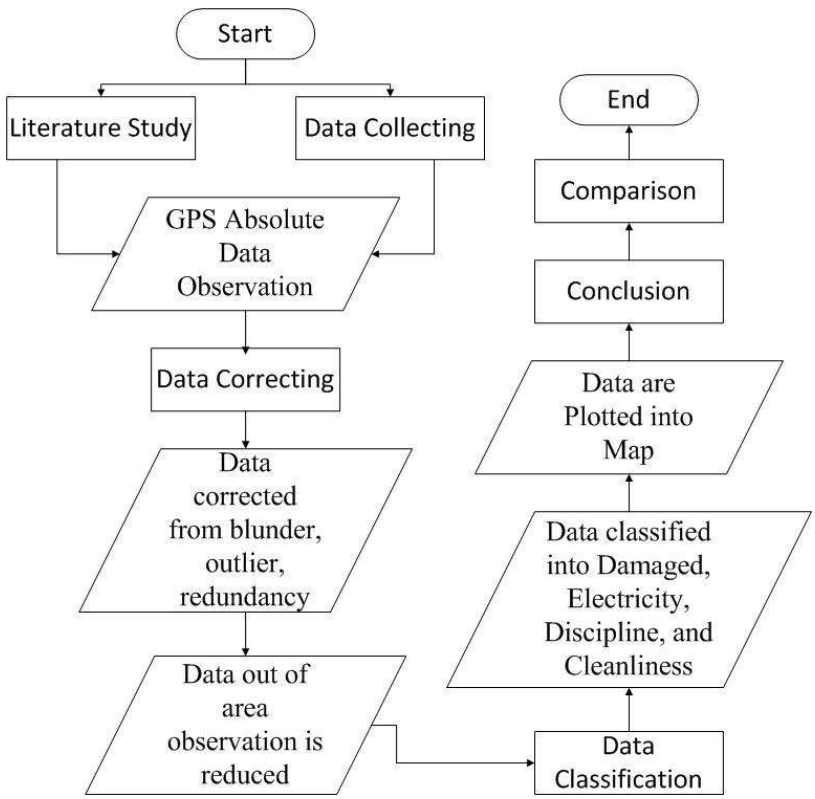

Figure 4. Flowchart of research method

3. Result and Discussions

Observations were made using smartphone as a receiver. Distribution of observations points that have been reduce from outliers, blunders, and also reduce from the data outside the observation area are then displayed on the map, and can be seen in Figure 5 (a).

The result shows that of the total 308 reporting data that can be used, there are 61 data or 19.81% reported from Lebak Gede Urban Village, 123 data or 39.94% data are taken in Lebak Siliwangi Urban Village, and 124 data or 40.26% data are reported from Cipaganti Urban Village. The Comparison of the overall data can be seen in Figure 5 (b).

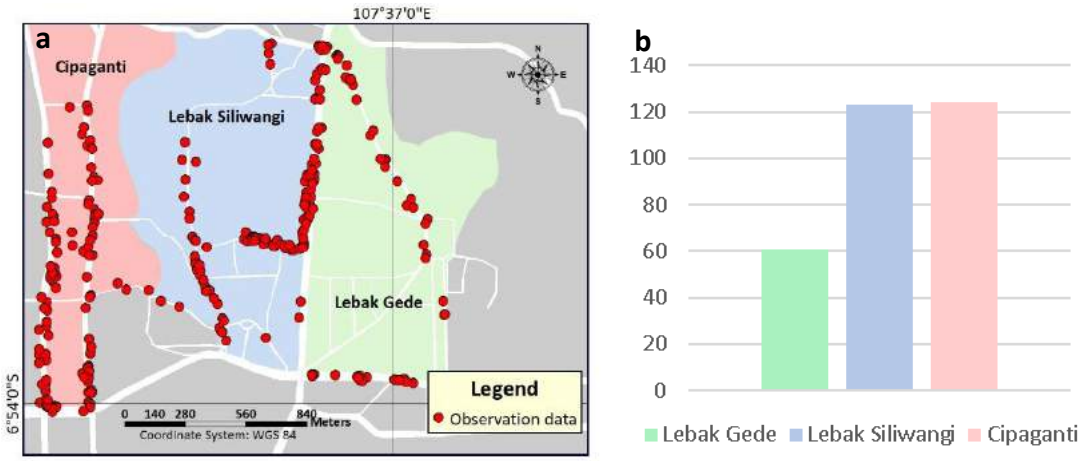

Figure 5. (a) Distribution of observation data (b) Comparison of overall data

From this entire report, basically the priority scale can be divided in two. There are the urgency based on issues and the urgency based on Urban Village.

3.1. Urgency Based on Issues

In this perspective, the priority scale is suitable for the Agencies in Bandung since it shown the specific issue and compare it urgency in each Urban Village. For Example, The Cleanliness Agency will use cleanliness data to fix cleanliness issue. In this section the urgency based on each issues will be reviewed.

Based on the issue, the data are classified into damage, electricity, discipline, and cleanliness. For damage data, the distribution of data obtained is shown in Figure 6 (a). For complaints related to damage reports, in Lebak Gede Urban Village area there are 27 data collected from total of 118 data, or about 27%. In Lebak Siliwangi area, the data reported are 31 data or about 26.7% of total damaged report. Furthermore for Cipaganti Urban Village, the existing data is as many as 60 reports or 50.85%. All three can be seen in Figure 6 (b).

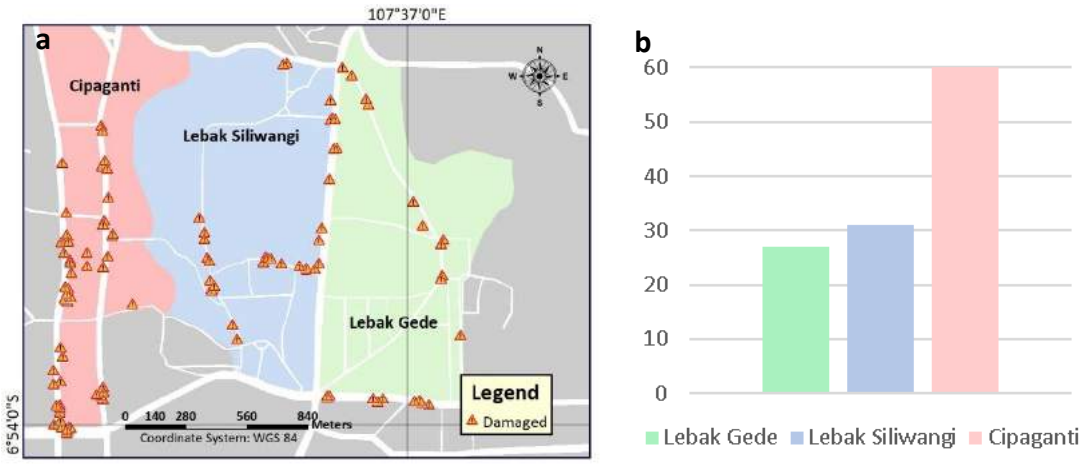

Figure 5. (a) Distribution of damaged data (b) Quantity of damage data in each Urban Village

Next will be discussed electricity data. For electricity data, the distribution of data obtained is shown in Figure 7 (a). For complaints related to electricity reports, in Lebak Gede Urban Village area there are 11 data collected from total of 42 data, or about 26.19%. In Lebak Siliwangi area, the data reported are 22 data or about 52.38% of total electricity report. Furthermore for Cipaganti Urban Village, the existing data is as many as 9 reports or 21.43%. All three can be seen in Figure 7 (b).

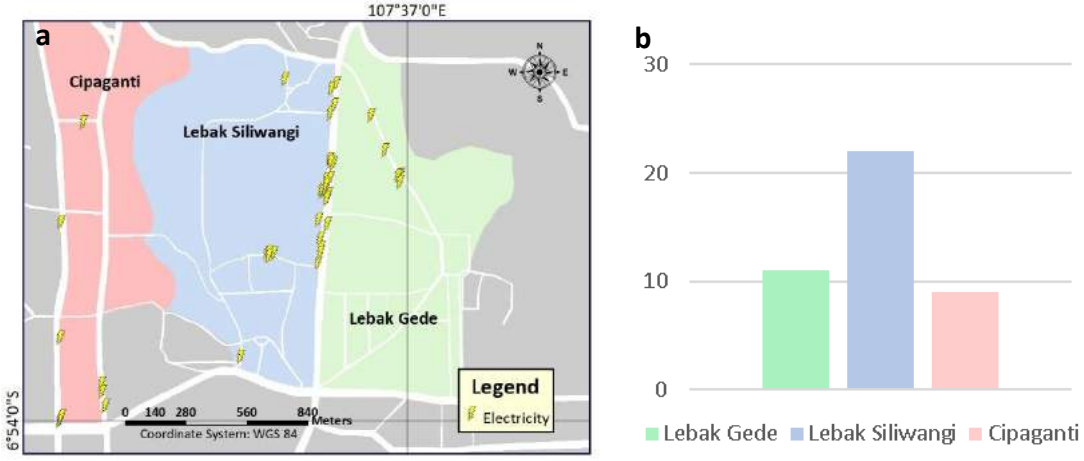

Figure 7. (a) Distribution of electricity data (b) Quantity of electricity data in each Urban Village

Next will be discussed discipline data. For discipline data, the distribution of data obtained is shown in Figure 8 (a). For complaints related to discipline reports, in Lebak Gede Urban Village area there are 6 data collected from total of 77 data, or about 7.79%. In Lebak Siliwangi area, the data reported are 33 data or about 42.86% of total discipline report. Furthermore for Cipaganti Urban Village, the existing data is as many as 38 reports or 49.35%. All three can be seen in Figure 8 (b).

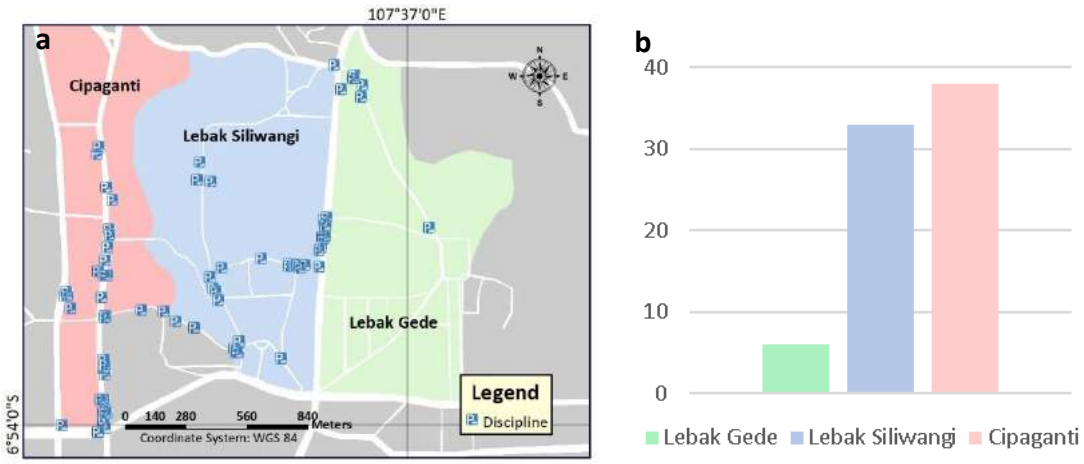

Figure 8. (a) Distribution of discipline data (b) Quantity of discipline data in each Urban Village

Next will be discussed cleanliness data. For cleanliness data, the distribution of data obtained is shown in Figure 9 (a). For complaints related to cleanliness reports, in Lebak Gede Urban Village area there are 17 data collected from total of 71 data, or about 23.94%. In Lebak Siliwangi area, the data reported are 37 data or about 52.11% of total cleanliness report. Furthermore for Cipaganti Urban Village, the existing data is as many as 17 reports or 23.94%. All three can be seen in Figure 9 (b).

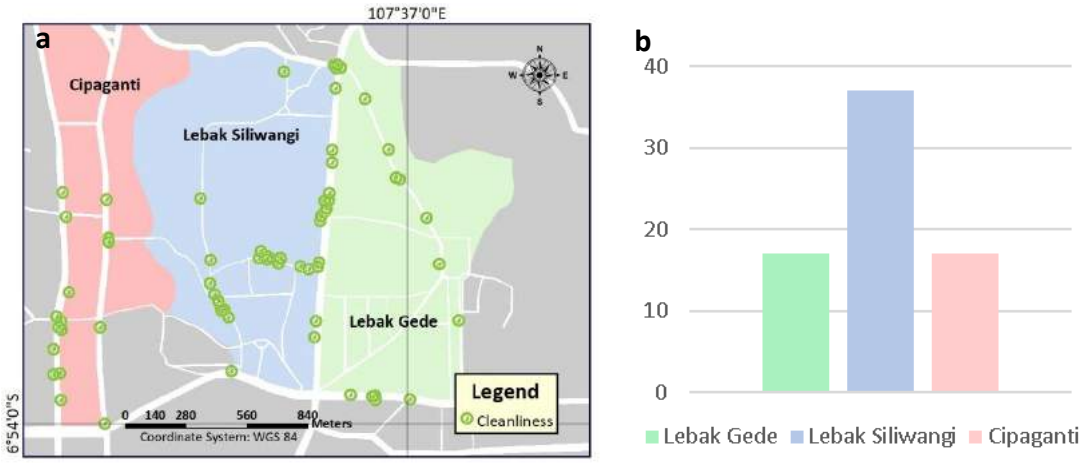

Figure 9. (a) Distribution of cleanliness data (b) Quantity of cleanliness data in each Urban Village

From the overall data, the urgency of each issues are obtained. The damage issue has the most reported in Cipaganti Urban Village, so this area requires high priority scale to be fixed, followed by Lebak Siliwangi and Lebak Gede Urban Village. Next to the electricity issue, the high priority is needed in Lebak Siliwangi Urban Village, followed by Lebak Gede and Cipaganti Urban Village. Then for discipline issue, the highest urgency is at Cipaganti Urban Village, followed by Lebak Siliwangi and Lebak Gede Urban Village. Lastly for the cleanliness issue, the highest urgency is at Lebak Siliwangi Urban Village and followed by Lebak Gede and Cipaganti Urban Village on the same level.

3.2. Urgency Based on Urban Village

In this perspective, the priority scale is suitable for the Urban Village needs, since it shown their specific area issue and compare it urgency to others. For Example, Lebak Gede Urban Village will see what issues should first be fixed in their own region.

As explained, Urban Village observed in this activity is Lebak Gede, Lebak Siliwangi, and Cipaganti. For Lebak Gede region, the data reported for damaged issue are 27 data from 61 data obtained, or about 44.26%. Furthermore for electricity issue, the data obtained are as much as 11 data or has a percentage of 18.03%. Then for the discipline issue, the data obtained are as much as 6 data or about 9.84% of data. Last cleanliness data that was collected for about 17 data or around 27.87%. The comparison of the four data can be seen in Figure 10.

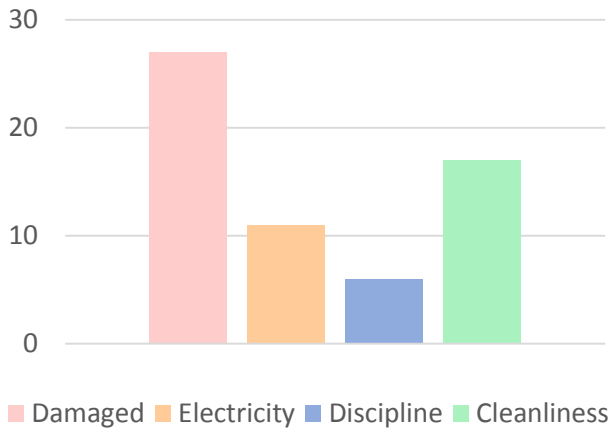

Figure 10. Quantity of each data in Lebak Gede Urban Village

The next area to be reviewed is Lebak Siliwangi Urban Village. In this region, the data reported for damaged issue are 31 data from 123 data obtained, or about 25.2%. Furthermore for electricity issue, the data obtained are as much as 22 data or has a percentage of 17.89%. Then for the discipline issue, the data obtained are as much as 33 data or about 26.83% of data. Last cleanliness data that was collected for about 37 data or around 30.08%. The comparison of the four data can be seen in Figure 11.

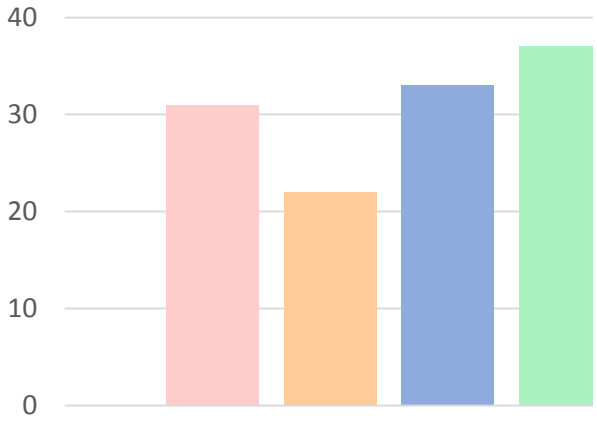

Figure 11. Quantity of each data in Lebak Siliwangi Urban Village

The last area to be reviewed is Cipaganti Urban Village. In this region, the data reported for damaged issue are 60 data from 124 data obtained, or about 48.39%. Furthermore for electricity issue, the data obtained are as much as 9 data or has a percentage of 7.26%. Then for the discipline issue, the data obtained are as much as 38 data or about 30.65% of data. Last cleanliness data that was collected for about 17 data or around 13.71%. The comparison of the four data can be seen in Figure 12.

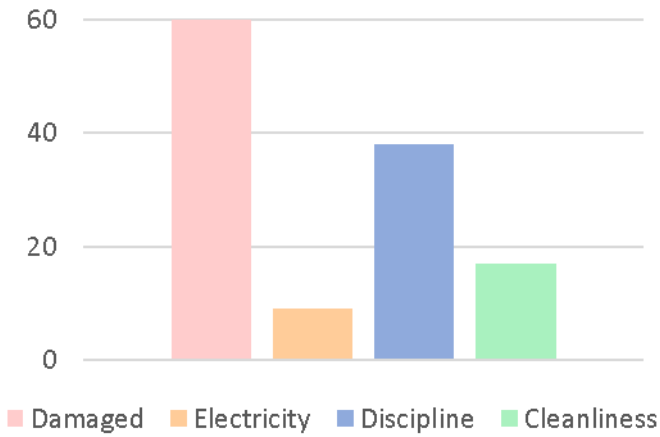

Figure 12. Quantity of each data in Cipaganti Urban Village

From the overall data, the urgency of each Urban Village are obtained. Damaged issue in Cipaganti Urban Village has the highest urgency compared to others, so this issue requires high priority scale to be fixed in Cipaganti, followed by cleanliness, electricity, and discipline issue. Next to Lebak Siliwangi Urban Village, the highest urgency is in cleanliness issue and followed by discipline, damaged, and electricity issue. Then for Cipaganti Urban Village, the highest urgency is on damaged issue, followed by discipline, cleanliness, and electricity issue.

4. Conclusion

The conclusion based on this paper are as follows:

- Overall, the Urban Village hat requires high priority to be fixed or developed is Cipaganti Urban Village, followed by Lebak Siliwangi and Lebak Gede Urban Village.
- Based on its Issue, the following conclusion can be drawn:
  - Urban Village that it damaged need the top priority to be fixed is Cipaganti Urban Village, followed by Lebak Siliwangi and Lebak Gede Urban Village.
  - Urban Village that it electricity need the top priority to be fixed is Lebak Siliwangi Urban Village, followed by Lebak Gede and Cipaganti Urban Village.
  - Urban Village that it discipline need the top priority to be fixed is Cipaganti Urban Village, followed by Lebak Siliwangi and Lebak Gede Urban Village.

  - Urban Village that it cleanliness need the top priority to be fixed is Lebak Siliwangi Urban Village, followed by Lebak Gede and Cipaganti Urban Village on the same level.
- Based on its Urban Village, the following conclusion can be drawn:
  - Damage issue have the high priority to be fixed in Lebak Gede Urban Village, followed by cleanliness, electricity, and discipline issue.
  - Cleanliness issue have the high priority to be fixed in Lebak Siliwangi Urban Village, followed by discipline, damage, and electricity issue.
  - Damage issue have the high priority to be fixed in Cipaganti Urban Village, followed by discipline, cleanliness, and electricity issue.in the following format:

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LAND INFORMATION SYSTEM SUPPORTS THE IMPLEMENTATION OF LAND CONSOLIDATION

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Abstract

Land Consolidation (LC) is one of the current focuses of the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN), which plays a role in realizing sustainable spatial planning. LC takes into account the provision/regulation of development and spatial planning. In the implementation of LC consider the carrying capacity, capacity, sustainability, participation and community empowerment. LC will be successful if all aspects of LC are met. The availability of land parcel data, such as land tenure, land ownership, land uses and land utilization are summarized in the IP4T activities. IP4T provides important data support for LC processes in physical and juridical data assessment activities. The purpose of this paper is to describe the importance of IP4T for the realization of Land Information System (LIS) in supporting the implementation of LC.
Keywords: Land Information System, Land Consolidation, IP4T.

1. Introduction

In some developing countries and in developed countries such as Taiwan, Latin America, Japan, Germany, and the Netherlands, a method of approach known as land consolidation has been said to have originated from Kukaku Seiri, a concept of rearranging the ownership of agricultural lands to support agricultural production, launched by the Emperor Meiji (Emperor of Japan) in 1899 through the Agrarian Land Restoration with the enactment of the Agricultural Land Readjustment Law. In subsequent developments , due to the arrangement on the farms is very successful , Kukaku Seiri eventually not only applied to agricultural sites, but also on the settlement sites so as not to develop into slum areas, but become an ideal area.

In accordance with BPN's Regulation No. 4 year 1991 article 1 verse 1, land consolidation is the land policy concerning the realignment of land tenure and land use and land acquisition for development purposes, to improve the quality of the environment and the maintenance of natural resources by involving the active participation of the community. In its theoretical concept, land consolidation is an effort to restructure the control, acquisition, land ownership by the land-owning community through joint efforts to build an environment ready to build and prepare the land plots in accordance with the applicable spatial plan. Rural land consolidation activities include: (1) Site selection, (2) Counseling, (3)

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Assessment of Agreement, (4) Determination of location by Decree of Regent of Head of District, (5) Identification of subject and object.

The data collection of land tenure, land ownership, land use and lan utilization (IP4T) program is an activity that produces maps and information on land by applying Geographic Information System (GIS). As a final outcome of the program is the IP4T Map and the Physical Land Tenure Statement Letter (SP2FBT) signed by each applicant as well as copies of other land tenure evidence. The results of these activities can be used as the basis of the realization of land-based Land Information System (LIS) that supports the implementation of land consolidation.

2. The Land Consolidation

Land consolidation is the land policy on the realignment of land tenure, land use and land acquisition for development purposes, to improve the quality of the environment and the maintenance of natural resources by involving the active participation of the people (BPN's Regulation No. 4 of 1991 article 1 verse 1). Objectives and targets of land consolidation activities aim to achieve optimal land use for efficiency and productivity of land use. While the target to be achieved is the realization of an orderly tenure and land to use order and equipped with environmental facilities. In KaBPN Regulation no. 4 year 1991 article 3 stated that land consolidation covers the re-arrangement of land parcels including land rights and/or their use with equipped road infrastructure, irrigation, environmental facilities and/or other supporting facilities required. The implementation of the land arrangement is always guided by the existing regional spatial planning. The implementation of land consolidation activities coordinated by the District/Municipal Land Consolidation Coordination Team and its implementation by the Provincial Land Consolidation Control Team.

There are two activities in the consolidation, namely: land consolidation involves the activities of restructuring the form, extent, location, control and use, as well as the right to land parcel so as to be orderly and regularly equipped with necessary infrastructure and public facilities by involving the participation of landowners directly. The land consolidation is also an integrated cross-sectoral activity, and carried out in a coordinated manner as one of the activities of the land tenure and tenure management program, which functionally becomes the task of the Directorate of Land Administration of the National Land Agency. Implementation phases of land consolidation based on Letter of Head of National Land Agency no. 410-245 dated 7 December 1991 on the Implementation Guidance of Land Consolidation is as follows: (1) assessment of location determination/site selection; (2) Counseling; (3) Assessment of Agreement; (4) Determination of Land Consolidation Location; (5) Submission of Proposed List of Land Consolidation Activity Plans (DURK); (6) Identification of subjects and objects; (7) Measuring/mapping; (8) Detailed mapping, (9)

Creating land use map, 10) Making maps of road network plans and supporting facilities; (11) Design of Spatial Planning (DTR); 12) Deliberation on the amount of Land Donation for Development (STUP); (13) Release of land rights by participants; (14) Confirmation of land as object of consolidation of Land; (15) BPN implement re-arrangement (reallocation/application of new plots); (16) Construction works; (17) Redistribution/issuance of Decree on granting of rights; (18) Certification.

3. The IP4T and Land Information System (LIS)

The implementation of IP4T activities at BPN is carried out through stages: counseling, working map creation and P4T data collection (primary data of P4T), secondary data collection related to village or potential hamlet, quality control, measurement and mapping of land, tabulation, spatial and textual data and data analysis. Data collection of IP4T primary data consists of collecting data/information on every parcel of land in the hamlet, whether certified or not, concerning tenureship, ownership, use and utilization of land, and other information. Results of IP4T activities in the form of land parcels in one village to ensure the relative position of each parcel contained in one village of IP4T location. Land information, one of which is adopted from FIG (Federation Internationale des Geometres): Land Information System is a tool used for legitimate decision making on administrative and economic issues and as a tool in planning and development consisting of databases containing spatial land reference information and data related to it, on the one hand and procedures and techniques in systematic data retrieval, updating, processing and distribution of data on the other party. The components that are often featured in LIS are data and maps of land use (potency, land allocation, and land use), land ownership and tenure. Therefore, the result of IP4T activities is a database to make the Land Information System (LIS).

4. Analysis

By looking at the sixth stage of land consolidation: Identification of subjects and objects to land rights to know the number of participants, shelter, proof of land ownership, size and location of each parcel, number of fields, boundaries of land ownership. Requirements for urban land consolidation participants are: (a) The participant has a letter or proof of ownership of the land; (b)The participant is willing to relinquish his/her land rights as a basis of the granting of new rights after being consolidated. (c) The participant is willing to donate some of his land for public infrastructure such as for roads and for other public facilities. (d) If the land is in a state of dispute then both parties must declare their consent and participate willingly in the land consolidation. Viewed from the 6th stage of this IP4T data that has been integrated into the LIS has prepared 80% needs of these stages. Viewed from the time side of the job takes months and requires a lot of human resources. While for

stage 7, 8, and 9 that is measuring/mapping, mapping detail can be done faster based on IP4T result which have been integrated into LIS. In other words the third stage can be simplified by field check activities only. With the cut off of the 6, 7, 8 and 9 stages of land consolidation can accelerate the process of land consolidation.

5. Conclusions

From the description above it is concluded that the LIS supported by IP4T activities can shorten the phase of land consolidation implementation that is in the identification step of the subject and the object of land rights. LIS is highly efficient in terms of time and human resource requirements as well as the efficiency of measurement and mapping activities.

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IMPACT OF LAND CONSOLIDATION TO THE SOCIO ECONOMY OF LANDOWNERS IN ROAD POJECT OF TOHPATI-GIANYAR AND KUTA-KEROBOKAN, BALI INDONESIA

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Abstract

The development of road project in urban development in Bali is required allocation of land through land consolidation. This had been implemented for the construction of road link Tohpati Gianyar and Kuta-Kerobokan. The objectives of the study are to identify the socio-economy of people who affected (landowners) after land consolidation project. The data was obtained through survey, where random sampling technique is employed 20% 77 families (15 respondents) and also using interview survey/questionnaire, discussion through focus group discussion. The descriptive analysis were chosen where in the process of analysis data were grouped and analysed according to their urgency level and described to reach the objectives of the study. The study shows that the land consolidation for a project, there has always been People Affected Project (Landowners), where this will initiate improvement or deterioration of social economy status of people involved, as feedback for local government to formulate the recommendation for program plan in order to increase the socio-economy of people affected project.

Keywords: land consolidation; socio-economy; landowners

1. Introduction

The development of road project that is funded by World Bank required allocation of land through land acquisition and land consolidation. This had been implemented for the construction of road link Tohpati-Gianyar and Kuta-Kerobokan.

The road construction plan of 23.589 km from Tohpati to Kusamba required of about 63.36 hectare land where at the time of this report produced, the road had been under-construction of about 14.050 km from Tohpati to Gianyar, for the Kuta-Tanah Lot road link, on the other hand had been under construction for 5 km from Kuta to Banjar Taman, Kelurahan Kerobokan.

In the land allocation for a project, there has always been People Affected Project (Landowners), where this will initiate improvement or deterioration of social economy status of people involved. This study have never been applied before to road construction Tohpati-Gianyar and Kuta-Kerobokan. Therefore, it is though that this study is essential to be applied to trace back the status of people who were affected by the project where their land and other properties had been surrendered or acquitted for the road Project.

The objectives of the study is to identify the socio-economy of people who affected by the project (landowners) whether their condition increase or decrease after their land subjected to allocation and resettlement (land acquisition) and also after land consolidation schemes. To identify and understand the expectation of people affected project in order to

increase their socio-economy level and as recommendation to prepare for program plan to increase the socio-economy of people affected project.

2. Methodelogy

The data was obtained through survey, where random sampling technique is employed. Sample was taken at least 20% of the sample population. In this study, the sample was taken 25% (37 respondents) of 147 families who were not relocated, even though their land and houses were surrendered and 20% of 11 families who were resettlement to other places where their land were provided for road link Tohpati-Gianyar. For road link Kuta-Kerobokan samples were taken 20% of people who reside in Kuta area and whose land were affected which is 20% of 77 families (15 respondents) and additional 3 to 5 families chosen in random from every kelurahan/district, which bring additional total of 20 families. Hence total samples were 35 respondents.

Field data were collected using interview survey (questionnaire), discussion through focus group (focus group discussion) and field investigation as follows:

- Interview using structured questioner and applied to families affected by the project (landowners).
- Discussion through focus group involving Kepala Desa, Lurah, Kelian Banjar, Kelian Adat, Pemuka Masyarakat (stakeholders), LSM (NGO), politician and religious leaders. Other than focus group, data also taken through Panitia Pembebasan dan Penataan Tanah Kabupaten (Land Acquisition and Consolidation Committee Team), who organized the land process for road development project.
- Field observation to evaluate the process of project at the time of this report produced.

The analysis was categorized as descriptive type where the description was already undertaken since data collection and field observation and later intensively analyzed in the working place (office) after finishing field survey. The descriptive analysis were chosen where in the process of analysis data were grouped and analyzed according to their urgency level and described to reach the objectives of the study.

3. Data and Analysis

3.1. Overview of Study Area

Link road construction projects of Tohpati-Gianyar and Kuta-Kerobokan have impact in all sector of development such as trade, tourism, urban and rural development, housing and settlement, etc. Tracer Study is to trace back the process of land acquisition in Tohpati-Gianyar and Land Consolidation in Kuta-Kerobokan and also to investigate the condition of people affected project (landowners) in terms of social-economics and social-culture.

Basically, the plan of link road development of both projects was prepared to Tohpati-Kusamba and Kuta-Tanah Lot link road. Administratively, both projects are located in

5 regencies: link road Tohpati-Kusamba in Denpasar City, Regency Gianyar and Klungkung while link road Kuta-Kerobokan in Kabupaten/Regency Badung and Tabanan (Figure 1).

The plan of Tohpati-Kusamba link road is about ± 23,589 km, which is located in Denpasar Municipality (± 2,4 km), Gianyar Regency (± 13,6 km), and Klungkung Regency (± 7,599 km). In that area, it have been done the land acquisition in which the land have already been acquitted around 63,36 hectare, which is owned by 679 landowners (668 landowners who not moved/without relocation and 11 landowners who moved/with relocation), with the land right status is 139 hectare (certificate), and others are 593 hectare (community land).

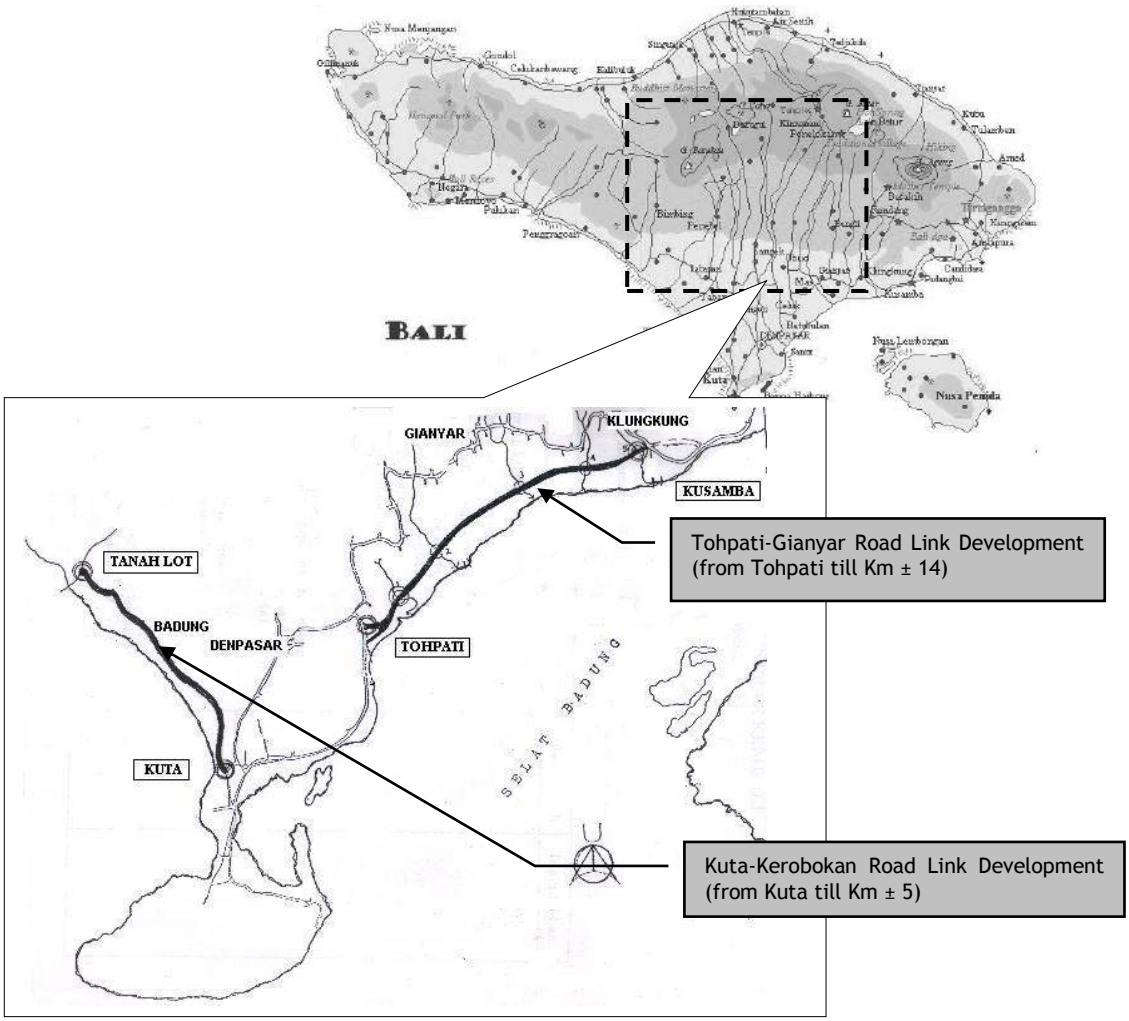


Figure 1. Location Map of Tracer Study

Moreover, the plan of Tohpati-Kusamba link road has already through three regencies and eleven villages. In Denpasar Municipality, it has been through Kesiman Village, in Gianyar Regency through Sukawati, Ketewel, Saba, Pering, Keramas and Lebih Village while in Klungkung Regency through Takmung, Losan, Galeran, and Gelgel Village.

While for the link road Kuta-Tanah Lot, the land has been contributed by landowners through Land Consolidation Scheme around 475,8247 hectare, which consist of 1553 landowners, with the land right status around 195,8247 hectare, and others (subak land) around 280 hectare (edited from Decree of BPN Badung, 1998-2000). The plan of Kuta-Tanah Lot link road gets through six kelurahan in Badung Regency such as Kelurahan Kuta, Legian, Seminyak, Kerobokan Kelod, Kerobokan and Kelurahan Kerobokan Kaja. So, the Study for the Kuta-Kerobokan link road only covered for the link road from Kuta till Banjar Taman, Kelurahan Kerobokan Kelod around ± 5 km.

3.2. Data and Analysis of Tohpati-Gianyar Road Link

Based on the result of field survey of Tohpati-Gianyar Road Link Project, 97,30% of respondents revealed that the government (land acquisition committee) previously has informed the landowners about the project through community meeting. The compulsion of committee to inform concerning the road development project to landowners is essentially appropriate with the law of the head of National Land Agency which issued that: "the government (land acquisition committee) together with the other actors who require land, should hand over the explanation to landowners about the purposes and objectives of the road construction so that the landowners understand undoubtedly and receive the construction itself." After conducting the explanation to landowners, the committee and the other government actor determined the limit of land location, which get through the road development, then following by inventory activities of land field included the building and the other asset related with the land itself.

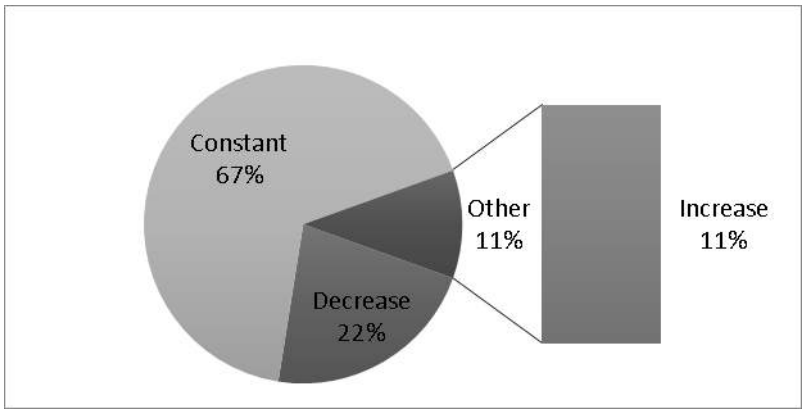
Additionally, all respondents argued that after conducting the explanation and determining the limit of land location, afterward it conducted the meeting between government who acquitted the land and landowners who owned land, building, tress and the other asset. Principally, meeting is process or activities of mutual listening with attitude of mutual receiving the opinion and aspiration, which are based on the willing between landowners and government or committee to obtain an agreement about the form and the huge of the land loss substitute.

The other reaction of respondents on land acquisition likewise can be explored in terms of: the satisfactory of land acquisition process, the satisfactory of the land loss substitute procedure, and satisfactory of the present respondents job.

Findings demonstrated that 88,57% respondents perceived satisfied with the payment of land loss substitute, though based on the result of focus group discussion discovered that some respondents felt unsatisfied with the process and procedure of land substitute that acquitted related to the land certificate for instance, some respondents have not got yet the land certificate and the unclear of land certificate fees. Though, in general the respondents 'job is still constant and also they perceived acceptable on the procedure of land acquisition

and the land loss substitute that are handed over by land acquisition committee. With regard to the impact of land acquisition on Tohpati-Gianyar road link project, the result of field survey shows that it is only 8,11% respondents exchange the job (most still remain as farmer). It means that the job of respondents (91,89%) is typically not change.

In terms of social-economics and culture condition, the result of research shows that the economic growth of respondents after land acquisition, 21,63% respondents revealed decrease, 67,57% felt constant and only 10,80% argued increase (Graph 1).



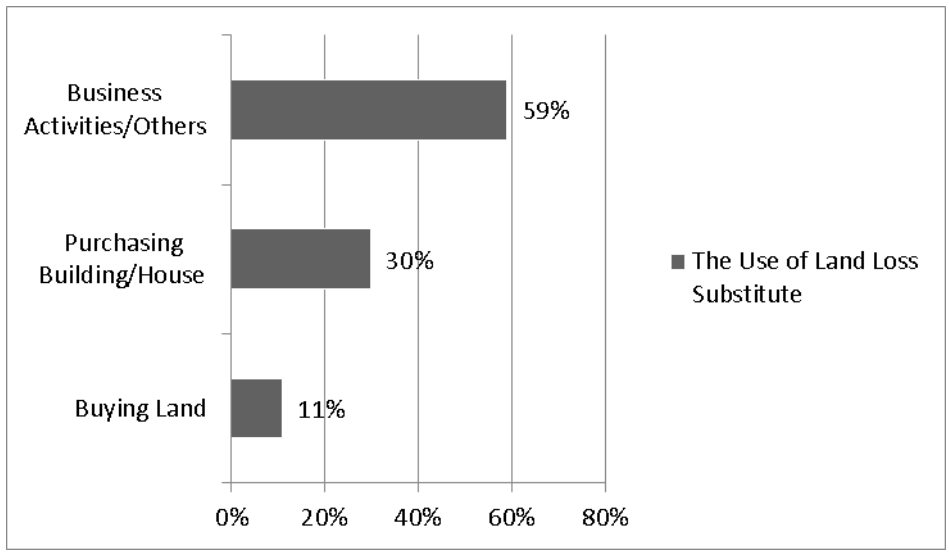
Graph 1. Social Economics Condition of Landowners without Relocation

With regard to the land loss substitute, the findings shows that 10,81% respondents spent for buying land, 29,73% purchasing building/house, and 59,46% for business activities or the other activities (Graph 2).

Respondents argued that the loss substitute which they received average 2 million rupiah included the land certificate fee. Data shows that 50% of the money of land loss substitutes was spent to the non-productive use (not well-organized).

The fact is that most land loss substitute was used for business activities by landowners and also based on facts from focus group discussion revealed that landowners have a tendency to spend the land loss substitute linked with all kind of commerce activities such as home industry, trade, handcraft, workshop, etc.

This is likely leading to the change of thinking scheme of community from agriculture thinking to the heterogeneity of the city development, which more likely offers opportunities for community in business sector.



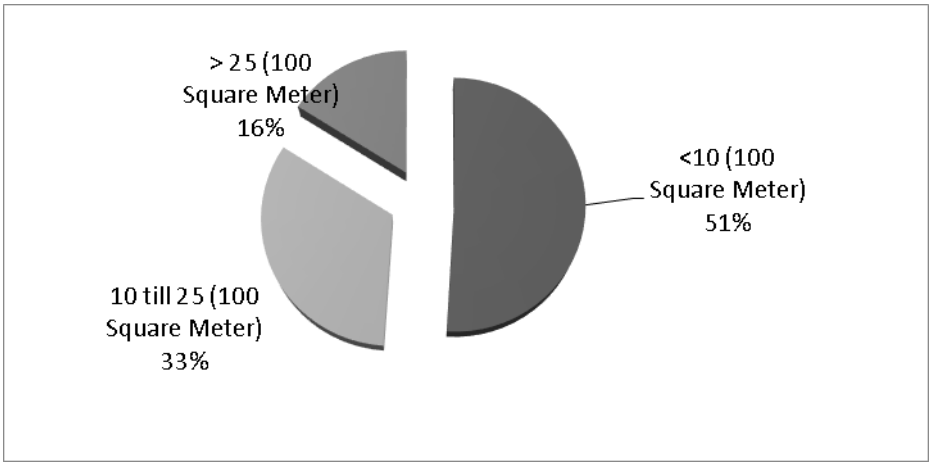
Graph 2. The use of Land Loss Substitute of Landowners without Relocation

In addition, the outcome of focus group discussion revealed that the road construction project leads to perform to the decrease of agriculture sector by declining the job opportunities in that sector and flowing to the other sectors. The facts are that the road development has impact to the rise of land price in location that leads to the landowners particularly farmer, tempted to sell the land. Consequently, the unemployment rate tends to rise because of the unqualified of them to shift to the other sector with regards the low level of their skill and education, which could be applied in the other sector.

Additionally, the land rest which they still own not to be able to be applied to agriculture because of the cut-off of subak's irrigation system that are caused by the road construction not equipped directly with proper drainage system. As a result, the agriculture product is gradually decreasing and eventually influence to decreasing of income level of people. It seems that the effort to stimulate the economic growth through road development is still not accomplished yet.

In relation to the land rest of landowners without relocation, the facts show that around 51,33% of ≤10 (100 square meter), 32,43% of 10<x≤25 (100 square meter), and 16,22% of more than 25 (100 square meter), (Graph 3). This seems obviously that the most land rest exists on the landowners who owned ≤10 (100 square meter).

It is important to anticipate the impact to landowners related to local law about road demarcation. Based on the result of focus group discussion, landowners who have land rest less than 200 m argued that they got road demarcation 200 m (Peraturan Sempadan 200 m). Consequently, they are not able to exploit their remaining land to build house or the other purposes (except green area).



Graph 3. The Land Rest Owned of Landowners without Relocation

3.3. Data and Analysis of Kuta-Kerobokan Road Link

The result of study impressed that the role of government on land consolidation in order to build the Kuta-Kerobokan road link development is strongly involved. It reflected through the setting up of a land consolidation committee who has main task to conduct the land consolidation process from pre till post construction.

Before the land consolidation started, the land committee have inquired the agreement from landowners wherein the research shows that 82,86% respondents argued that the land committee have invited them to have meeting about the change of land location caused by land consolidation scheme. The findings shows that all respondents (100%) have agreed with the land location change and nobody submitted protest.

With regard to Land Contribution for Development (STUP/Sumbangan Tanah untuk Pembangunan), according to AP Perlindungan and William A Doebele copied by Oloan Sitorus and Balans Sebayang (1996:43-44) revealed that theoretically, the ideal amount of Land Contribution for Development is 40% of all land area. It consists of 25% for road and public facilities development, and 15% for the cost of land consolidation included the administration fees. While the rest of 60% will be back to the landowners after their land are consolidated.

Moreover, Oloan Sitorus and Balans Sebayang (1996:43-44) argued that the land consolidation in many cities in Indonesia, the amount of Land Contribution for Development is variation between 15 and 25% from each land area of landowners. Whereas, country likes Japan, the Land Contribution for Development has achieved 30% till 45%. The low percentage of Land Contribution for Development in Indonesia because most realization of land consolidation still require to attain the minimum targets like road development and providing the land certificate for landowners after land consolidation. Additionally, most realization of land consolidation in Indonesia still used fund from government either National Budget (APBN) or Local Budget (APBD).

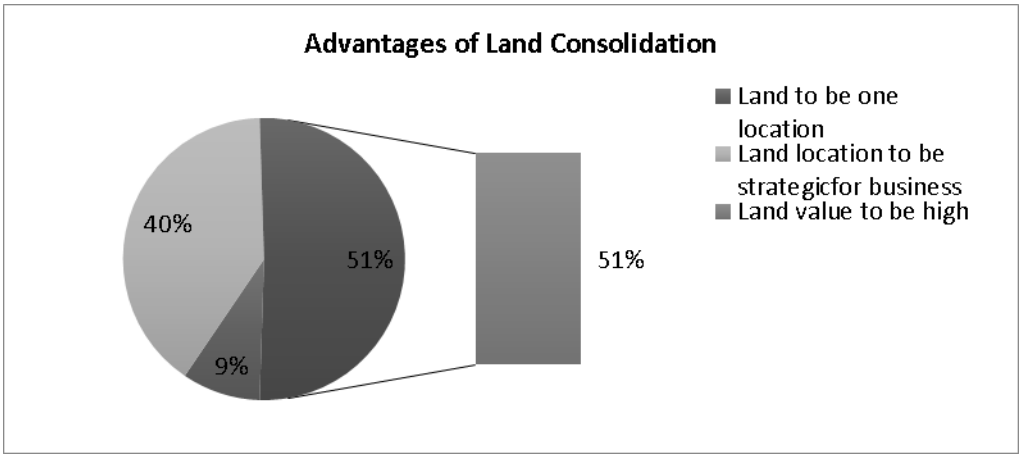
Based on secondary data that are collected, Land Contribution for Kuta-Kerobokan Road Link Development through Land Consolidation System reaching 20% from each land area of landowners.

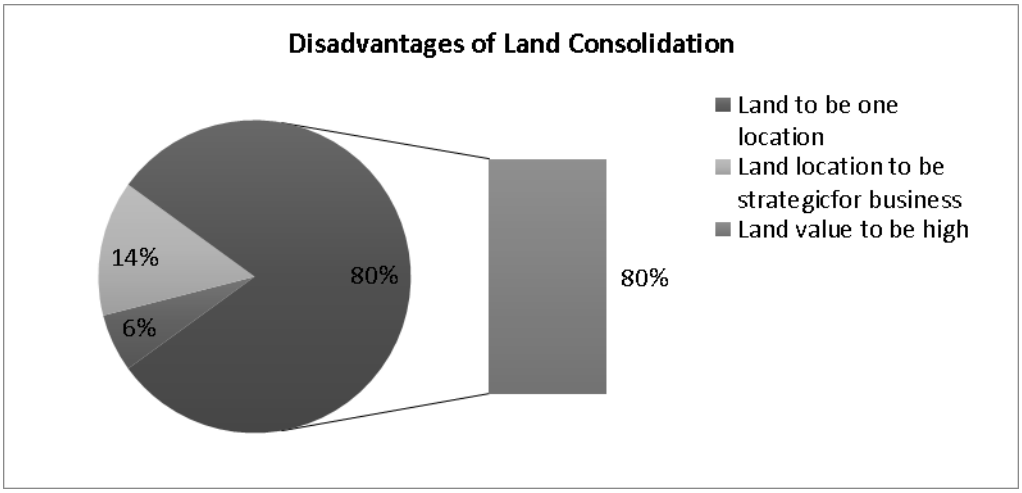
In spite of that, according to Law of the head of National Land Agency No.4/1991 section 6 subsection 3 (Pasal 6 ayat 3 PMNA/KBPN No. 4 Tahun 1991) issued that the people/landowners who have too small land area that is impossible to contribute to development purpose, even a half of it, this can be substituted as money or others form that are agreed together by the landowners.

The result of study shows that some respondents revealed that the land that they previously owned, was less than 200 square meters and the land committee have conducted a specific approach for the landowners, so that there was not problems in this process and even the landowners felt satisfied.

This matter essentially is appropriate with Law of the head of National Land Agency No.4/1991 section 7 subsection 3 (Pasal 7 ayat 3 PMNA/KBPN No. 4 Tahun 1991) that issued the land contribution for development which are used for land consolidation cost, the use of it are handed over to landowners who have too small land area or the other people with compensation payment in form of money that its amount is agreed by landowners.

With reference to the change of land use, the research shows that 25,71% respondents revealed that it was occurring the change of the land use. While the opinion of respondents concerning on it is discrepancy, some of them felt advantages and others oppositely. The response of respondents on land consolidation is distinction, the findings shows that the respondents felt advantages because of: 8,57% land to be one location, 40% land location to be strategic for business and 51,43% land value to be high. On the other hand, the respondents felt disadvantages because of: 5,72% the land owned to be widespread, 14,28% land location to be not strategic for business and 80% the land tax to be high (Graph 4).





Graph 4. Advantages and Disadvantages of Land Consolidation

As can be seen at Graph 3.5, respondents mostly felt loss or disadvantages because of the rise of land tax in location. Moreover, based on the result of focus group discussion, respondents argued that the land tax is burdened too high and increased fast compared previously, while some of their land is still non-productive (empty land) and others are allocated as agriculture field (not building or other function with the high taxation).

This tax greatly affects to the locals who still rely on agriculture sector (as farmer). As a result, this matter could influence directly to the social-economics condition of respondents.

The research also shows that landowners have still not allotted the land area optimally after land consolidation, and this could influence plainly to the social-economic of people. According to Law of the head of National Land Agency No.4/1991 section 2 subsection 1 (Pasal 2 ayat 1 PMNA/KBPN No. 4 Tahun 1991) issued that principally, the objectives of land consolidation is to achieve the optimal land use and this can be accomplished through increasing of the land use efficiency and productivity. To minimize the un-optimal land use requires to be anticipated through carrying out capacity building and briefing to landowners/locals about the effective use of land after land consolidation.

The loss factor can only be looked in terms of the change of land use particularly agriculture field, the facts show that they are not able to continue to work properly in agriculture sector because their field is unconnected with the water irrigation because the road construction was not synchronized directly with the drainage provision.

Furthermore, too complicated of land certificate procedure is also the other issue created the landowners felt unsatisfied. Although this factor is not strongly influencing the land consolidation process, however, it needs to make consideration in order to succeed the road development through land consolidation system.

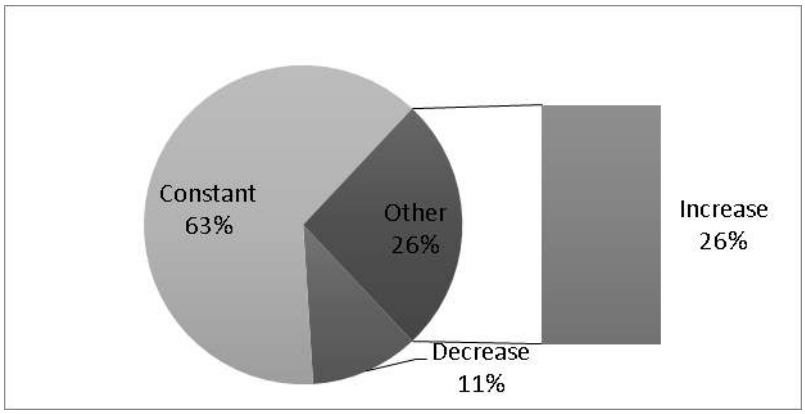
Regarding the objectives and target of land consolidation that would like to achieve, the research shows that after land consolidation, 54,28% respondents argued that their land more arranged/organized, and 45,72% revealed their land to be not organized.

It means that the land consolidation in Kuta have reached certainly the target. It is also appropriate with Law of the head of National Land Agency No.4/1991 section 2 subsection 2 (Pasal 2 ayat 2 PMNA/KBPN No. 4 Tahun 1991) that issued the main target of land consolidation is to allocate a land use in well-arranged.

In terms of the firing of land right, 91,43% respondents revealed that they have signed the land certificate and only 8,57% argued not yet. Furthermore, 91,43% respondents argued that they have already obtained land certificate and only 8,57% revealed not yet.

It seem clearly that the land certificate process have well organized, although some respondents have not attained yet. This is because of lack respondents participatory and lack education and information of respondents; mostly they still have not yet fulfilled some prerequisite that require to completing the certificate process.

Regarding social-economic of landowners after land consolidation, only 11,43% respondents argued decrease, the most (62,86%) revealed constant, and while 25,71% said increase (Graph 6).



Graph 5. Social Economics Condition of Landowners after Land Consolidation

It implies that the social-economics of landowners obviously tend to be constant. Based on research and the result of focus group discussion, it revealed that the land condition is not synchronized by road development. It leads to the land unable be used optimally and not support business opportunities (economic value). Moreover, the cut-off the water irrigation resulted the locals (farmer) are not able to increase their land productivity. It carries out tendency the change of agriculture to industry pattern. While to move to industry pattern, they have not ready yet to compete in this sector because of the low level of skills and education.

Additionally, the focus group discussion shows that some respondents have negative opinion and perception with Kuta-Kerobokan road link development project, especially

regard with the use of labours that come from outside location in this project. People argued that the presence of these labours would increase the criminal level and environment problems particularly to the growth of slum area.

The fact is that they create demography problems, because they have not returned to their hometown straight away after project completed but even they live in sub standard house on illegal land like slum area. While they have not been supported strongly by enough skills and education to compete in heterogeneity city development to get job opportunities. As a result, the unemployment is increasing sharply in Kuta and eventually it would create more urban social problems.

4. Conclusions

4.1. Tohpati-Gianyar Road Link

- Land process for People Affected by Project (Landowners), the finding is that the government (Land Acquisition Committee) have conducted and organized well and also in case of the firing of land right have appropriated with the law.
- The responses of Landowners are principally discrepancy/variation and more much depending on their social-economic condition, custom-behaviour, social-culture, religious matter and the neighbourhood and environment where they live.
- Although, the findings shows that some respondents felt unsatisfied with the amount of loss substitute, however, most locals have not complained or protest because they perceived well that their land rest have better prospect in the future both social and economic value and they fully support the road development project in order to provide better service.
- The use of loss substitute money would influence to social-economic condition. It seems that if they allocated in effective way, it would tend to increase their economics condition, the other hand, if they spent for unproductive needs, consequently their economic condition have tendency going down.
- The findings shows that either the change of landowners job or not have not influence to the increase or decrease the social-economics of people/landowners.
- To investigate the success of failure the land acquisition process for road development project requires properly taking into account many aspects point of view like social-economy, custom-behaviour, location value, social culture background and religious matters as well.

4.2. Kuta-Kerobokan Road Link

- The Land Consolidation Scheme in order to construct the Kuta-Kerobokan road link project have been conducted and appropriate with the law both National and Local Law.

- Finding shows that after land consolidation, the landowners have not allotted optimally their land for increasing their income level, it leads that this land consolidation process have not strongly impact to the growth of social-economic of people.
- The advantages and disadvantages of land consolidation, most landowners felt satisfied because of the land value to be high and strategic for business activities, the other hand, some felt unsatisfied because the land taxation in that area is too high while their land is not optimally allocated yet (unproductive).
- The use of land in land location make tendency to neglect the current law. It resulted that land consolidation for Kuta-Kerobokan road link project seems carrying out the unarranged or unorganized of land.

5. Recommendations

In the land acquisition and land consolidation used for road development project, it is felt that improper decision might be issued among government, the land committed team and community/landowners. Based on study explained, it might be recommended as follows:

5.1. General Recommendation

- The government should apply decision and regulation more transparent and responsible. This commitment is essential to acquire trust from the community.
- The government should offer optional choices, where the community involved in the land acquisition and land consolidation is included for their participation. In the land team, the community should have their representatives. Hence, their views and expectation can be heard and fair compromised can be decided.
- The government should take into account the community opinion in order to issue land certificates easier and faster. This matter can be activated through technical and skill training to the community involved and the government should apply simple bureaucracy steps, minimum certificate fee and better service to the community.
- In the land acquisition, the plan should be informed to the community and also in the strategic location, the land allocation should be preserved for future development.
- In general, it can be underlined that this project should increase job opportunities and income of the community and should not otherwise, where economic level of the community deteriorated.
- This issue can be achieved through information and effective socialized manner to treat the land compensation given to the community in order to anticipate the change of thinking scheme of the community from agricultural thinking to the heterogeneity of the city development.

- Further, the project should minimized cut-off of Subak's irrigation system. The irrigation cut-off obviously will kill the job opportunity of the community who are generally still relies on agriculture.
- This matter could be implemented through coordination of institutions involved, where the road construction should also equipped with proper drainage system. In this way the job opportunity of people can be preserved.
- Culture approach: traditional and religious matter is essential in the road construction. This approach should involve traditional leaders, religious leaders and community leaders.
- It is necessary to provide free educational and training to the locals who affected by the project. Also, it is important to provide them with a soft loan credit to develop their business.

5.2. Recommendation of Tohpati-Gianyar Road Link

- Direct information should be given confidentially to the owner of the land only. The information should not be exposed widely to prevent speculator/agents to purchase land before land negotiation by the project.
- To avoid negative opinion to the land acquisition, the owner required to be supervised and suggested to effectively manage or use the land compensation money for development of their business for example.
- This suggestion is necessary in order to improve the level of living of locals and spend the compensation money effectively.
- It is necessary to give orders or suggestion to the landowners, where the rest land, which is not purchased, should not be transferred or offered to other party. If the transferred cannot be avoided they should wait for appropriate time in order to gain maximum transferred values.
- It is necessary to provide help to the landowners where in case their rest land could not be managed properly after acquisition by the project.
- In order to keep community trust to the government and land acquisition team, the land certificate should be issued in a short time.
- In the land acquisition, especially for the people need to be relocated, should also given compensation for socio-economy and culture lost.
- For the locals, relocation should be given priority in the same Banjar and traditional village (desa adat).

5.3. Recommendation of Kuta-Kerobokan Road Link

- For locals who own land less than 2 acres, which is difficult to be managed by land consolidation scheme should be transferred in money or other compromising means.

- Negative impact due to labour of the project should be avoided, where the labour from out side should be returned to their hometown straight away after the project completed.
- This issue is essential to avoid slump area, unskilled labour, which will affect greatly the local socio-economy. Enforcement should be written in the contract document to force the contractor to return the labour to their hometown so penalty should be given to the contractor if ignored. Also, the traditional community (Adat) should be involved in this residential issue.
- Land taxation after land consolidation need to be considered, where increase tax should be stopped and minimized for the unproductive land or land used for agriculture.
- This tax greatly affects the locals who generally still rely on agriculture (farmers).
- After land consolidation, for locals who are considered as low-level economy should be given training, supervision and soft loan. However, for the landowners who are considered as high-level economy and who do not treat their land properly should be given a penalty in accordance to the law.

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REGION BASED DEVELOPMENT OF LAND CONSOLIDATION THROUGH LAND CONSOLIDATION VILLAGE

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Abstract

Land consolidation is an instrument of land management that involves the participation of the community. So far, the implementations of land consolidation were solitary conducted, which is separated from one location to another location, according to community proposal. Locations of land consolidation are independent and have no connection. This resulted in the efficiency and productivity of land and space utilization of the region became less optimal. To achieve the efficiency and productivity of land and space utilization and the improvement of the quality of the environment, it is necessary to develop the implementation of land consolidation to be more efficient in the land management within a wider area. The development of land consolidation implementation is oriented to the unit of a village or a particular zone. The introduced models are Gadingsari Land Consolidation and Cangkringan Land Consolidation. The result of land consoledation development through the land consolidation village is the improvement of the physical environmental arrangement within the wider area. The physical environmental regulations were held by involving the active participation of the community as well as integration with local government programs. In addition, through land consolidation villages, on going asset legalization and village-oriented of land administration can be fully mapped.
Keywords: land consolidation; land consolidation village

1. Introduction

Land consolidation is an instrument of land management that involves the participation of the community. Land management policy through land consolidation is the reorganization tenure, ownership, use and utilization of land both physically and juridically in order to optimally utilize the land, through increasing efficiency and productivity of land and space utilization and improving the quality of the environment, while providing legal certainty of land rights community involving community participation (Kementerian Agraria dan Tata Ruang/BPN, 2017). It is expected through land consolidation that tenure, ownership, use and utilization of land will be organized together by involving the participation of the land consolidation participants. The land management includes physical and juridical arrangement. Physical structuring will improve the efficiency and productivity of land and space utilization and the improvement of the quality of the environment. Juridical regulation will provide legal certainty of community land rights.

In addition, land consolidation becomes a means of acquisition of land for development (Tanah untuk Pembangunan-TP/land contribution). TP can be used for the construction of public infrastructure and facilities. Through the land consolidation, the size and planning of utilization of TP is determined based on participant's agreement. Land consolidation

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becomes an alternative to land registration as well as land management. Land consolidation is widely held in the land development and development of residential zones. Thus, according to Sitorus, there are 2 (two) activities simultaneously undertaken in a land consolidation activity: (a) land management covering the reorganization of tenure (against landlessness disorder) and land use (against land use irregularities); and (b) land acquisition for the purpose of construction of public infrastructure and facilities at the locations of land consolidation (Sitorus, 2014).

The implementation of land consolidation has been started in Indonesia since 1982 in Denpasar City, Bali by adopting land consolidation in Taiwan (Suhesti, 2015). Furthermore, land consolidation is disseminated throughout Indonesia. In its development, land consolidation in Indonesia is carried out through two financing approaches, government funds (State Budget/APBN) and non govermental (swadaya). Land consolidation through government funds is budgeted through the State Budget, so that the financing of the entire process of activities is financed by the state. Meanwhile, the consolidation of land through community self-financing, the whole process of activities financed by the community itself. The implementation of land consolidation, both government and non-government funds, is based on community proposals with a minimum of 10 parcels of land.

In this paper, an overview of the implementation of land consolidation in Sleman Regency, Yogyakarta Special Region from 1989 to 2014, as in Table 1 below. Within 25 years has been held land consolidation as much as 34 times, two of them financed by government funds. Land consolidation was held in 10 sub-districts of 17 sub-districts in Sleman Regency. The number of parcels involved varies from 7 to 1,687 parcels. In general, land consolidation is carried out involving 20 to 30 land parcels. Examples of distribution of land consolidation locations can be seen in Figure 1.

Table 1. Land consolidation in Sleman, 1989 – 2014

No	Years	Fundings	District	Village (and Sub-village)	Areas (m^2)	Parcels
1	1989/1990	APBN	Mlati	Sinduadi	224.455	324
2	1997/1998	Swadaya	Depok	Condongcatur	2.118	12
3	1997/1998	Swadaya	Ngaglik	Sinduharjo	1.732	10
4	1998/1999	Swadaya	Ngaglik	Sukoharjo	3.060	18
5	1998/1999	Swadaya	Kalasan	Purwomartani	27.988	62
6	1998/1999	Swadaya	No data	No data	15.875	66
7	1999/2000	Swadaya	Depok	Maguwoharjo (Tajem Lama)	2.419	18
8	1999/2000	Swadaya	Kalasan	Purwomartani (Sambisari)	8.350	30
9	1999/2000	Swadaya	Mlati	Sendangadi (Jatirejo)	3.779	24
10	1999/2000	Swadaya	Ngemplak	Wedomartani (Gupitsari)	7.310	25
11	1999/2000	Swadaya	Pakem	Candibinangun	22.262	74
12	1999/2000	Swadaya	Ngemplak	Umbulmartani	5.178	30

13	2001	Swadaya	Kalasan	Purwomartani (Grenjeng)	7.190	27
14	2001	Swadaya	Ngaglik	Sukoharjo (Kroco)	2.285	14
15	2001	Swadaya	Mlati	Tlogoadi (Bolawen)	3.222	13
16	2001	Swadaya	Ngemplak	Wedomartani (Gondang Legi)	6.144	29
17	2001	Swadaya	Ngaglik	Sukoharjo (Banjarsari)	3.910	23
18	2001	Swadaya	Godean	Sidomoyo (Sawahan)	2.705	18
19	2002	Swadaya	Ngaglik	Sinduharjo	2.355	17
20	2002	Swadaya	Ngaglik	Sinduharjo	4.885	29
21	2002	Swadaya	Gamping	Banyuraden (Cokrowijayan)	3.548	17
22	2002	Swadaya	Gamping	Banyuraden (Banyumeneng)	2.025	7
23	2002	Swadaya	Mlati	Sendangadi	6.419	18
24	2002	Swadaya	Kalasan	Tirtomartani	5.719	13
25	2002	Swadaya	Godean	Sidoarum	5.515	33
26	2002	Swadaya	Sleman	Trimulyo	16.230	133
27	2004	Swadaya	Kalasan	Purwomartani	4.506	16
28	2005	Swadaya	Gamping	Ambarketawang	7.494	118
29	2005	Swadaya	Gamping	Nogotirto (Nogosaren)	2.415	16
30	2006	Swadaya	Kalasan	Purwomartani (Sambiroto)	13.418	79
31	2006	Swadaya	Godean	Sidomoyo (Sawahan)	2.569	9
32	2007	Swadaya	Ngemplak	Wedomartani (Babadan)	5.805	33
33	2010	Swadaya	Gamping	Ambarketawang (Patukan)	982	30
34	2014	APBN	Cangkringan	Umbulharjo, Kepuharjo	2.899.284	1.687
				Total	3.333.151	3.072

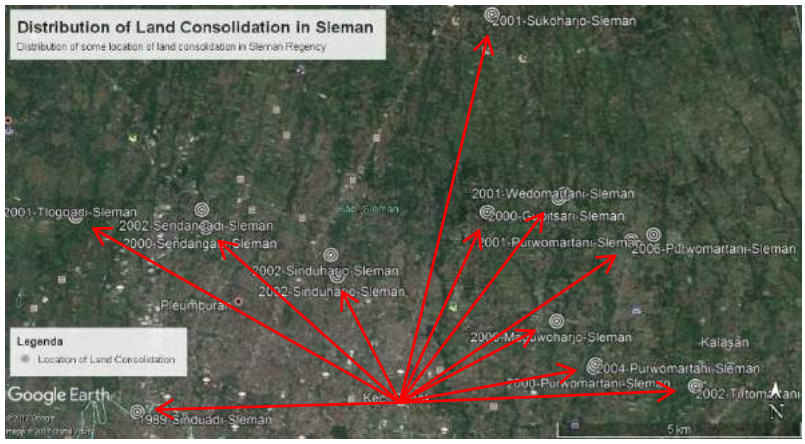

Figure 1. Distribution of some location of land consolidation in Sleman

Therefore, it can be said that the implementation of land consolidation is systematic and sporadic. It is systematic if the land consolidation is carried out in one field of location. In a location of land consolidation can be published tens to hundreds of certificates. On the other hand, it is sporadic that the implementation of other land consolidation or subsequent location is different and separate from previous activities. The determination of the location takes into account the preparedness of relevant stakeholders. So far, the implementations of land consolidation were solitary conducted, which is separated from one location to another location, according to community proposal. Locations of land consolidation are independent and have no connection. This resulted in the efficiency and productivity of land and space utilization of the region became less optimal.

To achieve the efficiency and productivity of land and space utilization and the improvement of the quality of the environment, it is necessary to develop the implementation of land consolidation to be more efficient in the land management within a wider area. The development of land consolidation implementation is oriented to the unit of a village or a particular zone. The smallest unit of land administration is the village. Thereby the implementation of land consolidation is directed to be implemented in one village on a continuous and fully mapped village-oriented. In addition, it is possible to develop the implementation of zone / region based land consolidation. This paper presents the concept of sustainable land consolidation through the Land Consolidation Village.

2. Land Consolidation Village

Land Consolidation Village (LCV) is intended as a systematic land registration system through land consolidation mechanisms in certain area units that are implemented on an on going basis. In general, LCV is a series of implementation of land consolidation activities within a village area either through government funds (APBN) or non-governmental (*swadaya*). To get an overview and or model of LCV, the Gadingsari Land Consolidation and Cangkringan Land Consolidation is proposed.

2.1. Gadingsari Land Consolidation

Gadingsari Land Consolidation (GLC) is a land consolidation in Gadingsari Village, Sanden Sub district, Bantul Regency, Yogyakarta Special Region, as in (Prabowo, 2015). Land consolidation is carried out on one area and continued on adjacent areas, resulting in a well-organized and well-ordered land administration. Structuring of tenure, ownership, use and utilization of land according to the local Spatial Plan (RTRW) and the provision of public facilities and community participation in every process is carried out on land consolidation in Gadingsari Village.

The implementation of land consolidation in Gadingsari Village started from Wonorejo II Sub-village for 300 parcels. Successful implementation of land consolidation in Wonorejo II Sub-village encourages surrounding sub-villages to carry out land consolidation. The implementation of GLC was started in 2009. The next GLC was implemented in 2010, 2011,

2013, 2015 and 2017. During the six times of implementation, 1,723 parcels have been recorded and involved 1,478 participants with a total area of 729,826 square meters. The following table shows the implementation of land consolidation in Gadingsari Village.

Table 2. The implementation of land consolidation in Gadingsari Village

No	Years	Locations	Parcels	Participants	Area (m^2)
1	2009	Dusun Wonorejo II	300	267	136.795
2	2010	Dusun Wonorejo I	200	156	86.546
3	2011	Dusun Wonorejo I	223	200	97.460
4	2013	Dusun Bongos II dan Bongos I	200	170	92.804
5	2015	Dusun Bongos I, Demakan dan Nanggulan	600	491	301.221
6	2017	Dusun Nanggulan, Patihan dan Wonoroto	200	194	15.000*
			1.723	1.478	729.826*

*) estimated

The location of the land consolidation in Gadingsari Village is shown in the Figure 2a below. The total area of Gadingsari Village is about 811,74 hectares, while the implementation of land consolidation in Gadingsari Village until 2017 covers an area of about 71,48 hectares or 8.98% of the total area of Gadingsari Village. The relative position of GLC's location to the Gadingsari Village is shown in the Figure 2b.

2.2. Characteristics of Gadingsari Land Consolidation

There are several characteristics of GLC:

1. Rural settlement areas

   The GLC area is built area and a medium-density (R-3) and low-density (R-4) rural settlement area, making it a relatively difficult arrangement. However, the potential for social conflict is relatively small compared to urban settlement areas.

2. Physical arrangement of environment

   In the physical arrangement of the environment every parcels should have the road access. In pre-land consolidation, there are some parcels that do not have the roads access. Through land consolidation, these parcels have the road access either with shifts, provision of roads, or new road construction. The old road segment is widened so it can be passed by four-wheeled vehicles. Inundated areas are provided with waterways that also serve as sewerage channels.

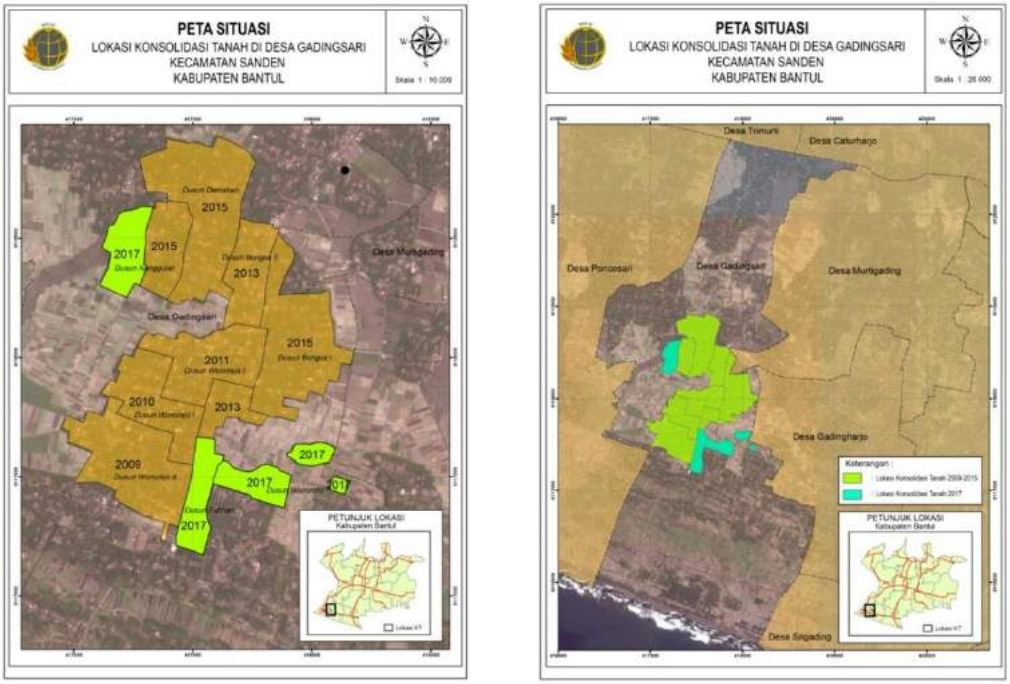

Figure 2. (a) The location of the land consolidation in Gadingsari Village; (b) The relative position of GLC's location to the Gadingsari Village

3. Arrangement of land administration.

   In the arrangement of land administration, the roads that are still included in individual authorization are released became public property. Other, inheritance due to the death of the holder of land rights is settled through land consolidation.

4. Community participation and local wisdom.

   The participation of the participating communities of land consolidation in Gadingsari Village is very high. Community involvement includes participation in land consolidation, participation in the provision of TP, participation in the contruction of roads and / or other facilities, and participation in post-land consolidation activities. The active participation of the community is driven by the values of local wisdom in interpreting the social function of the land.

5. Provision of Land Contribution (TP)

   Provisions of TP are drains and mostly roads. According to the agreement of the participants, the provision of TP is limited by the participants along the new roads or widening the existing road. Participants who are not exposed to new roads or road widening have the same right to use the road.

6. Post-land consolidation construction

   Physical construction, especially the pavement of roads generated through land consolidation, is carried out in the following year through physical development programs. The source of physical development programs funds come from the central government as well as local government.

7. Education and socialization

   Education and socialization to the participants of land consolidtion as well as the surrounding community members regarding the land consolidation and the provision of TP is sustainably and planned, so that the people around the location will prepare to hold land consolidation in the following year.

2.3. Cangkringan Land Consolidation

The Merapi eruption especially affected areas close to the crater. Material bursts of Mount Merapi damaged several villages in the region of Sleman, destroying thousands of homes and affecting ownership of local residents. To avoid the potential of land conflict the provincial land agency decided to execute a land consolidation process, specifically in the local villages surrounding the area of village of Cangkringan.

The post-disaster handling paradigm on land affairs especially in disaster prone areas III needs to be directed to the arrangement of the area without removing the rights of local landowners through Land Consolidation. The land consolidation plan was based on 4 pillars (de Vries, 2016):

1. the regional spatial plan, primarily targeting re-establishing and reconstructing economic activity such as agriculture;
2. infrastructure development associated with the handling and control of disasters;
3. local topographical conditions,
4. community participation.

Cangkringan Land Consolidation (CLC) in the District Cangkringan expected to be a model of post-disaster handling of land affairs. The result of land consolidation is; first, the availability of public facilities and social facilities without removing landowners; second, landowners share financing and benefits fairly through participation of land contributions for development (TP); third, optimal land use due to regular land parcel and access to the roads; fourth, the land tenure and ownership are controlled through entirely registered all of land parcel (BPN Province Special Region of Yogyakarta, 2014).

CLC is implementation of land consolidation which held in Disaster Prone Areas (Kawasan Rawan Bencana-KRB). According to Sleman Regent Regulation No. 20 of 2011, has been determined Disaster Prone Areas I / KRB I, KRB II and KRB III. Merapi Disaster Prone Area III is an area close to the source of frequent hot clouds, lava flows, falling rocks, stones (incandescent) and heavy ash rains. Disaster Prone Area III is located in Umbulharjo Village (Pelemsari and Pangukrejo sub-villages), Kepuharjo Village (Kaliadem, Petung, Jambu and Kopeng sub-villages) and Glagaharjo Village (Kalitengah Lor, Kalitengah Kidul and Srunen sub-villages) (Pemerintah Kabupaten Sleman, 2011).

The implementation of land consolidation was carried out in 2014 in KRB III zone in 2 villages, Umbulharjo Village and Kepuharjo Village (Table 3). The location can be seen in Figure 3a.

Table 3. The implementation of Cangkringan Land Consolidation year 2014

No	Village	Sub-village	Parcels	Participants	Area (m^2)
1	Umbulharjo	Pelemsari	167	121	246.686
2	Umbulharjo	Pangukrejo	468	350	603.376
3	Kepuharjo	Kaliadem	292	172	583.263
4	Kepuharjo	Jambu	230	173	401.985
5	Kepuharjo	Kopeng	205	154	290.234
6	Kepuharjo	Petung	325	200	773.740
			1.687	1.170	2.899.284

2.4. Characteristics of Cangkringan Land Consolidation

There are several characteristics of CLC:

1. Arrangement of land administration.
   In the arrangement of land administration, traditional tenure such as "*kuli kenceng-kuli kendho*" and other types of land tenure can be solved. Thereby, the land tenure and ownership of the land is appropriate. In addition, roads that are still within the control of individuals may be released into public property.
2. Fully mapped Village
   Through CLC two sub-village in Umbulharjo Village and four sub-village in Kepuharjo Village can be fully mapped and registered as shown in Figure 3b.

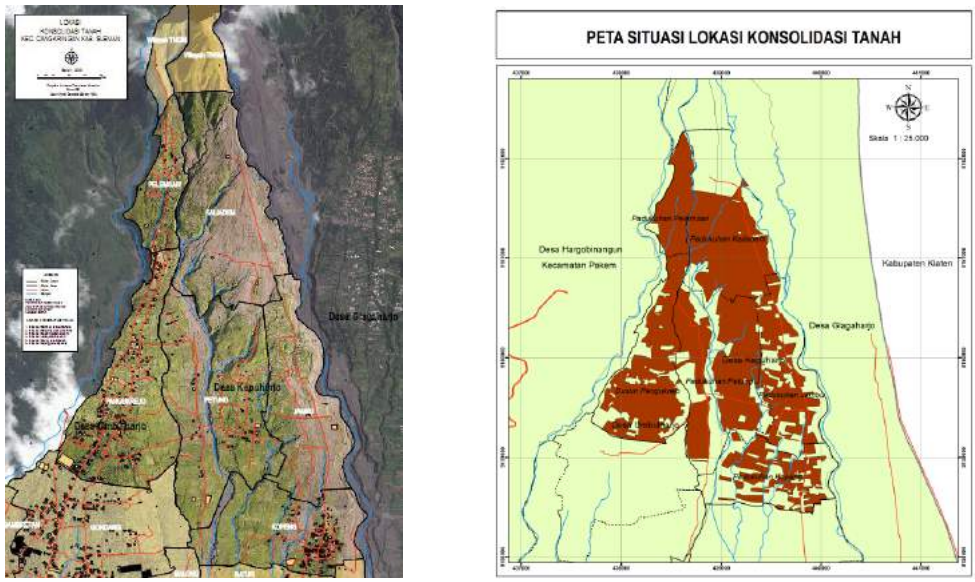

Figure 3. (a) The location of the Cangkringan Land Consolidation; (b) Brown area shown Cangkringan Land Consolidation land parcels

3. Disaster Prone Area

   The CLC is in Disaster Prone Area III / KRB III. The spatial plan for the next 20 years also included that it would not be allowed to live in a residential development area directly affected eruption Merapi 2010; that it would not be allowed to add new facilities and infrastructure in the affected areas Direct eruption 2010; and, that land utilization would only be allowed for special interest tourism, agriculture, plantation and reforestation in areas directly affected the eruption in 2010. The Sleman Land Office and Government of Sleman agreed to change the status of land use into agricultural land and not to be converted to other function. Through the policy, it is expected that there is no development / expansion of residential areas in Disaster Prone Area III.

4. Anticipatory efforts of post disaster land conflict

   As a result of blast of Mount Merapi have been stockpiling and destroying thousands of homes and causing the loss of the boundaries of land ownership. Loss of the boundaries of land ownership within a large area has the potential land conflicts. Moreover, sand and stone materials have high economic value. Therefore, the registration of land parcels in KRB III became the anticipative effort of land conflict after the disaster.

5. Community participation, disaster mitigation and local wisdom

   Participation of land consolidation participants is very high. Communities are involved in providing TP that is closely linked to disaster mitigation. Disaster mitigation initiated in CLC is the provision of TP as an evacuation route. New roads function as transportation routes also serve as evacuation routes in case of eruption. The eruption of Mount Merapi has made people aware of Mount Merapi's continuous and cross-sectoral disaster mitigation efforts. One of the main reasons for the successful implementation of CLC is the existence of '*gotong royong*' in certain communities, which are Indonesian traditions, rooted in Javanese culture (de Vries, 2016).

6. Ecotuorism

   Post-eruption of Merapi increase the activities of nature-based tourism in the area of KRB III. Besides climbing, there is "Lava tours" which became a iconic tourist attraction in Cangkringan. "Lava tours" is a tour through the former area of lava flows due to eruption of Mount Merapi using four-wheeled and two wheels vehicles that have been specially designed. The routes passes through residents land parcels which have cooperation agreement. The certainty of the boundaries of the land parcel supports the continuity of the tours.

Figure 4. Lava tour: "jeeps" crossing the temporary bridge in Cangkringan

2.5. GLC and CLC Comparison

Table 4. GLC and CLC Comparison

No	Aspects of Land Consolidation	Gadingsari LC	Cangkringan LC
1	Time	6 times in 6 years (2009, 2010, 2011, 2013, 2015, 2017)	1 time in 1 year (2014)
2	Units	Sub-village, minimum 1 sub-village in every project	Zone
3	Zones	medium-density (R-3) and low-density (R-4) rural settlement area	Disaster Prone Area (KRB) III
4	Parcels	1.723	1.687
5	Allocation of land contributions for development	Roads and drains	Roads for evacuate routes
6	Arrangements of Land administration	• Legalization of roads • Inheritance	• Reconstruction of landownership boundaries • Solved traditional land tenure • Inheritance
7	Funding source	Government	Government
8	Types of land consolidation	Non-Agricultural	Agricultural

2.6. Establishment of Land Consolidation Village

Based on the characteristics of GLC and CLC then can be prepared general directives for LCV establishment. It is hoped that based on these directives, LCV can be developed elsewhere by considering local wisdom. Implementation of land consolidation in Gadingsari

Village and Cangkringan is expected to be a model for establishment of LCV elsewhere. These directives are:

1. Prerequisite of LCV

   To establish the LCV required several prerequisites as follows:

   - The community's interest and understanding of land consolidation, as well as the ability to participate actively in every process of land consolidation activities.
   - There is strong commitment and support from the village government in terms of delineation of land rights for land consolidation participants.
   - Support from the district / city government.
   - Availability of inventory data of tenure, ownership, use and utilization of land.
   - Included in the project of Potential Object of Land Consolidation. Suitability of Spatial Planning and land use has been selected through the project of Potential Object of Land Consolidation.

2. Stage of LCV implementation

   To start the implementation of the LCV is the selection of locations that meet the preconditions as above. This is to ensure smooth and successful implementation of land consolidation. From the experience of holding land consolidation in Yogyakarta Special Region, the high interest and understanding of the people towards land consolidation is not accompanied by the support of the village government is very hampering the smooth phase of land consolidation. Furthermore, the implementation of land consolidation follows the procedures established in the Land Consolidation Procedure of the Ministry of Agrarian and Spatial Planning.

3. Financing

   Financing of LCV can be through the mechanism of government funds and non goverment funds. For the government funding mechanism, the determination of the location and the number of target areas is the authority of the Regional Office of the National Land Agency based on the available budget. As for non goverment funding mechanism, the determination of location, number of parcels, cost and participants are the responsibility of third party. A third party may be a community group or a legal entity or a local government / agency.

4. Local government support

   Basically land consolidation is an activity that requires coordination and cooperation with local governments, both districts / cities and provinces. The responsibility of the Ministry of Agrarian and Spatial Planning / National Land Agency is the land registration that is the object of land consolidation. Development of infrastructure and facilities are not the main tasks and functions of the Ministry of Agrarian and Spatial Planning / National Land Agency. Therefore, with good cooperation and coordination with local government, infrastructure and facilities can be realized.

5. Region-based
   At the beginning mentioned that the orientation of the region refers to the smallest administrative unit, the village. However, the base of the region can be adjusted according to the needs and conditions that exist in the field, such as cultural site buffer zone, nature tourism zone, and so forth.

3. Results and Discussion

1. According to the above description, LCV is the development of the implementation of region-oriented land consolidation. Implementation of land consolidation has been aimed at establishing an area that will support the efficiency and productivity of land and space utilization and the improvement of environmental quality.
2. The implementation of the LCV shall comply with the requirements of the LCV: the interest and understanding of the community, the support of the village government, the support of the local government, the availability of land inventory data and the suitability in the project of the potential objects of land consolidation.
3. The sources of LCV financing can be through government fundings (APBN) and non government fundings (*swadaya*) mechanisms, enabling community groups, legal entities, and even local governments to participate in the development of land consolidation.
4. Given that land consolidation is an activity that requires coordination and cooperation with local governments, it can be developed LCV that facilitate local government programs such as the development of tourist areas, the development of industrial estates, and so forth.

The Land Consolidation Village is expected to be a region-based participatory land management model that can be held elsewhere, especially in rural and other areas. LCV does not rule out the possibility of being implemented based on zone / region. LCV can be adjusted with development program by local government.

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TAROK CITY DEVELOPMENT PLANNING IN PADANG PARIAMAN AS THE IMPLEMENTATION ON LAND CONSOLIDATION

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Abstract

Land as a part of earth surface, has very important meaning in human life, as a place or a space for living with any activities, as living source, moreover as a nation, land is a part of region in nation sovereignty. Land consolidation has purpose to utilize the land proportionally, balanced, and sustainably by increasing the efficiency of land use. Such improvement leads to the achievment an order and authorization orderly and regularly. The main objective of Land consolidation is mainly the relatively empty area of the suburbs that is expected to develop as residential areas. This study aims to obtain information about the implementation of land consolidation in planning development of Tarok City area in Padang Pariaman District. The research was done by qualitative descriptive method. The research use the primary data obtained by interviews and the secondary data obtained by library researc and using SWOT analysis. The result of qualitative descriptive analysis is the Tarok City area in Padang Pariaman with 697 hectares is the answer to the availability of land for large-scale development that actively participates in advancing West Sumatra, especially to the people's economy.
Keywords: development planning and land consolidation.

1. Introduction

Sustainable development is an ideal concept hope in the 21st century. Many of the activities conducted by various countries in the world to continue toward countries that implement sustainable development. In every development activity of course it is necessary spatial planning is sustainable. Spatial planning is often used to manage one of the most precious natural resources of the land. Land is essential for socio-economic development of people and nations because almost all human activity takes place on the ground (Fuseini, Kemp, 2015). Increased competition for space among human activities has been a driving factor for land-use planning practices (Pacione, 2009). Rapid urbanization is set to increase this competition and propose more claims for wise land resource management in the 21st century.

Land is an inseparable part of human life. Land as one of Indonesia's wealth must be utilized as big as according to Pasal 33 ayat (3) UUD 1945 that the earth, water, and natural resources contained there in are controlled by the state and used as much as possible for the prosperity of the people. The existence of spatial management and/or spatial planning can at least address and mitigate conditions that can hamper development in the community. In this case, land consolidation, as part of spatial planning has an important role in arranging and revitalizing land tenure, ownership, use and utilization.

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According to Peraturan Kepala Badan Pertanahan Nasional Nomor 4 Tahun 1991 Land consolidation is a land policy concerning the realignment of tenure, ownership, use and utilization of land in accordance with the Spatial Plan and the procurement of land for development purposes in order to improve the environmental quality and maintenance of Natural Resources by involving the active participation of the community. Further the objective of Land consolidation is to achieve optimal land utilization, through increased efficiency and productivity of land use and improvement of environmental quality (Direktorat Konsolidasi Tanah, 2015). In the implementation, land consolidation is the same as other spatial plans, considering the carrying capacity, sustainability, participation, and community empowerment. Based on the description, land consolidation is an integrated activity to rearrange an area to be regular and aimed at improving the quality of the environment including the provision of facilities and infrastructure, utilize the land optimally, and provide assurance of land rights certainty. The provision of land for infrastructure and territorial arrangement through land consolidation can be done in various ways, one of which is public and government participation in land procurement (Ministry of Land and Spatial Planning/National Land Agency, 2017).

One of the priority locations of land consolidation arrangements is the relatively empty areas in the suburbs that are expected to develop as residential areas. Geographically Padang Pariaman Regency 0° 11 '' – 0° 49 '' LS and 98° 36 '' – 100° 28 '' BT with area of 1,328,79 km² and long coastline 60,35 km (Badan Perencanaan Pembangunan daerah Kabupaten Padang Pariaman, 2015). The land area is equivalent to 3.15% of the land area of West Sumatera Province. From 17 (seventeen) sub-districts in Padang Pariaman Regency, 2x11 Kayu Tanam sub-district has the widest area of 228.70 km². Padang Pariaman Regency also has a strategic location because it is directly adjacent to the city of Padang as the capital of West Sumatra Province (Badan Pusat Statistik kabupaten Padang Pariaman). Population and population growth rate from 2010, 2014, and 2015 continues to increase (Indonesian population projection 2010-2035). Year 2015 recorded poverty rate 10% of the total population in Padang Pariaman or equivalent to 45,876 inhabitants. This figure should be hurried, although it is still in the target poverty figure, but the central government is peging the decline in the number 10% in 2017. Meanwhile, in details of APBD 2017, Padang Pariaman regency set the target to be achieved in 2017 is economic growth of 7.12%, reduce unemployment rate up to 5.3%, reduce poverty rate up to 8.5% and increase the development index up to 75.7 % (Peraturan Daerah Kabupaten Padang Pariaman, 2017).

Achieving these targets is a tough task that should be borne while the public demand for welfare improvements does not cease to appear every day. Therefore, change and development are inevitable in order to obtain increased resources and economic growth. Recently, the Regent of Ali Mukhni was granted authority from the Central Government through the National Land Agency of the Republic of Indonesia based on the Decree of BPN

RI Number 25-V, B-2003 dated September 3 on the Confirmation of the Cultivation Rights Title (HGU) based on Decree of the Head of BPN dated October 5, 1992 Number 24/HGU/BPN/92 on Land located in Padang Pariaman Regency. In the decree is explained 3 things, namely; 1) The cancellation of HGU granted to PT. Purna Karya on the State Land of 697 Ha and returned to the land controlled by the state, 2) Submitted entirely to the Regent of Padang Pariaman to regulate land allocation and use in accordance with the spatial plan (RTRW), and 3) Considering the rights civil PT Retirement. Following up the BPN Decree, Regent Ali Mukhni conducted the following process; 1) On 23 October 2016 held a meeting with the Chairman of the Regional House of Representatives and Chairman of the Commission of DPRD Padang Pariaman in the Regent-Karan Aur Pariaman, Ali Mukhni explained the development plan of Tarok City area, Nagari Kapalo Hilalang, District 2 x 11 Kayu Tanam, 2) Then on 17 November 2016 continued by sending a letter to Kajari and Padang Pariaman Police Chief to seek legal opinion, 3) On the same date sent a letter to the Parliament of Padang Pariaman Regency with the contents of the Planning Implementation Plan of Tarok Development Activities, 4) Next do various meetings, coordination meetings, socialization, and etc (http://webtorial.klikpositif.com/baca/15314/pembangunan-tarok-city-jaditarget-pemkab-padang-pariaman-majukan-daerah?page=2).

The problem formulation in this research is to know how planning of development of Tarok City in Padang Pariaman as implementation of land consolidation. The purpose of this research is to get information about the implementation of land consolidation implementation in planning of development of Tarok City area in Padang Pariaman and its benefit for society layer.

2. Method

This research is descriptive qualitative research (Sugiyono, 2009). The data collected in descriptive qualitative research is in the form of words or images, so it does not emphasize the numbers. Descriptive qualitative research in the first stage is the orientation/descriptive stage, in the second stage is the reduction/focus stage, and in the third stage is the selection stage. The data used are primary data obtained through interviews and secondary data obtained through library research by collecting data relevant to the research theme, and using SWOT analysis.

SWOT stands for strengths (S), weaknesses (W), oppurtinities (O) and threats (T). This technique is used in planning and management to organize information in developing a system (Goodstein: 1993). The strategies taken should maximize the strengths and opportunities, minimize the weaknesses and threats to make the system better. SWOT analysis is often described as a 2x2 matrix. There are 4 points analyzed that are strengths and weaknesses related to internal factors while opportunities and threats are related to external factors (Pickton, et al: 1998).

Based on internal factors and external factors of a SWOT analysis of the implementation land consolidation plan Tarok City area in Padang Pariaman conducted interviews with relevant agencies namely BPN Regional Office of West Sumatra province. The question grid in the interview can be seen in Table 1.

Table 1. Grid Interview Questions Regarding Tarok City, Padang Pariaman

External Factors	Internal Factors
Impacts of land consolidation	a. Geographical conditions b. Increased Economic Growth c. Coordination of related agencies

The type of interview used is semi-structured interview, in the implementation of the researcher more freely compared with structured interviews. In conducting interviews the researchers listened carefully and recorded what was put forward by informants (Sugiyono, 2009).

3. Discussion

3.1 SWOT Analysis

Based on the literature review on internal factors and external factors of land consolidation implementation in the planning of Tarok City development in Padang Pariaman Regency, it is found that the integrated area of Tarok City is planned to be built in Nagari Kapalo Hilalang, 2x11 Kayu Tanam Subdistrict, Padang Pariaman Regency considering that the location is based on SK BPN RI No. 25-V, B-2003 dated September 3, 2003 regarding the confirmation of the cancellation of HGU to PT. Purna Karya on the land of the land area of 697 Ha. Therefore, the Regent of Padang Pariaman District follow up with the planning of integrated area development to increase economic growth of Padang Pariaman Regency. In addition, the APBD glances Padang Pariaman District in 2017 amounting to Rp 1.4 Trillion, which is divided into salaries of employees and allowances of 50%, the remaining Rp 700 billion for development (http://www.canangnews.com/2017/06/rencana-pembangunan-kawasan-tarok-city.html) it seems possible to plan development in improving the welfare of the community by utilizing the resources owned in accordance with the legislation.

The development plan of Tarok City area also has wide support from various parties, besides the people who continue to urge the district government in improving the welfare, some universities, hospitals, education centers and the National Crypto Agency (Lemsaneg) are also interested in the area. This is evidenced by the invitation of the Regent of Padang Pariaman to present an integrated area of Tarok City in Lemsaneg office in Jakarta (http://minangkabaunews.com/artikel-13461-bupati-padang-pariaman-ekspose-kawasan-

terpadu-tarok-city-di-lemsaneg.html). In addition, the opportunity to increase economic growth in planning the development of Tarok City area is this area close to the trans-Sumatra highway (Padang-Pekanbaru).

However, in development planning there are difficulties and even conflicts. Such difficulties are difficult to socialize with the people who work on land in the area of development planning. In addition how to cope with the impacts that occur on such development planning, such as ecological damage because the area is located near one of the natural bathing attractions Lubuk Bonta.

SWOT analysis consisting of strengths, weaknesses, opportunities, and threats based on the above literature review can be summarized in Table 2.

Table 2. SWOT Analysis of Tarok City Development Planning in Padang Pariaman

Strength (S)	**Weakness (W)**
1. Geographical Condition The area of Tarok City Padang Pariaman is located in 2x11 Kayu Tanam District which has the most wide area of 228,70 km2 in Padang Pariaman and the cool climate. **2.** Extensive support from various agencies such as several universities, hospitals, training centers, and Lemsaneg.	Difficult socialization with the community who worked on land for this in the region. **Strategy:** 1. Coordination between district government/related agencies by mediating. 2. Provide community approaches to the benefits of such development planning in economic growth. 3. Providing land compensation to the people who have been working on the land in the area.
Opportunity (O)	**Threat (T)**
1. Increasing the economic growth of the community. **2.** Location of the integrated area of Tarok City is close to the Trans Sumatera toll road	Ecological damage **Strategy:** 1. Conduct an environmental impact analysis (AMDAL) in the vicinity of Tarok City. 2. Increasing the active role of district government and related agencies in conducting socialization to the community.

3.2 Interview Analysis

The interview was conducted on 01 October 2017 at 14.00 WIB. Interviewees related to the development planning of Tarok City area in Padang Pariaman District as the implementation of land consolidation is Mr. Alferi Halyan as Chief of Agrarian Infrastructure Section of Land Office of Padang Pariaman Regency. Questions are raised based on the lattice of questions that have been made before based on internal and external factors. The results of interviews with him are as follows;

3.2.1 Geographical Condition of Kabupaten Padang Pariaman

According to Mr. Alferi Halyan, the geographical condition of Padang Pariaman Regency is suitable for the development planning of Tarok City Territory. The area in the region is cool, while the area for the development planning of Tarok City area which has been measured again by the Measurement Team of Regional Office of Badan Pertanahan Nasional is 697 Ha where 50.01 hectare is allocated for road access.

3.2.2 Siteplan Tarok City

According to Mr. Alferi Halyan, Tarok City area already exists planning designation of its use which can be seen in Table 3.

Table 3. List of Planning for Use of Tarok City Area

Number	**Plan for Use**	**Large (Ha)**
1	Agro area	80
2	Training attorney General's Office	30,06
3	Imam Bonjol State Islamic University	47,96
4	Training of State Administration Institution	28,89
5	Government of Padang Pariaman Regency	50,29
6	Padang State University	84,84
7	Polytechnic of Padang State	40
8	Vertical Hospital	30,74
9	Ministry of Agrarian Affairs and Spatial Planning/BPN RI	50
10	Sports Centers	21,23
11	Institute of art Indonesian	42,24
12	Government of Padang Pariaman Regency II	15,74
13	Government of Padang Pariaman Regency III	3,7
14	Community Academy of West Sumatra	10
15	Land Compensation Community	73,03
16	National Crypto Agency	38,27
Total		646, 99

Then, the area of Tarok City which previously amounted to 697 Ha divided for sixteen peruntukkan with the total area is 646.99 Ha and the remaining 50.01 Ha used for road access. If we see, there are 73.03 Ha destined for community compensation land. This is done to minimize future conflicts from people who have been working on the land. In addition, there are several fields devoted to the construction of agencies, campuses, and other public facilities. This can certainly improve the human development index and ultimately the opportunity to improve the welfare of the community in Padang Pariaman Regency.

Furthermore, the field of Tarok City area that has been overlaid with google earth image on July 21, 2017 can be seen in Figure 1.

(a) (b)

Figure 1. (a) Around the Tarok City Area; (b) Territorial Division of Tarok City

3.2.3 Coordination of Related Parties

The parties involved in planning the development of Tarok City area are: Local Government of Padang Pariaman Regency, Regional Office of Agararia Ministry and National Land Office/Land Agency of West Sumatera Province, District Prosecutor General West Sumatera Province. In addition to involving government agencies, the development of Tarok City also involves community participation in supporting the development of the region.

In this case, the Regent of Padang Pariaman invites all communities directly related to the Tarok City area such as the Farmers who work on the land, Adat Stakeholders and Ninik Mamak Nagari Kapalo Hilalang, 2 x 11 Kayu Tanam Subdistrict to socialize the development planning of the area. Socialization is not only done once, but several times until all parties understand the importance of the region to increase economic growth Padang Pariaman Regency.

3.2.4 How To Minimize Ecological Damage

In the vicinity of the Tarok City there is a natural tourist attraction that is Lubuk Bonta where if the development is not considering the surrounding conditions, it can damage the ecosystem in Lubuk Bonta area is still beautiful and natural. Therefore, the government should strive to minimize the occurrence of such damage by making development plans that do not damage the ecosystem and not about the area of Lubuk Bonta and add green open space in the area of Tarok City.

4. Conclusion

Based on the result and discussion, it can be concluded that the planning of the development of Tarok City area in Padang Pariaman is the implementation of the State Land Consolidation activity based on BPN RI Decree No. 25-V, B-2003. Tarok City area of 697 Ha will become an integrated area which is divided into 16 (sixteen) parts such as universities, training centers, sports centers, government agencies, hospitals, and land compensation for the community. There are several disadvantages in the implementation of the development, but can be overcome by several strategies such as coordination between district government/related agencies, giving approaches to the community about the benefits of development planning in economic growth, and compensating the land to the people who have been working on the land in the region. While threats such as ecological damage can be overcome by several strategies such as conducting an environmental impact analysis (AMDAL) around the Tarok City area and increasing the government's active role in disseminating to the community. Planning of the implementation of the development of Tarok City area is hoped to improve the economic growth of the people of West Sumatra, especially the people of Padang Pariaman Regency.

5. Acknowledgments

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Sub Theme 2

Implementation and Roles of Vertical Land Consolidation in Urban Spatial

THE CHALLENGES OF INDONESIA LAND ADMINISTRATION SYSTEM IN UPPER AND LOWER GROUND SPATIAL PLANNING

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Abstract

Indonesia is a country with a fairly high economic development. The development is followed by the growth of economic centers in its big cities such as Jakarta, Surabaya, and Makassar and so on. Massive construction in these cities has been resulting in depletion of land availability for settlement purposes and community activities. The pace of economic growth that is followed by the high rate of population growth in the big cities has been causing quite complex problems such as the number of people who do not have sufficient space to live in due to limited land.

In response to this problem, the local government is trying to utilize space effectively by using the upper and lower ground in development to overcome the limited land. Vertical development by utilizing the upper and lower ground is chosen to provide adequate housing and community centers such as offices, roads and shopping centers.

The city development should be followed by the development of existing land administration in order to overcome the problems and possible spatial conflicts. This paper attempts to reveal simply what over ground and underground spatial challenges need to be resolved through the land administration in Indonesia and how solutions to these challenges based on legal, institutional and spatial framework.

Keywords: Development, upper and lower ground, spatial planning, land administration

1. Background and Context

Indonesia has large territory which spreads from Sabang in Nangroe Aceh Darussalam Province to Meureuke in Papua Province. The Western region of Indonesia has a relatively more rapid development compared to the central and eastern regions of Indonesia. Jakarta, which is located in western region and the capital of Indonesia, is one of the largest cities in the world due to its economic development and the rapid increase of its population. The large number of residents inhabit Jakarta due to uncontrolled urbanization. The inequality of development between rural and urban and western and eastern Indonesia leads that problem persist. That problem also encourages Jakarta to be a center of economy and business that has been forcing to intensively use space to support the resident needs.

Population that rapidly grow has been forcing the municipal government began to make policies to intensify the use of upper and lower ground space for business and residential purposes. Recently, living in an apartment has become a lifestyle in Jakarta. Apartments are built in urban centers for businessmen who want easily approaching their offices, shopping centers have been built with tower buildings integrated with apartments and transport centers, and roads, electricity, water facilities also utilize upper and lower

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ground space. In Jakarta and other big city, development by utilizing space upper and lower the ground has become a necessity at this time.

This situation holds potential problems such as spatial conflicts. Integrated spatial planning and land administration system is absolutely necessary. But there many things that need to be considered by the government in the process of arranging upper and lower ground space. This is because the process of existing spatial planning has not considering 3-dimensional space.

To overcome these problems, the concept of 3D cadastre has been introduced. The basic reason why 3D cadastre needs to be considered in the redesign of Indonesia cadastre system is the increasing space utilization particularly in urban area. Currently, the increasing needs of the utilization of under and above land surface are not yet provided by the present land registration system. The needs of 3D cadastre to register 3D properties is realized by National Land Agency (BPN) as government organization whose mandate to execute land and cadastral registration and supply land information in Indonesia.

2. Indonesian Land Registration

Indonesia has 2 (two) types of land right, namely Primary Land Right and Secondary Land Right. The right grants the authority to the holder of the land right to use and build on his land. In the framework of utilizing ground space there is no clear restriction on ownership rights. according to article 4 of the 1960 BAL, the earth, water and airspace, including the natural resources, contained therein are in the highest instance controlled by the state being and authoritative organization of the whole people.

The implementation of all matter related to land may be delegated to the autonomous regions and adat law communities. The rights of controlled by state provide the authority:

- to regulate and implement the appropriation, the utilization, the reservation and the cultivation of that earth, water and air space as mention above.
- to determine and regulate the legal relations between persons, concerning the earth, water and air space.
- to determine and regulate the legal relations between persons and legal acts, concerning the earth, water and air space

From the explanation about the existing right above, the Indonesian land right can be divided into three broad categories:

- Primary title: This title is directly derived from the state. For example, right of ownership, right of building and right of management.
- Secondary title: This title is granted by other title holder based on the contract agreement, The agreement state the primary titleholder gives the other party to have right to take advantages from the land owned by primary title holder. For example, right of use, right to lease land for building.
- Security of right: The title granted because of mortgage.

The relation between primary and secondary title in the Indonesian land law could be seen at below figure:

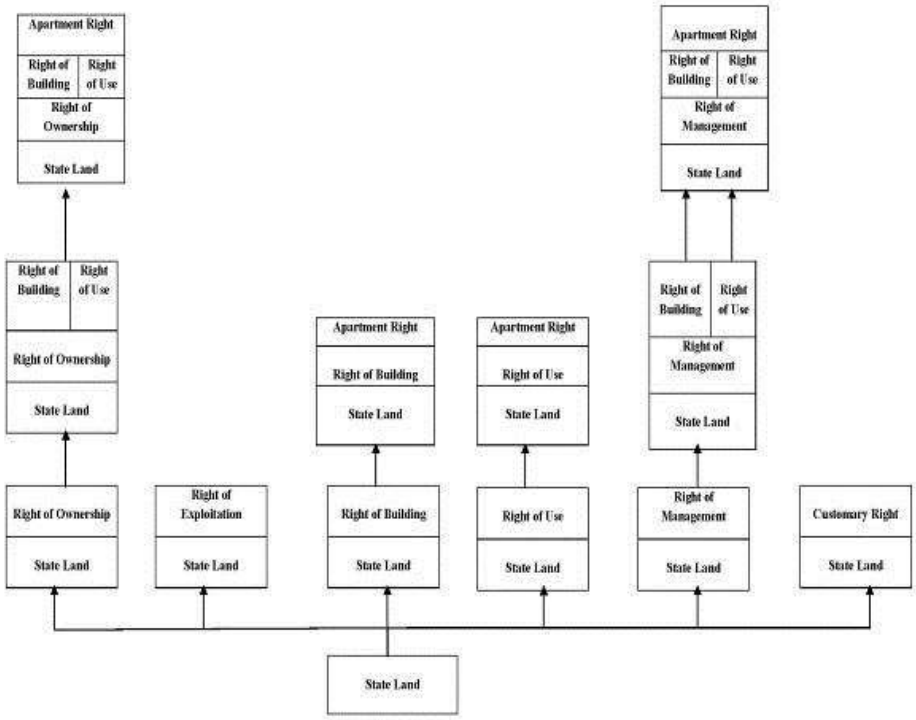

Figure 1. Relation Between Primary Title and Secondary Title

3. 3D Cadastre

Cadastre should be able to provide clear information between the property, right and rights owners so that the cadastre can answer these questions: which rightful claimants claim which rights and interest to which lot of land, that reflect the principle of specialty. The principle of specialty is needed to develop cadastre system to manage the intensive use of space above and under land surface. 3D cadastre is a concept that is created in order to fulfil the interest of public that need complete, accurate, land information to support the activities related to land.

3D cadastre is a concept to overcome the problems related to how to give better insight for registering the uses of space, which have been happening in the recent time. (Stoter and Van Oosterom 2006) explains that 3D cadastre is a cadastre that registers and gives insight into rights and restrictions not only on parcels but also on 3D property units. A 3D property unit, also abbreviated as 3D property is that (bounded) amount of space to which a person is entitled by means of real rights. 3D property situations or 3D situations refer to situations in which different property units are located on top of each other or constructed in even more complex structures i.e. interlocking one another.

In principle, 3D cadastre is needed if there are multiuse and multi ownership of land exist, it is stated by Van Der Molen (2001), In situation where separation of ownership is

present, the legal object should be represented on the cadastral map. If the legal object coincidences with the real object, the representation of the legal object includes the real object. If not, the orientation function of the cadastral map makes representation of the real object recommendable.

Based on Stoter and Salzmann (2003), the solution to register 3D properties can be achieved with 3 ways

a. Full 3D cadastre, in which persons can explicitly be entitled to volumes, in this solution the registration object is fully bounded by 3D volumes so the parcel is not considered as a basis for land registration anymore.
b. Hybrid cadastre, this solution provides opportunities to combine existing 2D registration for traditional parcel and 3D registration for 3D property situation. There are two alternatives of hybrid solutions:
   - Alternative 1: registration of 2D parcels in all cases of real property registration, and additional registration of 3D legal space in the case of 3D property units within one parcel, using a bottom and top height level of the space to which rights apply.
   - Alternative 2: registration of 2D parcels in all cases of real property registration and additional registration of the legal space of physical objects in 3D space.
c. 3D administrative tags or files linked to parcels that exist in the current cadastral registration.

Figure show the model how this solution will maintain subject, object and right of cadastral system.

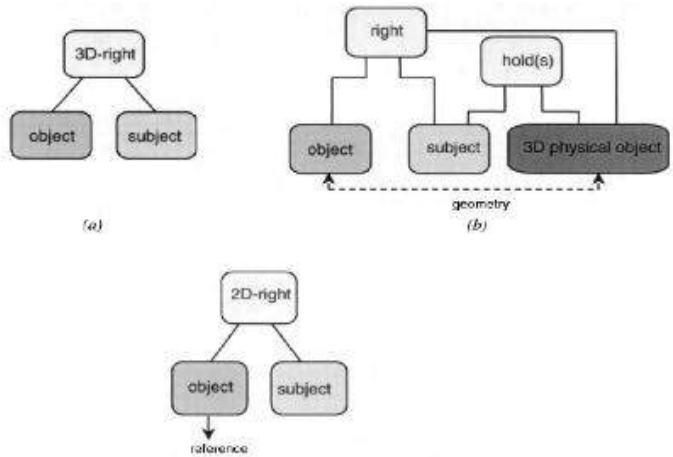

Figure 2. Models of 3D cadastre solution (Stoter and Salzmann 2003)

4. Managing 3D Property In Indonesian Land Administration

Indonesian Land Law adopts the principle of horizontal separation. It provides the possibility of separation ownership between parcel and buildings in the same plot of land. In general, landowner is also the owner of existing buildings above it, but by giving

secondary land title above the primary land title based on the agreement between land owner and building owner, the horizontal division therefore could be implemented. The Right of Building and The Right to Lease Land for Building are usually used in the case of horizontal division.

The problem of registering 3D Property in Indonesia mainly in providing the proper title for 3D situation can be explained as follow:

- Case 1

The use of basements as part of building construction is often found in big cities in Indonesia. Parts of underground construction is often used as a parking lot, shops, offices etc. In such cases, if the construction of the underground building is in accordance with the rights to the land granted, no special space title are required.

The problem arise when the use of underground space is different with the use of ground surface. A typical example of this problem is the monorail transportation that has been constructing in Jakarta. It uses the underground space as its track while other land use and land ownership locate on the land surface. Other multiuse case of land also happen in Blok M Jakarta. 3D situation can be seen in Blok M, shopping Centre that is located in underground while bus terminal is located above shopping centre. In this case the existing land law has not been able to grant the proper land rights. So it is needed the new type named the right of underground utilization. This right is based on article 33 verse 3 of the 1945 constitution which states that The earth, water and the contained land resources, is brought under the state and used for the citizen prosperity". The meaning of the earth in the article is not only the surface of the ground but also the body of earth. The reason for the creation of this new right is to grant the security of title holder and other parties who take advantage of the space and provide security for the users of the underground buildings and buildings above them.

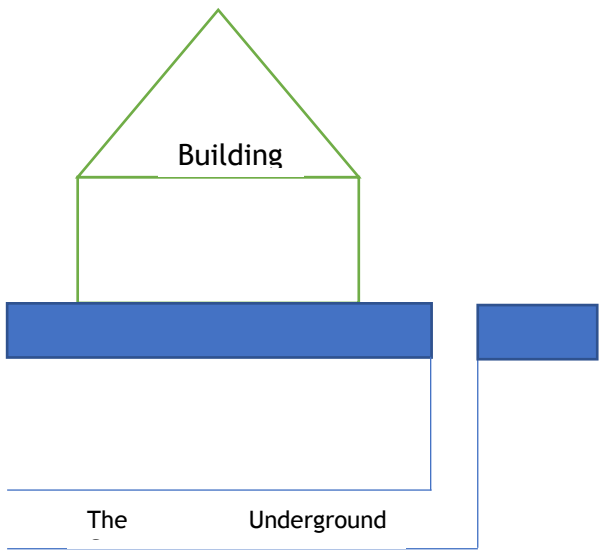

Figure 3. Example of underground 3D situation

Jakarta, with its complex infrastructure inside, has been facing many problem because there are not enough information about where the underground infrastructure is located such as cable, pipe, conduit etc. The situation is more complex because there is lack coordination between institutions that have responsibility to manage them. This conditions have been pushing many problem such us flood, irregular development, disruption of community activities due to excavation of roads, etc.

- Case 2

Another common case is the use of space above the land surface that still has a physical relationship with the land surface beneath it. Examples of such cases are fly over and bridge over road. In such cases, the existing land rights can still be used. The reason for the use of existing land rights is that although the building is in the upper space but still physically connected to the ground. For this case, using the existing right (The right of building and the use right) still can manage for titling the rightful claimant (Hutagalung 2008).

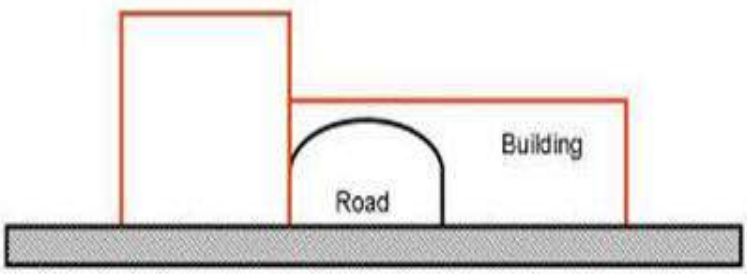

Figure 3. Example of 3D situation above Land Surface

As it is generally accepted, in the real situation, world is in 3D situations including geographic objects. The physical property and the accompanying rights always have a 3D component. But the existing cadastre still ignores the 3 dimensional reality by registering and depicting the map on the 2D situation. The Indonesia cadastre system, like general cadastre in the world, is still using 2D based registration to model cadastre objects.

According to (Tamtomo 2008), the development of 3D cadastre in Indonesia has to consider points as follow:

- It should not consider to empower the state authority, but to give service for public
- It should not have orientation to quo status, that just merely refer to the existing implemented law, it is true that the land registration still cannot cope the 2 dimension problems but it does not mean the registration of space use can be neglected.
- The visionary thinking and holistic insight to operate the public decision are needed to build the new system.

National Land Agency offices (BPN) have been equipped with GIS applications to handle cadastral data. The application is an integrated application called Land Office Computerization System. In this application system, 3D information is managed as 2 D information by storing the floor plan as a scan file connected to the main database. But the problem of managing 3D property as previously mentioned is the data about them scattered in many institution without one map that store them in integrated database. Recently, BPN only manage one type of 3D property namely apartment unit.

The visualization of the existing cadastral system in order to inform the apartment unit can be seen in the below picture.

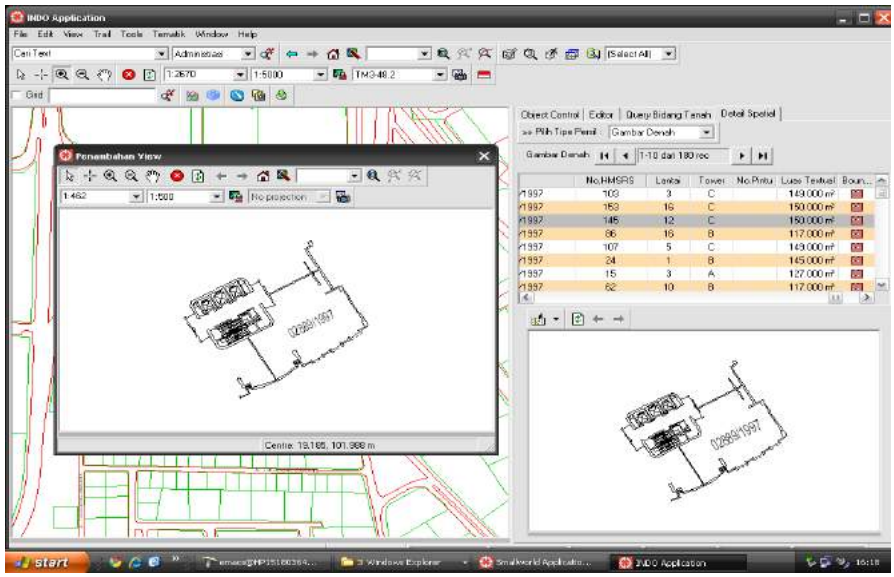

Figure 4. Visualization of apartment unit Registration in Land Office Computerization System

The weaknesses of the existing system in order to register 3D property can be summarized as follow:

- The legal part does not provide yet sufficient regulation for all types of 3D situations
- No integration between cadastral map and spatial information of 3D property
- Cadastral registration cannot provide 3D information on how properties are located in the building complex itself, it because there is separation between cadastre map which contain the whole parcels and the division plan which contain spatial information relate to the unit of property ownership, thus cadastral map merely describe the position of parcel where then building erect on.
- No height information in strata plan/drawing plan because cadastral surveying is not executed for 3D property but just survey and map common surface land right.
- It is not possible to view 3D property unit interactively, which is helpful to get insight into complex 3D property
- Limited accessibility of data exchange because analogue achieves is still used.

5. Strategy to improve Existing System

Basically , the current cadastral system in Indonesia adopts the third solution of 3D property registration that use tags or external file to give spatial information of apartment unit case only. The system use scanned drawing plan to illustrate the shape of registered apartment unit.

In relation of its efforts to conduct a complete land registration, including to provide information on 3D property, BPN can perform the following strategies:

- Providing 3D cadastral registration to register 3D properties using the advantages of combination between cadastral registration and land registration;
- Improving insight of 3D situation using 3D registration meanwhile keep running 2D registration (using hybrid solution);
- Playing role to improve institutional and legal background of 3D properties management with other organization and Increasing the role of other government organization such as Geospatial Information Agency (BIG), municipalities, tax agency to provide 3D cadastral registration, because property management is not sole responsibility of BPN but multi-sectoral responsibility;
- Increasing participation of private sectors for survey and mapping activities because to survey and map 3D situation is more complicated and expensive than 2D situation;
- Using the existing ICT technology (LOC) to provide information system that can be easily accessed by customer and Updating technology especially for survey and mapping 3D situation.

6. Conclusion

- The needs of registering property in 3D could be seen from the reality in the real world that space utilizations have pushed multiuse and multi ownership in different strata of space, It makes a question how to register this kind of phenomena in proper way. According to the main task of cadastre that should give information for the public with the complete and detail information (publicity and speciality)
- In the Indonesian legal point of views there is no big problem in registering 3D property as long as the existing right can follow the complexity of land utilization in the recent time. But for certain case there is needed to provide new title that can give security for space right owner.
- The consideration should be taken by BPN before implementation of 3D cadastre registration such as providing sufficient regulation to give guidance for 3D registration and technical reference of 3D properties survey. In addition, the most important part is improving the GIS software that is used in order to manage 3D spatial data.

- One map policy is necessary to handle management of 3D property. The strong relationship between BPN, Municipality, BIG and others are needed to build integrated map.

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THE OPTIMIZATION OF GOVERNMENT'S LAND ASSET USING VERTICAL LAND CONSOLIDATION IN SUPPORTING ONE MILLION HOUSING PROGRAM

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Abstract

The houses provision in Indonesia, specifically for Low-Income Household (MBR) still face constraints. The Government in Book I of the National Medium-Term Development Plan (RPJMN) 2015-2019 states that houses deficit/backlog in 2014 amounted to 7.6 million. On contrary, Housing Financing Fund Management Center (PPDPP)[2] states that houses backlog in 2010 and 2014[3] is aproximately 13.5 million and 13.1 million respectively. One of the problems in reducing the backlog number is the availability of land mainly in urban area. Government in RPJMN states that one of government strategies to solve lack land availability is by optimizing the utilization of government's and state-own company's (BUMN) land asset. This strategy can be combined with vertical land consolidation to reduce the number of houses backlog. This paper will elaborate the problems in the government's and BUMN's land asset as well as the role of vertical land consolidation in supporting one million housing program. Finally, it can give a solution to reduce the number of houses backlog.

Keywords: Vertical Land Consolidation; Government's Land Asset; One Million Housing Program; Houses Backlog

1. Introduction

The provision of housing, especially for Low Income Household (MBR) in Indonesia is still experiencing difficulties. There is a housing deficit/backlog[4] of 7.6 million households until 2014 (Bappenas, 2014). This backlog rate will increase if using the perspective of owning a home. The government of President Joko Widodo (Jokowi) seeks to reduce the backlog rate. The Government in the National Medium Term Development Plan (RPJMN) 2015-2019 targets the backlog of 5 million households by 2019.

The availability of land to build housing for the MBR is one of the obstacles in the fulfillment of housing supplies. Limited land and high value of land in urban areas resulted in the provision of land for social housing more difficult. One of the methods in which the government tries to overcome land availability problems is by optimizing the use of government and state-owned enterprises (BUMN) land assets and implementing land consolidation (Bappenas, 2014).

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[2] Housing Financing Fund Management Center (PPDPP) is a non-echelon unit under Ministry of Public Work and Housing (PUPR).

[3] PPDPP on their website actually publish houses backlog in 2010 and 2015, but the backlog in 2014 can be calculated by using the same equation.

[4] Housing backlog used in the RPJMN 2015-2019 is in the perspective of inhabiting.

This paper discusses topic of land consolidation and optimization of government's land asset in supporting housing program. The paper first briefly presents housing backlog and housing provision in Indonesia. Next section will introduces government's land asset concept and its problems. The third section will explain land consolidation concept, and then discuss how government's land asset and land consolidation can support housing program. Finally, this paper will be concluded in the last section.

2. Housing Backlog and Provision in Indonesia

Housing backlog is still a problem in Indonesia. The housing deficit can be defined as the lack of houses that are not required for the availability of environmental facilities and infrastructure (Dimyati, 2010 in Permatasari, 2012). Housing deficit can also be interpreted as a gap between the number of houses needed and the number of houses built (Directorate General of Budget/DJA, 2015). DJA (2015) describes the factors affecting the backlog is the number of households that reflect the needs of the house and the number of houses that can be built /provided. Unlike Indonesia, The Joao Pinheiro Foundation in Brazil has several criteria for determining the backlog: (a) excessive spending on rent (more than 30 per cent of household income); (b) involuntary cohabitation (when more than one household live in the same premise); (c) quality of building and access to infrastructure; and (d) number of persons per unit or over-crowding (UN-Habitat, 2013).

There are still differences of perception in determining the backlogs. There are two perspectives used by two institutions in Indonesia in determining the amount of the backlog. The first perspective used by the Central Bureau of Statistics (BPS) is 'the perspective of owning' where the backlog is calculated based on the number of houses owned by the community (see Fig. 1). The second perspective is 'the inhabiting perspective' used by the Ministry of Public Works and Housing (PUPR). This perspective not only uses data on the number of houses owned but also the number of people who have lived in habitable houses even with rent (see Fig. 2). These differences in perspective resulted in the backlog rate of the Ministry of PUPR Ministry is smaller compared to BPS. The amount of backlogs in Indonesia in 2010-2015 can be seen in Table 1.

$$\text{Backlog} = \sum \text{Household} - \sum \text{Household who own}$$

Figure1. Backlog Calculations Based on 'Owning Perspective'

$$\text{Backlog} = \sum \text{Household} - \sum \text{Household who own or rent}$$

Figure2. Backlog Calculations Based on 'Inhabiting Perspective'

Table1. Houses Backlogs in Indonesia in 2010-2015

Year	Number of Household	Number of houses owned	Number of rental houses	Backlog (Owning)	Backlog (Inhabiting)
2010	61,390,300	47,884,434	6,335,479	13,505,866	7,170,387
2013	64,041,200	50,893,542	5,360,249	13,147,658	7,787,409
2014	64,771,600	51,668,305	5,421,383	13,103,295	7,681,912
2015	65,588,400	54,195,695	5,299,543	11,392,705	6,093,162

Source: bps.go.id and analysis

The government is trying to reduce the backlog rate. The government, in the RPJMN 2015-2019, targets the backlog rate in 2019 is 5 million households or goes down 34% from 2014. The RPJMN 2015-2019 has also outlined the details of housing construction to achieve the target through (1) 900,000 public houses with credit facilities House (KPR) of habitable landed house, KPR of Flats Units (Sarusun) and KPR of lease and purchase to Sarusun; (2) 550,000 units of rental flats; (3) 450,000 unit of houses with self-help's KPR; (4) aid of stimulant development of new self-help houses to 250,000 households; and (5) 50,000 units of specific houses in the border area, post-disaster area and post-conflict area. In addition, the Government in 2015 issued a One Million Houses program. This program is especially devoted to Low-Income Household and does not only provide owned houses but also rental houses, special houses and self-help houses.

Government efforts to push backlog rate still face problems. One of the problems that arise is the availability of land, especially in urban areas, which are limited with high land values. In the case of MBR, the underlying problem is the inability to access decent and secure land for housing needs (UNESCAP, 2008). To address these land issues, UNESCAP (2008) argues that public lands have the potential to be used as housing for MBR-both current and future-, yet there are some problems with access to these public lands. In line with UNESCAP, the Government of Indonesia also makes the land owned by the government and State Owned Enterprises (BUMN) as an alternative location for housing provision (Bappenas, 2014). In addition, land consolidation becomes another alternative instrument of providing housing. An explanation of government land and land consolidation will be described in Sections 3 and 4, respectively.

3. Government's Land Asset Concept and Problems

Government's Land Assets can be an alternative location of housing development for MBR especially in urban areas. Government's Land Assets pursuant to provisions of the Law Number 1 Year 2004 Article 1 explains that State/Regional Asset (BMN/BMD) in the form of land is the land purchased or obtained at the expense of State Budget (APBN)/Regional

Budget (APBD) or derived from other legal revenues. The Data and Information Centre of Land, Spatial Planning and LP2B (Pusdatin) of the Ministry of Agrarian Affairs and Spatial Planning/BPN (2017) describes the government's land assets that have been certified and recorded on KKP and geoKKP databases until August 2017 is 192,771 certificates with details of 14,829 certificates of right of ownership (SHM), 762 certificates of Right to Cultivate (HGU), 12,510 certificates of Right to Build (HGB), 163,727 certificates of Right to Use (HP), and 883 certificates of Right to Manage (HPL). In addition, there are still government assets that have not been certified but registered in the database of the Directorate General of State Assets (DJKN) the Ministry of Finance and databases in the Regional Government.

The existence of government's assets that do not have a certificate resulted in problems. The problem that often occurred is the presence of occupation by the community. The Ministry of ATR/BPN is currently listing the number of government assets problems, especially those occupied by the community. The lack of government control over the assets is one of the reasons for the occurrence of community occupation. Ultimately, evictions are the solution made by the government.

Utilization of government land as an alternative location of housing development has been regulated by the government. The Law Number 1 of 2011 Article 106 stated that land provision for housing development can utilize the government's land. Another regulation related to this issue is the Law Number 20 of 2011. Article 18 of this law mentioned that flats can be built by utilizing the government's land.

4. Land Consolidation

Land consolidation can be a land management tools in the urban area. Land readjustment[5] is a self-financing land management (Mittal, 2014). Williamson (2010) argues that the aim of land readjustment is to repurpose the allocation of parcels into modern social and business uses. Land readjustment involves a mix of principles such as planning laws, urban design, real estate appraisal method, participatory and communicative planning method and land surveying (Day, 2007 in Mittal, 2014).

The successful implementation of land consolidation is required several requirements. Williamson (2010: 191) describes the important precondition of land consolidation based on the UN Economic and Social Commission for Asia and the Pacific:

- The program must be supported by national, regional and municipal government with the regulation provided by the national government;
- Land consolidation agency should have powers to coordinate access from various government stakeholders;
- Land registration and cadastral system should be efficient;

[5] some scholar use the term of 'land readjustment' for land consolidation concept.

- A sufficient of skill and dedicated professional members at local level must be provided by the government as well as independent and well-trained land's valuers;
- The process should be based on public-private cooperation, supported by the majority of landowners, and forced acquisition must be avoided.

Mittal (2014) summarizes land consolidation process into 6 stages as follows:

- Intent Declaration Stage
- Collection and Collation of Land Records
- Preparation of a Preliminary Layout Plan
- Estimation of Costs and Finances
- Public Participation and Legal Due Process
- Final Modification of Land Records

The increasingly limited land parcels in urban areas resulted in the implementation of land consolidation done vertically. FAR maximization becomes the key of the implementation of vertical consolidation.

5. Optimization of Government's Land Asset in Supporting Housing Programs

As mention previously in Section 2 and 3, the optimization of Government's Land Asset can be an alternative for land provision to support one million housing program. The asset is usually located in the city center or near central business district. Furthermore, housing development in urban areas will face obstacles if it has to build landed houses. As a result, the flats development using vertical land consolidation becomes solution. Some concepts/examples of vertical land consolidation in government's land such as (1) vertical land consolidation as a solution for occupation, (2) mixed used concept in government's land, and (3) urban revitalization using vertical land consolidation.

5.1. Vertical Land Consolidation as solution for occupations

As stated in section 3, one of problem in government's land is occupations. This problem usually occurs in the urban green space area or restricted area such as river basin. Government in most cases is using eviction to solve this problem. However, there is another solution by using land consolidation. Communities who are living on government land should not be evicted when the government needs to build urban space areas or to preserve the river basin. The parcels arrangement with the land consolidation is done by building a part of the parcels as flats while the remaining land parcels can be built as urban green space. The preservation of river basin can also use this concept.

5.2. Mixed Used Concept in the Government's Land

Development on government land is commonly only for one type of designation such as a market. In market cases, the seller usually stays quite far from the market where

transportation costs are required. Maximizing the use of FAR in market areas by building flats above markets will benefit the seller. In addition, the number of other available flats units can be housing supply for MBR. Implementation of this concept must gain approval not only from Market Managers (usually local government) but also the seller. Perumnas as a state-owned housing company is trying to develop this mixed used concept in Jakarta in cooperation with PD Pasar Jaya as a market manager.

5.3. Revitalization Using Vertical Land Consolidation

The Indonesian government has built many flats where some have been very old. The condition of these old flats is no longer habitable. In addition, the increasing needs of houses also resulted in a lack of housing supplies, especially for MBR. Perumnas who is managing several flats in Indonesia began to revitalize their flats. Sukaramai Flats in Medan became the pilot project of this program[6]. This revitalization is to increase the height of the building from 4 floors to 20 floors[7] and also increase the public space. Residents who live in the Flats receive priority from this program to occupy new units with the same unit's wide as the previous while the other units will be sold or rented to the public. Perumnas also plans to revitalize their other flats such as Klender Flats in Jakarta and Palembang Flats.

6. Conclusion

Lack of houses supply still overshadowed the Indonesian government. In the Year 2014, it recorded 7.6 million households have not occupied a habitable houses. This data is a reference in the National Medium Term Development Plan (RPJMN) 2015-2019. The Government of Indonesia targets the number of backlogs decreasing by 34% to around 5 million households in 2019. The government performs various methods to fulfill these targets include creating a One Million House program.

Implementation of this program still faces obstacles. The increasing availability of urban land with high land prices is one of the obstacles. The Government in the RPJMN 2015-2019 tries to overcome this problem by maximizing the government and BUMN's land asset as well as the implementation of land consolidation.

The optimization of Government's land asset using vertical land consolidation to support One Million Housing program can be implemented. Some concepts/examples of vertical land consolidation in the Government's land such as (1) vertical land consolidation as a solution for occupation, (2) mixed used concept in government's land, and (3) urban revitalization using vertical land consolidation. Perumas, as a state-owned housing company, has started to implement some of the concept.

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[6] http://www.perumnas.co.id/tingkatkan-kualitas-hunian-perumnas-remajakan-rusun-sukaramai/, last accessed 14 October 2017.

[7] https://www.jawapos.com/read/2017/04/06/121401/perumnas-remajakan-rusun-semula-4-lantai-kini-jadi-20, last accessed 14 October 2017.

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THE ROLE OF COMMUNITY PARTICIPATION AND SPATIAL DATA ON VERTICALLY LAND CONSOLIDATION PROGRAM IN MANAGING SLUM AREA

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Abstract

Limitations of land in slum areas in the suburbs and in urban areas make vertical land consolidation selected by the government to rejuvenate and improve environmental quality. In the context of land consolidation, community participation should be an important point to be considered. Community participation should be carried out from planning, implementation to physical development. In the vertically land consolidation, aspects of community participation should also be supported by socio-economic approaches. The vertical consolidation of land is not only organize the physical aspect, but also concern to the social aspects of community, employment, and livelihood of the community after being transferred to vertical housing/LC. The research method is done descriptively by conducting literature study on Land consolidation program vertically and development of flats in some areas. The results show that the consolidation of land that has been done through the development of flats often occurs constraints where people have a decent home from the physical aspect, but from the social and economic aspects they experience degrees of decline. Some flats development programs are not well targeted due to lack of community participation and expensive rental fees. To support vertical land consolidation programs can utilize remote sensing data and spatial data. Spatial and remote sensing imageries can provide the spatial aspect that can give information of KL the distribution in an appropriate target.
Keywords: Vertically land consolidation, community participation, slum area

A. Introduction

Slums area is the one worst side of the injustice and inequality of development. The high demand for land causes land process so high. Therefore, some communities are marginalized by high land prices. The effect is they choose to live in slum areas such as riverbanks, railroad edge, or near of garbage disposal area. Development in the slum area causes inconsistency with urban spatial planning.

Various phenomenon of slum areas in the capital area and other major provinces are reflection of incompatibility between housing need assessment and regional planning. The central and local governments should be wise for revitalizing slums area. Some of communities also hope that slums area can be significantly reduced by governments. Sometimes, slum area revitalization policies are not appropriate for the lower communities. It makes the go out form their societies. Another problem based on revitalization of slum areas is highly cost for rent. Sometimes, they are not involved for decision making of slum

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rejuvenation and arrangement. The aim of slum reductions is to create healthier settlements and better quality environments. In general, row houses are used to overcome the problem of slum area. In other hand the construction of row houses is not possible in slum area whit densely populated and narrow land. The arrangements of slum areas should be supported by adequate road networks, waterways, open green space, public facilities, public space, and also social facilities. Therefore, the governments must have the appropriate solutions for handling and structuring of slum areas.

B. Implementation of Slum Area Revitalization trough Flats Developments in Various Area

The revitalization program that has been implemented by government are relocations and flat developments. In plain view, the program was successful enough to slums set up and create a better environment quality. However, this programs are less successful for solving the slums problems especially in cultural, social, and economic aspects due to lack of assessments, socializations, and participations of the communities.

One example of research conducted by LBH Jakarta on 18 locations of relocation and flats development showed that the implementation process of relocation that has been implemented is not maximal. This are caused by less attention to community rights, socialization is not comprehensive, less than maximum assessment, less attention to rights and community participation. Relocation that far enough from previous community livelihoods reduces income levels in the communities. The high rental price of the apartment causes the community cannot afford to pay. Consequently, they must be evicted from their residence (LBH Jakarta, 2016).

C. Land Control and Land Management

Ministry of Agrarian and Spatial is in charge of issuing land certificates, regulating, managing, and controlling land and spatial planning. In the context of slum areas rejuvenations, ministries has authority for providing land availability for settlements relocation and regulating land rights to occupied land/settlements.

Land consolidation (LC) as the policy program of ministry of ATR / BPN has not been running maximally due to lack of coordination among local ministries in implementing LC. This is indicated by low implementation of land consolidation program in Indonesia. Meanwhile, if we understand the purpose of the land consolidation is “of the people, by the people and for the people”. This program in controlling and regulating the ownership, control, use and utilization of land will be much more effective and beneficial to the community. This program should be used for land control, ownership arrangements, power regulation, land regulation, and land use. With the enactment of this program, the consolidation of the land will be more effective and beneficial to society.

D. Vertical Land Consolidation

Land consolidation (LC) as land policy concerning the realignment, control and use of land and land procurement for development purposes. LC will improve the quality environment and maintain the natural resources by involving the active participation of the community is expected to be one solution of slum areas problem (Perkaban No. 4 of 1991). Consolidation as one of the land control policy can be realized through the cooperation of local government level I, local government level II, Ministry of ATR / BPN, and society.

As regulated in Regulation of Head of National Land Agency Number 4 Year 1991 concerning Land Consolidation that land consolidation participant can as the holder of land rights or can also as a cultivator of state land object Consolidation Land. Article 5 states that the Land Consolidation is functionally carried out by the Land Office. The Land Consolidation Organization is the Coordinating Team, especially as a coach is held by the Governor. The governor has authority over the territory and controls the spatial layout of the territory. Land consolidation as a policy of land control must be in line with the planned spatial plan. In addition to having the authority to region regulation, the local Government/Regent also has authority in infrastructure development such as roads, waterways, public facilities, and social facilities, which should be implemented in Land Consolidation.

Vertical Land Consolidation is expected to provide for slums area solutions. Through this program, controlling the existing slums of the river can be overcome. They can live in flats that are not far from the previous livelihood location and dwelling place. Facilities provided by LC in the form of social facilities and public facilities can be fulfilled by government cooperation through government funds and self-help communities.

E. Community Participation In Land Consolidation

The difference between land consolidation and other programs is the active participation of the community. In land consolidation as set forth in Chapter I General Provisions and Chapter III Implementation of Land Consolidation, participation is an important part of the LC process. Society is involved from the earliest process. This process begins with the socialization of the Land Office and the Regional Government. In the next phase, community participation is realized in the approval of the implementation of LC in accordance with the regulation which reads "Land Consolidation can be implemented if it gets the approval of 80% of LC participants". In further process, community participation continues to be involved in block design of the LC plan, agreement on the number of TPBP (Land Reimbursement of Development Costs) and approval of STUP (*Sumbangan Tanah Untuk Pembangunan* - Land Donation for Development). Community participation that continues to be included in the LC process certainly makes this program much more cost-

effective. This is because the aspirations and rights of the community is very concerned. Some advantages of revitalizing slum areas through LC are presented in Figure 1.

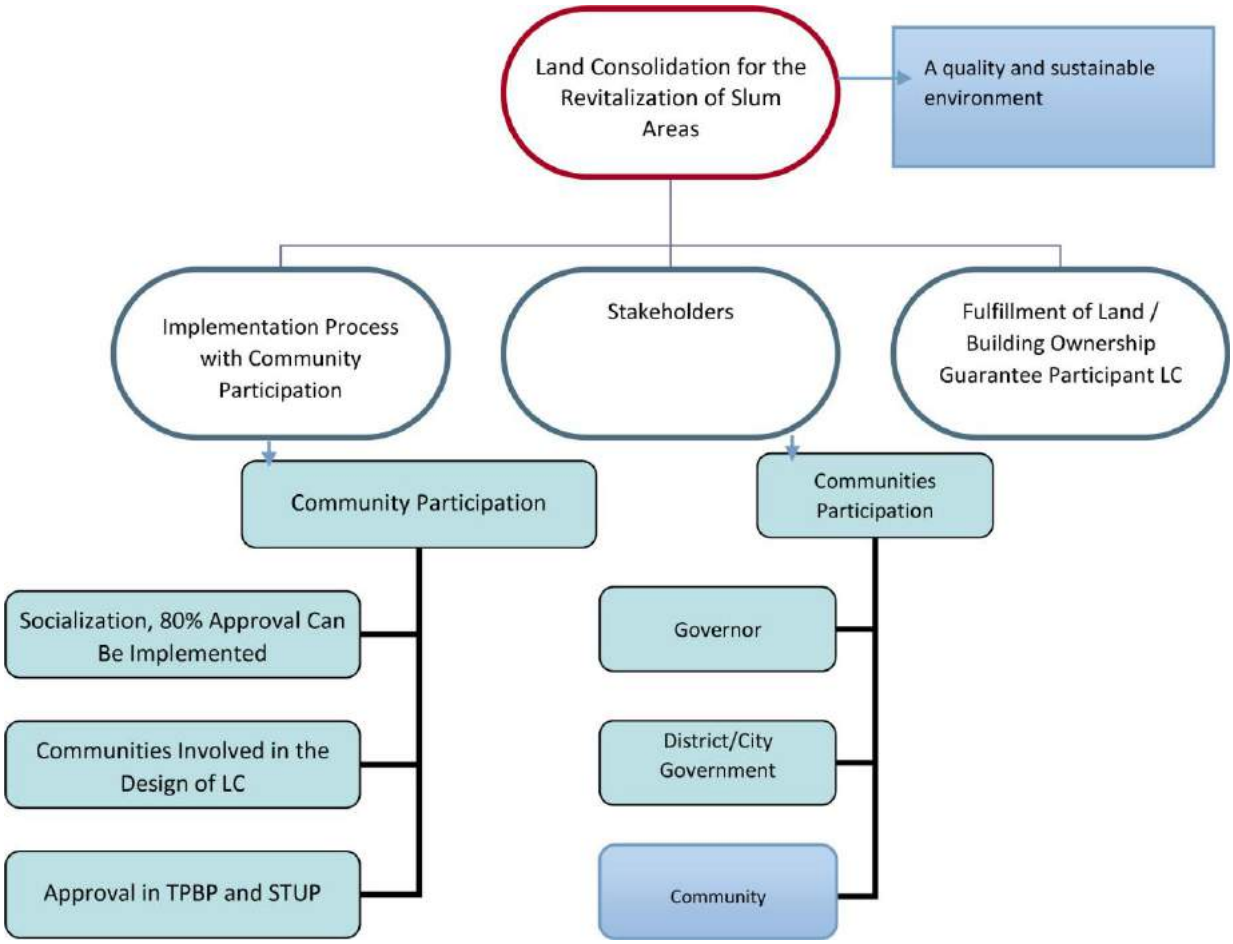

Figure 1. Advantages of Slum Areas Revitalization with Land Consolidation Program

F. The Role of Remote Sensing Data and Spatial Data in Vertically Land Consolidation

Remote sensing can play a key role in dynamic analyzing such as monitoring densification and expansion processes or assisting in the implementation of slum improvement policies. Remote sensing is capable of mapping the amount of slums areas or the general environmental conditions. A first attempt in bringing together the methodological expertise on slum mapping and monitoring for slum identification based on VHR imagery that included visual interpretation, object-based image analysis (OBIA), texture-based methods, and community-based approaches (Kuffer et al. 2016). Remote sensing is presently being used in numerous scientific research projects covering various fields and disciplines, where the results obtain interpret a vast volume of information on distant features and areas. A set of methodological procedures for acquisition and processing of digital records, obtained from sensors of various wavelengths of visible, thermal and invisible part of the spectrum is one of the definitions of the remote sensing.

Land consolidation is regarded as an instrument or entry point for rural development, urban development, and an important means of reconciling land use conflict. Remote sensing is a research method providing for identification and analysis of spatial–temporal elements of the environment, land use and land cover change, in order to obtain timely information on environment and influence of human activities. Land consolidation (LC) charge in general is done territorially because of situation detail need. Yet, in the mapping technology development especially remote sensing and geographic information system (GIS), causes some steps cannot be implemented territorially, for example the chosen of location and making flats for lower communities. In the context of that remote sensing technology, it is deserved to study as far as the extraction can be done, related to the thoroughness of interpretation and mapping result in tapping the information. On the other side, GIS role in land consolidation can be studied more especially in solving how the spatial model can be implemented. High resolution image which can be used as data source of LC location determination such as Quick bird, worldview, IKONOS, or small format areal photography. Standard Process that must be done by the radiometric, geometric, and refers to projection system. The variables and parameters that can be used in LC research area the quality of environmental settlement (building density, size, type, and sanitation), Vacant land potency (road accessibility, type of existing land), the suitability of land space planning, and road infrastructure availability (Tinus et al. 2007). Remote sensing data has also been used for land consolidation research using NDVI approach with MODIS data (Jin et al. 2017).Visual and spatial analysis of data collected using various methods and for various purposes that had been jointly integrated in the GIS environment had indicated the possibility to use the data collected by remote sensing, for the purpose of land cover examination. Methodology for further development of remote sensing use is a potential option for planning and implementation of future land consolidation surveys.

G. Conclusion

1. The lack of success of the slum revitalization program is caused by forced relocation and ignoring the rights of the people;
2. Rejuvenation Slum areas are essential to discipline the use and utilization of land in accordance with the spatial plan of the region that embodies a more qualified, healthy, regulatory, and sustainable environment;
3. Vertical land consolidation involving communities from planning, implementation, and construction of social facilities and public facilities is expected to overcome the problems of slum areas in some regions of Indonesia.
4. Visual and spatial analysis of data collected using various methods and for various purposes in remote sensing and spatial data is a potential option for planning and implementation of future land consolidation surveys.

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Sub Theme 3

Agricultural Land Consolidation to Support National Food Scurity

CHALLENGES OF AGRICULTURAL LAND CONSOLIDATION IN YOGYAKARTA URBANIZED AREA

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Abstract

The agricultural land consolidation, as a means of land use control, is seen as a need to be implemented in Yogyakarta Urbanized Area (YUA) due to the high rate of agricultural land conversion in this area. The agricultural land conversion has had an impact on the degradation of food production, while food needs continue to increase as the population increases. The agricultural land consolidation was expected to achieve efficiency of farm management, increased food production and household income of farmers, job creation, also as land use control (Departemen Pertanian, 2009).

The purpose of this research was to analyze the challenges of agricultural land consolidation in YUA. YUA was chosen as a research location because this area was planned as an expansion of development area that happened in Yogyakarta city, while on the other side the existence of agricultural land needs to be controlled to support regional food sovereignty.

This research was conducted with the qualitative deductive method, with two main variables, namely the regional spatial plan and community paradigm on agricultural land. The data used were secondary and primary data. Secondary data were obtained from the literature, prevailing laws, and activity reports, while primary data was obtained from interviews with a number of informants selected by purposive sampling. Data analysis technique was done with qualitative rules.

The expected result inputted to local governments to take a stand in the face of a number of challenges faced in the implementation of agricultural land consolidation, particularly on site selection activities.

Keywords: Agricultural land consolidation; regional spatial plan; community paradigm.

Introduction

Food needs are the basic need of every human being (Yuwono, 2011). Rice, that derived from rice crop, is a kind of food that used predominantly in Indonesia generally and Daerah Istimewa Yogyakarta (DIY) in particular. To get optimal growth, rice crops should be cultivated on paddy fields that have the carrying capacity in accordance some requirements (Appendix 1). In order to achieve the food needs in DIY, Provincial Regulation of DIY Number 10 of 2011 on Sustainable Land Farming Farm Protection was passed. This regulation purpose is to ensure the existence of paddy fields in DIY, and in article 9 it is regulated on the allocation of agricultural land in the four districts. Bantul and Sleman became two districts with the largest allocation of agricultural land between two other districts, 13,000 ha, and 12,377,59 ha respectively.

As a district, that adjacent to the city, the dynamics of spatial changes on Bantul and Sleman were so rapidly. It was made some existing areas in Bantul and Sleman set as Yogyakarta Urbanized Area (YUA), which is stated on the Provincial Regulation of DIY Number 2

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of 2010. This determination aims to expand the economic area because the city had considered unable to accommodate the needs of land for economic activity. On the other hand, YUA's determination has had an impact on the conversion rate of agricultural land use in the local area. Based on secondary data from Regional Office of BPN DIY in 2012, the area of agricultural land on the outside of YUA Bantul and Sleman were 12.944,16 ha and 11.614,96 ha (Figure 1). It means that paddy field in YUA's should be protected to fulfill the allocation of the sustainable agricultural land area as regulated in Provincial Regulation of DIY Number 10 The year 2011.

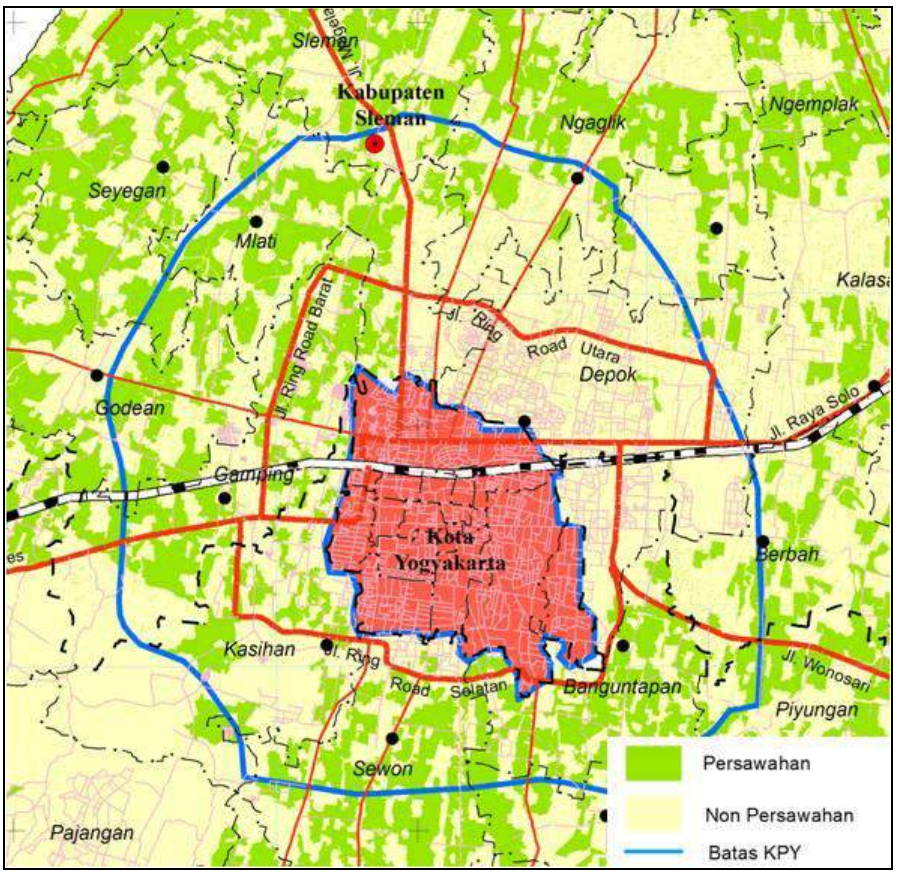

Figure 1. Land Use Around YUA on 2012
Source: Neraca PGT 2012 of Regional Office of BPN DIY

Therefore the consolidation of agricultural land as a land management model became the bridge between of the agricultural land use control as an effort to achieve food sovereignty and the expansion of YUA as an effort to accelerate economic growth. The agricultural land consolidation aims to improve the efficiency of farm management, food production, farm household income, employment creation, as well as controlling the fragmentation and conversion of agricultural land (Departemen Pertanian, 2009). It is deemed necessary to be implemented in the YUA because the rapid economic development has threatened the existence of agricultural land, while food demand increases along with the population growth and the need of quality agricultural products.

Table 1 Implementation of Agricultural Land Consolidation from Year to Year

Tahun	Lokasi
2009	4 Kabupaten/Kota pada 2 Provinsi
2010	21 kabupaten/kota pada 12 provinsi
2011	39 kabupaten/kota pada 10 provinsi

Source: Data Analysis 2009-2011 of Agriculture Ministry

Table 1 shows the increasing number of locations that have become the object of agricultural land consolidation from year to year. The increasing number of consolidated agricultural land location sites occurred due to the positive effect of agricultural land consolidation. The positive effect was on improving the welfare of farmers caused by the increase of agricultural production. In Denpasar, for example of a successful location, the farmer's income got increased. Farmers income when using conventional model farming on 25 ha of land is Rp 1.483.733,-/person and after consolidation model was obtained the income became Rp 2.625.400,-/person (Kementerian Pertanian, 2010).

The successful key of agricultural land consolidation, both in the world and in Indonesia, was a strong commitment from all relevant stakeholders. The existence of an agricultural land area in the spatial plan was a form of that commitment. It will be the legal basis for local leaders in selecting and establishing consolidated sites (Sinuraya et al, 2011; Setiawan, 2008; Isa, 2006). Furthermore, the active participation of landowner and communities were the successful key of agricultural land consolidation in selected locations (Sinuraya et al, 2011; Backman, 2002, Zhong and Ping, 2014).

The purpose of this paper was to analyze the challenges of agricultural land consolidation in YUA. YUA was chosen because the area is loaded with a number of development interests, as the area directly adjacent to the city, and on the other hand, the existence of agricultural land need to be controlled in order to maintain regional food sovereignty as mandated in Provincial Regulation Number 10 The year 2011. The expected result inputted to local governments for agricultural land consolidation activities in YUA.

Materials and Methods

This paper was the result of the study and analysis of a number of literature contents, applicable legislation, activity implementation reports, and interviews with a number of informants. The research method used was deductive qualitative. Deductive was used because the variables used as the basis of analysis were found in the amount of literature and explicitly stated in the Regulation of Head of BPN Number 4 The year 1991, namely the role of government in the selection of location and the participation of the community of

landowners in selected locations. Further, qualitative was chosen to provide analytical descriptive analysis.

Results and Discussion

The agricultural land consolidation as triggered by the government was the impact of the high conversion rate of agricultural land that can threaten food sovereignty, both on the regional and national scale. Therefore the discussion in this paper starts from the condition of agricultural land depreciation that occurred in YUA. Furthermore, the challenges that will be faced in the implementation of agricultural land consolidation, from the side of the government and the community landowners, will be discussed in the next discussion.

Depreciation of Agricultural Land from Year to Year

The population growth in Yogyakarta that occurred from year to year has an impact on the increase of land demand. Statistical data released by the Badan Pusat Statistik shows that the population density in DIY had increased from year to year (Figure 2). The total area of Yogyakarta city which was only 32.5 km² or 1.02% of the total area of the provincial administration, gradually no longer able to accommodate the land demand from communities.

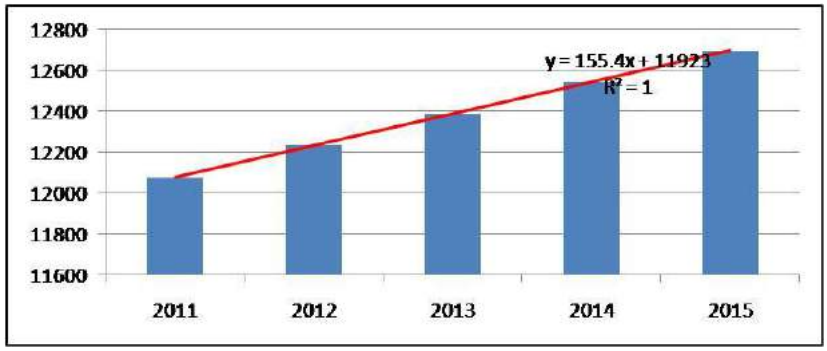

Figure 2. Population Density Year to Year of Yogyakarta City
Source: Data Strategies DIY 2015

The increased population that not matched by urban land expansion, impacts on land expansion in suburban areas. Mansyur (2001) and Gedy (2001) suggested a number of factors that cause growth in the suburban area, there were:

- Population growth in cities,
- The geographic and physical proximity between the city and the suburban area,
- Transportation facilities and infrastructure were available,
- Land prices were cheap, and
- A housing development that triggers the growth of other living facilities.

The five factors above also occurred in Bantul and Sleman, which were administratively adjacent to the city. Growth population that occurred in that area had an impact on

changes in basic functions of the region, the periphery area that originally functioned as a buffer zone has changed the function to support the city development and has an urban nature. The sub-districts were further established as YUA, namely Kasihan, Sewon, and Banguntapan that in Bantul, and then Depok, Ngemplak, Ngaglik, Mlati, Godean and Gamping districts in Sleman (Figure 3).

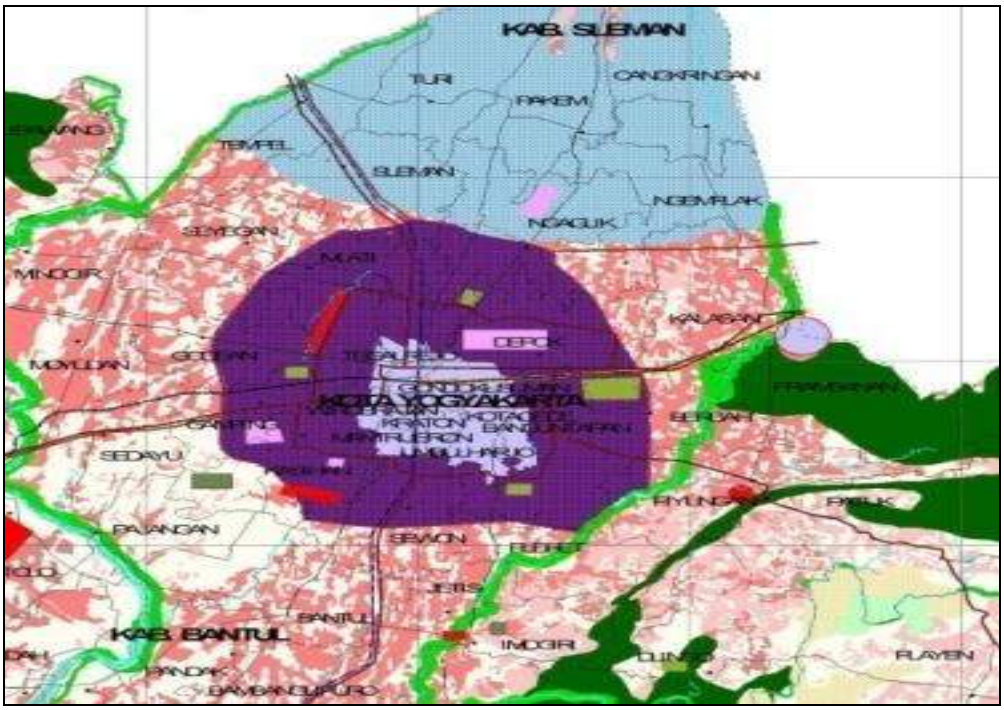

Figure 3. Designation of sub-districts in Bantul and Sleman as YUA
Source: Provincial Law of DIY Number 2 The year 2010

One of the land uses that affected by urban growth was agricultural land. Agricultural land that holistically has various functions, its area continues to depreciate from year to year as it is dried and converted into another type of uses, even the efforts of local government through Provincial Regulation Number 10 of 2011 was considered unsuccessful to control the conversion rate. The high number of agricultural land conversion, which is 181,667 hectares/year in Sleman and 148 hectares/year in Bantul, shows that the implementation of these regulation has failed (Widiyantoro, 2017).

The high rate of agricultural land conversion in Bantul and in Sleman was the impact of the determination of YUA as a settlement area and the absence of sustainable agricultural land as stipulated in Provincial Regulation Number 10 of 2011 (Joewono, 2011; Huda, 2014; Atmasari, 2014; Ismiyanto, 2016). If the determination of YUA as a settlement area was not revised and the object of sustainable agricultural land was not immediately established, the hectare of productive agricultural land that located in YUA will be lost. Meanwhile, location permits and land use permits will continue to be provided as long as the proposed plan does not violate the spatial regulations.

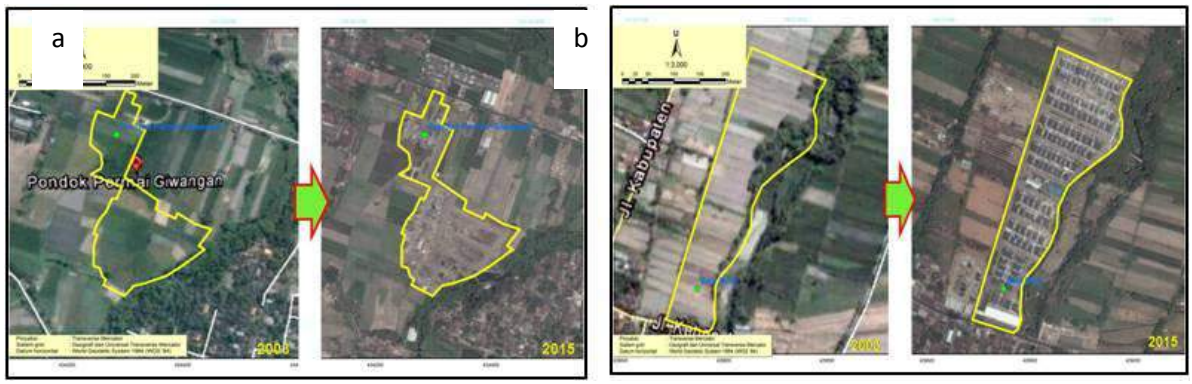

Figure 4. Agricultural Land Conversion to Residential Land (a) in YUA Bantul and (b) in YUA Sleman. *Source: Widiyantoro, 2017*

Agricultural Land Consolidation in the Era of Regional Autonomy

The era of regional autonomy was an era of freedom for local governments. The freedom referred to in this case was the authority of local governments to regulate and manage their own governmental affairs in their territories as mandated in Law Number 32 of 2004. The granting of authority from the central government to the local government aims to realize the acceleration of development due to the active participation of all levels of society. However, the authority of the local government remains based on some corridors so the development does not sacrifice the quality of human's lives and the environment.

Based on article 14 (1) of Law Number 32 The year 2004, the local governments have authority in the preparation of spatial planning. The spatial authority given to the regional government was intended to make the region realize the regional spatial plan in accordance with the capabilities and characteristics of each region. Therefore, the growth of regional development that occurred can be aligned with the ability of natural resources.

However, in some areas, the autonomy was interpreted as an authority for local governments to pursue the acceleration of local revenue. The regional spatial plan then becomes a tool to exploit the existing land resources in the area. The expansion of non-agricultural land use areas, which are oriented towards economic improvement, was modeled on the spatial plan of the region at the expense of agricultural land which is a basic function or local potential. The consequence is the granting of permits to the use of agricultural land to be converted to other types of land use. Permit for land use change was issued by the relevant agencies due to land use plans at the site in accordance with the spatial plan of the region. This conditions made autonomy was seen as one of the causes of conversion of agricultural land (Isa, 2004).

Autonomy then becomes a challenge for local governments, while on the one hand local governments intend to accelerate development growth at the expense of some land resources or on the other by optimizing existing potential while maintaining the existence of agricultural land. Both conditions will have different development directions and the final policy chosen by the local government will be realized in a regional spatial plan. The

regional spatial plan then becomes a guide for the development of an area and it will have implications for the agricultural land consolidation policy. As regulated in article 4 (1) from Regulation of the Head of BPN Number 4 of 1991 that the determination of the location of land consolidation shall be carried out by the regent/mayor with reference to the local spatial plan. This means that the consolidation of agricultural land can only be implemented if the area of agricultural land use has been determined in the spatial plan of the region on the wide scale.

The provincial spatial plan of DIY tended to be toward acceleration of development at the expense of the existence of agricultural land. The indication was the designation of all YUA as a non-agricultural area although there was hectare of active and productive agricultural land. This designation became the legal basis for granting permits for all kinds of activities related to non-agricultural activities and this led to the high conversion of agricultural land in the YUA.

If reviewed from the spatial plan aspects, the implementation of agricultural land consolidation in YUA cannot be implemented. The regent of Bantul or Sleman can not appoint YUA as the location of agricultural land consolidation due to the designation of YUA as a non-agricultural area. If YUA was planned as the location of agricultural land consolidation, it requires a strong commitment from all stakeholders to review and revise the regional spatial plan, considering the regional spatial plan as the legal basis for site selection. Stakeholder commitment becomes the key in the implementation of regional autonomy, the namely autonomy that can actualize the sustainable development and one of its activities was agricultural land consolidation.

Society Paradigm on Land

The causes of agricultural land conversion not only come from the government but also from the society. Landowners, land brokers, and entrepreneurs become three figures who play a role in this land conversion and the government can not control them through legislation until now (Widiyantoro, 2017). The existing sanctions were only applied to space users whose considered to violate the spatial plan and to government officials whose considered to violate the granting of permit space utilization. This condition causes agricultural land conversion continues because land conversion actors have run the conversion process before the land use permit was submitted by the space used by the local government.

A number of reasons become the basis for the actors to convert agricultural land to non-agricultural. In terms of landowners, the agricultural land conversion was caused by financial need, high tax value, lack of government assistance, uncertain crop yields due to natural factors, the desire for lifestyle changes, the sold of adjacent land and cutting off the irrigation channels, and no future generations working as farmers. From the broker's side,

the agricultural land conversion was caused by financial need and the amount of bonus, while the expansion of economic activity was the reason of entrepreneur to converting agricultural land.

Various reasons on above show the society's perspective on an agricultural land. The society holds that an agricultural land was an asset that has high economic value and this can be realized through the sale of land. The capitalist system prevailing in YUA has had an impact on the increase in land prices from year to year and this condition was used by the society to gain some profit from the sale of agricultural land. Landowners and brokers will expect all forms of financial needs to be met from the sale, while entrepreneurs try to expand agricultural land as quickly as possible before the price of farmland soars. The entrepreneurs choice on agricultural land was caused by the purchase price of agricultural land was cheaper than dry land.

The paradigm of a society that agricultural land as an economic asset has an impact on people's reluctance to maintain the existence of agricultural land. The public has forgotten that the agricultural land has a social function as mandated in the Basic Agrarian Law. Holistically, an agricultural land has some value in it. The values were (1) use value, for example as food producers, job creation, and flood control; and (2) congenital value, for example as a vehicle for maintaining biodiversity and educational vehicle (Direktorat Pangan dan Pertanian Kementerian Perencanaan Pembangunan Nasional/Bappenas, 2006).

The paradigm that agricultural land has many social functions should be instilled in the public so the awareness of the agricultural land existence was increasing. Changing the social paradigm was the challenge for the local government. Efforts that can be done by the local government was to socialize and implement programs that can provide welfare to landowners. As stated Larsson (2006) that the agricultural land use control will be optimal if the government provides welfare improvement programs.

The social paradigm of agricultural land owned by the community will affect the level of community participation. The high level of community participation contributes to the success of agricultural land consolidation. Community participation became the first key in land consolidation as it has an effect on the designation of consolidation sites. The majority will of the community was needed before the regent or mayor appoint the location. As mandated in BPN Regulation Number 4 of 1991 that land consolidation can be carried out if the majority of the local community declare their approval and then put into an agreement. This approval can be achieved if the socialization has been done by the government intensively, in order to build the paradigm of society.

Conclusion

Agricultural land consolidation in YUA was an impossible activity. The indication was the designation of all areas of YUA as non-agricultural activities in the regional spatial plan

and the paradigm of society in the YUA region that the land as economic assets that can be profitable. The designation of YUA as non-agricultural activities has an impact on the absence of a legal basis for regent or mayor to appoint YUA as the location of agricultural land consolidation, while the land paradigm as an economic asset impacts on the weak participation of the community to follow the agricultural land consolidation program.

It takes a strong commitment from stakeholders to (1) revise the regional spatial plan, (2) socialization intensively and sustainably, and (3) implementation of welfare programs for the agricultural landowner. Thus the agricultural land consolidation can be implemented in YUA and the regional food sovereignty can be realized, considering the existence of agricultural land in YUA as an object that must be protected to fulfill the sustainable agricultural land allocation as mandated in Provincial Regulation of DIY Number 10 The year 2011.

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Appendix 1.

Padi Sawah

L2.1

Kualitas/Karakteristik Lahan		Kelas Kesesuaian Lahan				
		S1	S2	S3	N1	N2
Temperatur	(t)					
- Rata-rata tahunan	(°C)	24 - 29	> 29 - 32 22 - < 24	> 32 - 35 18 - < 22	Td	> 35 < 18
Ketersediaan air	(w)					
- Bulan kering	(< 75 mm)	< 3	3 - < 9	9 - 9.5	Td	> 9.5
- Curah hujan/tahun	(mm)	> 1500	1200 - 1500	800 - < 1200		< 800
- LGP	(hari)	90 - 240	75 - 90	75 - 90	< 75	< 75
Media perakaran	(r)					
- Drainase Tanah		Terhambat	Terhambat	Sedang - baik	Cepat	Sangat cepat
- Tekstur		SCL, SiL, Si, CL	SL, L, SiCL, C, SiC	LS, Str C	Td	Kerikil, pasir
		> 50				
- Kedalaman efektif	(cm)		40 - 50	25 - 40	20 - 25	< 20
- Gambut		-				
- Kematangan		-	Saprik	Hemik	Hemik - Saprik	Fibrik
- Ketebalan	(cm)		< 100	100 - 150	> 150 - 200	> 200
Retensi hara	(f)					
- KTK tanah		≥ Sedang	Rendah	Sangat rendah	-	-
- pH tanah		5.5 - 7.0	> 7.0 - 8.0 4.5 - 5.5	> 8.0 - 8.5 4.0 - < 4.5	-	> 8.5 < 4.0
- C - organik	(%)	-	-	-	-	-
Kegaraman	(c)					
- Salinitas	(mmhos/cm)	< 3.5	3.5 - 5.0	> 5.0 - 6.6	> 6.6 - 8.0	> 8.0
Toksisitas	(x)					
- Kejenuhan Al	(%)					
- Kedalaman sulfidik	(cm)	> 75	60 - 75	40 - < 60	30 - < 40	< 30
Hara tersedia	(n)					
- Total N		Sedang	Rendah	Sangat rendah	-	-
- P_2O_5		Tinggi	Sedang	Rendah - sangat rendah		
- K_2O		Sedang	rendah	Sangat rendah		
Kemudahan pengolahan	(p)	-	-	Sangat keras, sangat teguh, sangat lekat	-	Berkerikil, berbatu
Terrain/potensi mekanisasi	(s/m)					
- Lereng	(%)	< 3	3 - 8	> 8 - 15	> 15 - 25	> 25
- Batuan permukaan	(%)	< 3	3 - 15	> 15 - 40	Td	> 40
- Singkapan batuan	(%)	< 2	2 - 10	> 10 - 25	> 25 - 40	> 40
Tingkat bahaya erosi	(e)	SR	R	S	B	SB
Bahaya banjir	(b)	F0 - 1	F2	F3	F4	F4

Keterangan :

- Td : Tidak berlaku
- S : Pasir
- Str C : Liat berstruktur
- Si : Debu
- L : Lempung
- Liat masiv : Liat dari tipe 2 : 1 (Vertisols)

Kedalaman tanah untuk tekstur penentuan tekstur, KTK, C - Organik, Al, N, P_2O_5, K_2O disesuaikan dengan zone perakaran tanaman yang dievaluasi.
Kriteria C - organik, N, P_2O_5 dan K_2O dan bahaya banjir pada Lampiran 3.

Source: Djaenuddin et al, 1994

PROJECTION OF LAND SUITABILITY OF PADDY FIELD BASED ON REPRESENTATIVE CONCENTRATION PATHWAYS (RCP) 4.5 SCENARIO IN BOJONEGORO REGENCY

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Abstract

The level of land suitability for plants in an area is influenced by climate factors such as temperature and rainfall. Climate change that occurred has an impact on the agricultural sector. Therefore, there is a need for research on the description of the suitability level of land for crops, especially paddy in the future, to determine appropriate adaptation and mitigation strategies so that the impacts of climate change can be reduced and crop production can be maximized. The purpose of this research is to understand the change of land suitability level for paddy plant in Bojonegoro regency until 2040. The data used are observation data and projection data to describe the climatic condition in the future. Observation data used are air temperature, rainfall, oldeman climate type and altitude data. While the projection data used is Scenario Representative Concentration Pathways (RCP) 4.5 with MIROC5 scale 20 km. The model data contains climatic data to illustrate the present climatic conditions of the 2006-2015 period for future baseline information and future climate projection, in 2021-2030 and 2031-2040 used to calculate land suitability for paddy in the future which will come. The results showed that the level of land suitability in Bojonegoro Regency in the period 2006-2015 is mostly very suitable (S1) for paddy cultivation. Future changes in rainfall and air temperature projected by the RCP4.5 scenario until 2040 result in a corresponding degree of land suitability (S1) to be reduced, while sufficient land (S2) increases. However, the changes are not too significant. The land suitability level still lies on suitable land (S1) and is suitable (S2), so in Bojonegoro until 2040 it is still suitable for paddy cultivation.

Keywords: Land Suitability; Scenario RCP 4.5; Paddy

1. Introduction

Climate change is a rapidly growing issue today. The Intergovernmental Panel on Climate Change (IPCC) through the 5th Assessment Report outlines the evidence that climate change does occur. The earth's temperature increased by about 0.8 °C. This condition is warmer than the previous few decades (IPCC, 2013). Climate change negatively impacts crop production and reduces crop yields especially for food crops based on observations and research that has been widely conducted (IPCC, 2014). Paddy is a food crop that has a high degree of vulnerability to the impacts of climate change.

Indonesia is the third largest paddy producer country in the world after China and India. Paddy production in Indonesia can be increased through increasing planting area and productivity. The planting area is increased through control non-agricultural land into new

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land or settlement. Productivity is enhanced through the use of good technology in agriculture (Suryana, et al, 2009).

Bojonegoro regency is one of the largest paddy producing districts in East Java. In 2015 the production of wetland paddy and dryland paddy in Bojonegoro decreased by 1.9% compared to 2014, which was 16.066 tons. Production of wetland paddy in 2015 amounted to 793.172 tons and dryland paddy production of 38.619 tons (BPS, 2016).

There needs to be an effort to minimize the impacts of climate change. In reducing the impacts of climate change in agriculture, especially on paddy crops, it is necessary to research the suitability of land in the future so that we can prepare the scheme of adaptation and mitigation to support national food. Ministry of Agriculture (2013) defines land suitability as the level of suitability of a field of land for the use of certain crops, both annual and perennial crops. The land suitability classification is a grouping of land based on its suitability or capability for a particular purpose of use. (Hardjowigeno and Widiatmaka, 2007) explain land suitability is the level of suitability of a land for a particular type of land use (plant species and management level).

One way to look at future climate conditions is projection using a specific scenario. In this study the scenario used is the Representative Concentration Pathways (RCP) 4.5 of the MIROC5 model with a resolution that has been upgraded to 20 km. RCP 4.5 explains that radiative forcing will be stable about 4.5 Wm-2 after 2100. This RCP replaces the previous scenario of Special Reports on Emission Scenario (SRES) and has four scenarios namely RCP2.5, RCP4.5, RCP6.0 and RCP8.5. The use of scenarios is not aimed at predicting the future but to understand better about future uncertainties and alternatives (IPCC AR5, 2013).

The results of this study aim to provide information about the type of Oldeman climate and the land suitability of paddy field spatially and temporally. Areas that have good paddy productivity are obtained by looking at potential future land suitability projection. Climate is one of the most important information in changing the land suitability of paddy field so that the impact on the production of paddy produced. The information can be used as the basic technical guidance of science for sectoral decision makers in supporting agricultural land consolidation to support national food security especially in Bojonegoro.

2. Material and Methods

The data used in this research is observation data of rainfall and air temperature period 2006-2015 at 22 point of observation Bojonegoro Regency. Temperature data obtained from the temperature estimation with the formula (Braak 1928 in Rusdiana and Amalia, 2012) as follows:

$$T_h = T_{h0} - \left(\frac{0,6}{100} h\right) \quad (1)$$

Where T_h is the temperature of the rain gauge stations (^{0}C), T_{h0} is the temperature of the reference stations (^{0}C) and h is altitude (m).

Projection data using MIROC5 model of 20 km scale with parameters of temperature and rainfall. The model data is differentiated into baseline data (2006-2015) and projection (2021-2040). Furthermore, MIROC5 model data is extracted using GraDs software and corrected to observation data. The correction of rainfall and temperature data is performed using the following equation (Weiland et al, 2010).

$$CH_{model\_kor} = CH_{mod} \times \frac{\overline{CH}_{obs}}{\overline{CH}_{mod}} \quad (2)$$

$$T_{model\_kor} = T_{mod} + (\bar{T}_{obs} - \bar{T}_{mod}) \quad (3)$$

Where :

CH_{model_kor} = monthly rainfall of the corrected model

CH_{mod} = precipitation model before the correction

$\overline{CH}_{obs}$ = average rainfall of the baseline period of observational data

$\overline{CH}_{mod}$ = baseline rainfall period data model

T_{model_kor} = monthly model air temperature after correction

T_{mod} = monthly air temperature model before correction

$\bar{T}_{obs}$ = average monthly temperature of baseline observation data

$\bar{T}_{mod}$ = average monthly temperature of baseline data model

After the model data is corrected, then determined the type of Oldeman climate in each period. The determination of the Oldeman climate type is based on the number of wet and dry months in succession with the following criteria:

Table 1. Oldeman climate type classification criteria (Oldeman, 1982)

Main Type	Wet Months	Sub Division	Dry Months
A	>9	1	<2
B	7-9	2	2-3
C	5-6	3	4-6
D	3-4	4	>6
E	<3		

Land suitability is determined by summing the qualities of some characteristics such as air temperature, rainfall, Oldeman climate type and altitude. Land suitability is the level of suitability of a plot of land for a particular use (Djaenudin et al., 2003). The land suitability classification according to FAO (1976) is as follows:

Class S1, very suitable class: Land has no significant or apparent limiting factors on continuous use, or limiting factors that are minor and will not significantly reduce the productivity of the land. Class S2, Adequate suitable class: Land has limiting factor, and this

limiting factor will affect its productivity, requiring additional input. Such barriers can usually be overcome by the farmers themselves. Class S3, marginally suitable class: Land has a severe limiting factor, and this limiting factor will affect its productivity, requiring additional input more than land classified as S2. To overcome the limiting factor in S3 requires more input than land classified as S2. To overcome the limiting factor in S3 requires high capital, so that the need for assistance or intervention of government or private parties. Without such assistance farmers are unable to cope. Class N, not suitable: Unsuitable land (N) because it has a very heavy limiting factor and / or difficult to overcome. The classification of land suitability for paddy crops can be seen in table 2

Table 2. Classification and weight of land suitability of paddy crops (Djaenudin, et all, 2003)

Terms of use / land characteristics	Quality 4	Quality 3	Quality 2	Quality 1
Annual average of air temperature (°C)	24-29	22-24 and 29-32	18-22 and 32-35	<18 and >35
Precipitation (mm)	>1500	1200	800-1200	<800
Oldeman Climate Type	A1, A2	B1, B2,B3	C1, C2, C3	D1, D2, D3, E
Altitude	<500	<750	<1000	>1000

Furthermore, the level of land suitability is determined by summing the quality of each element according to their classification in table 3.

Table 3. Classification of quality (Djaenudin, et all, 2003)

No	Number of quality values	Land Suitability Classification
1	>9	S1
2	7-9	S2
3	5-6	S3
4	<6	N

3. Results and Discussion

The RCP 4.5 scenario model data from the MIROC5 model has an error on the observation data so correction is necessary. Correction results are tested using RMSE. If the RMSE value is small, then the performance and accuracy of the model is getting better. The RMSE test results show temperature and rainfall parameters at all points of observation. The RMSE value is smaller in the model data after correction than the model data before

the correction. The model data after correction has good performance and accuracy for use in the study. RMSE test results can be seen in tables 4 and 5.

Table 4. RMSE value of Rainfall

Rain Gauge Station	RMSE before the Correction	RMSE after the Correction
Balen	125.6	113.6
Baureno	145.4	111.5
Bojonegoro	118.1	96.7
Cawak	153.4	87.8
Dander	119.0	87.8
Gondang	160.4	70.7
Jatiblimbing	124.1	110.1
Kanor	141.5	100.3
Kapas	122.8	108.0
Karangnongko	171.5	102.6
Kerjo	148.1	79.0
Klepek	135.9	124.4
Leran	122.4	88.8
Merkurius	134.0	98.7
PJ K Adem	141.5	121.2
Simorejo	153.1	118.6
Stren	116.4	90.2
Sugihan	179.4	173.5
Sukun	159.0	60.7
Sumberejo	140.1	105.4
Tlogorejo	165.3	89.9
Tretes	130.7	99.1

Table 5. RMSE value of Air Temperature

Rain Gauge Station	RMSE before the Correction	RMSE after the Correction
Balen	0.946	0.350
Baureno	0.773	0.369
Bojonegoro	0.946	0.350
Cawak	0.837	0.369
Dander	0.803	0.350
Gondang	0.376	0.369
Jatiblimbing	0.874	0.350
Kanor	0.767	0.369
Kapas	0.846	0.350
Karangnongko	0.835	0.324
Kerjo	0.757	0.369
Klepek	0.918	0.350
Leran	0.918	0.350
Merkurius	0.685	0.369
PJ K Adem	0.688	0370
Simorejo	0.837	0.369

Stren	0.701	0.343
Sugihan	0.400	0.369
Sukun	0.370	0.369
Sumberejo	0.853	0.369
Tlogorejo	0.783	0.369
Tretes	0.482	0.369

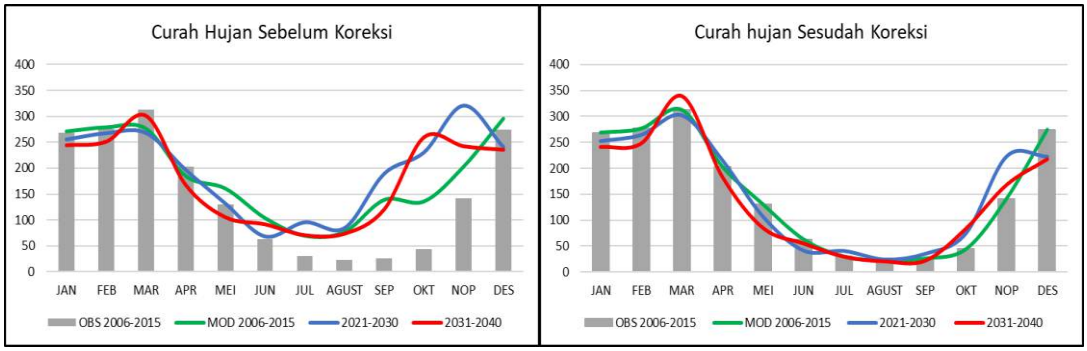

Figure 1. Graph of rainfall model before and after correction in Rain Post Bojonegoro

The improved correction results are shown in Figure 1. The graph shows that precipitation before the correction in both the 2006-2015, 2021-2030 and 2031-2040 periods from July to November has higher rainfall than observed rainfall. Meanwhile, after correction, the rainfall value of the model approaches observation rainfall pattern.

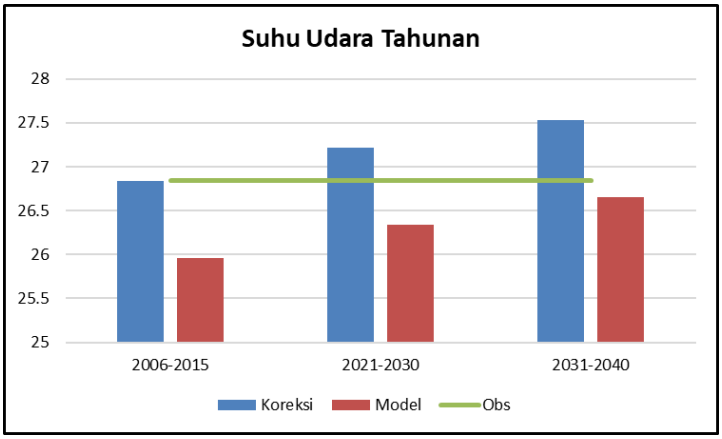

Figure 2. Graph of air temperature model before and after correction in Rain Post Bojonegoro

Air temperature parameters show that the average model year air temperature model before the correction has a lower value than the average annual observation air temperature over the entire period, while after correction tends to be higher than observed air temperature. The data of temperature and rainfall projection is used to project Oldeman climate type. Oldeman climatic classification results can be seen in Table 6.

Table 6. Classification of the Oldeman climate type in Bojonegoro Region

Rain Gauge Station	2006-2015	2021-2030	2031-2040
Balen	C3	C3	D3
Baureno	C3	D3	D3
Bojonegoro	C3	C3	D3
Cawak	E	E	E
Dander	C3	C3	C3
Gondang	E	E	E
Jatiblimbing	C3	C3	C3
Kanor	D3	E	E
Kapas	C3	C3	D3
Karangnongko	E	E	E
Kerjo	E	E	E
Klepek	C3	C3	C3
Leran	D3	C3	D3
Merkurius	C3	E	E
PJ K Adem	C3	C3	C3
Simorejo	D3	C3	D3
Stren	C3	D3	D3
Sugihan	C3	C3	C3
Sukun	E	E	E
Sumberejo	D3	E	E
Tlogorejo	E	E	E
Tretes	C3	D3	C3

Table 6 shows that there are several observations points that experienced changes in Oldeman climate type from 2006-2015 to 2021-2030 and 2031-2040 periods. Most of the changing regions show changes to more dry climates. It can be seen that the condition of the area in the year of projection (2021-2030 and 2031-2040) is getting dry. Land suitability in this study is more emphasized on the suitability of agro climate so that in the weighting method used several climate parameters such as annual air temperature, annual rainfall, Oldeman climate type and altitude. The result of land suitability weighting in the period 2006-2015 can be seen in Figure 3.

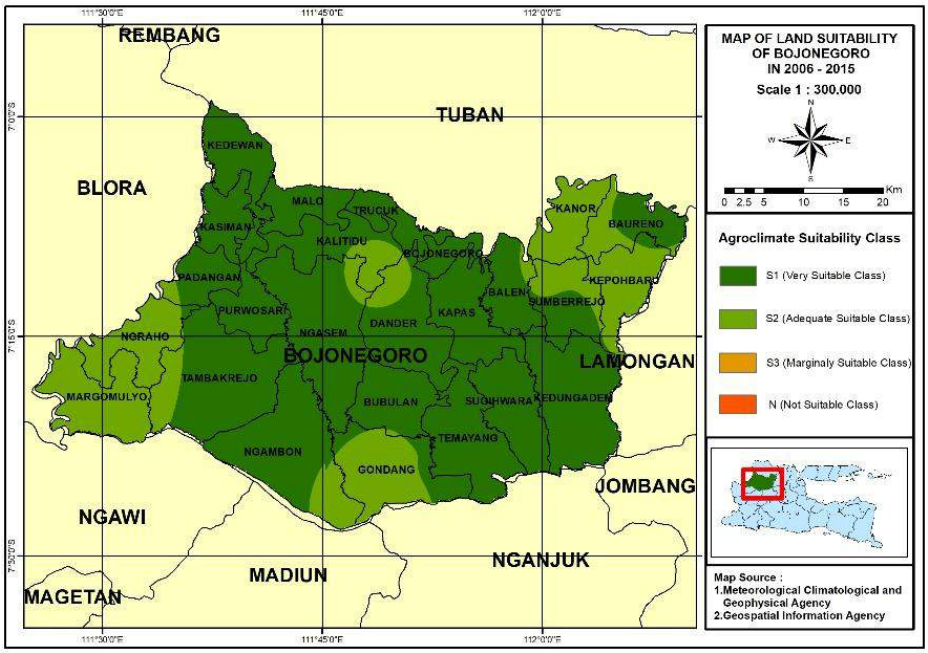

Figure 3. Map of Land Suitability Bojonegoro in 2006-2015

The condition of the suitability of agro climate especially for paddy crops in Bojonegoro Regency is mostly in the S1 class or very suitable class (Figure 3). Only a small part of western, eastern and southern Bojonegoro areas are in the appropriate class (S2). In the period of 2021-2030 there is an expansion of S2 or class area is quite appropriate in the western part of Bojonegoro regency. The expansion increased again in the period of 2031-2040 in the west to east of Bojonegoro. Agro climate compatibility period 2021-2030 and 2031-2040 can be seen in Figure 4 and Figure 5.

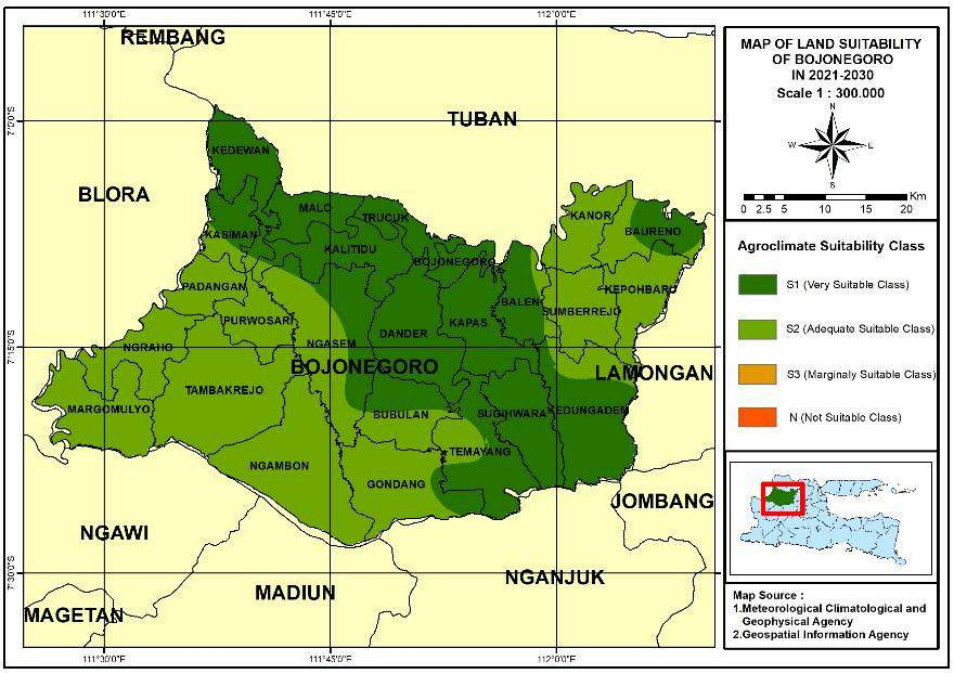

Figure 4. Map of Land Suitability Bojonegoro in 2021-2030

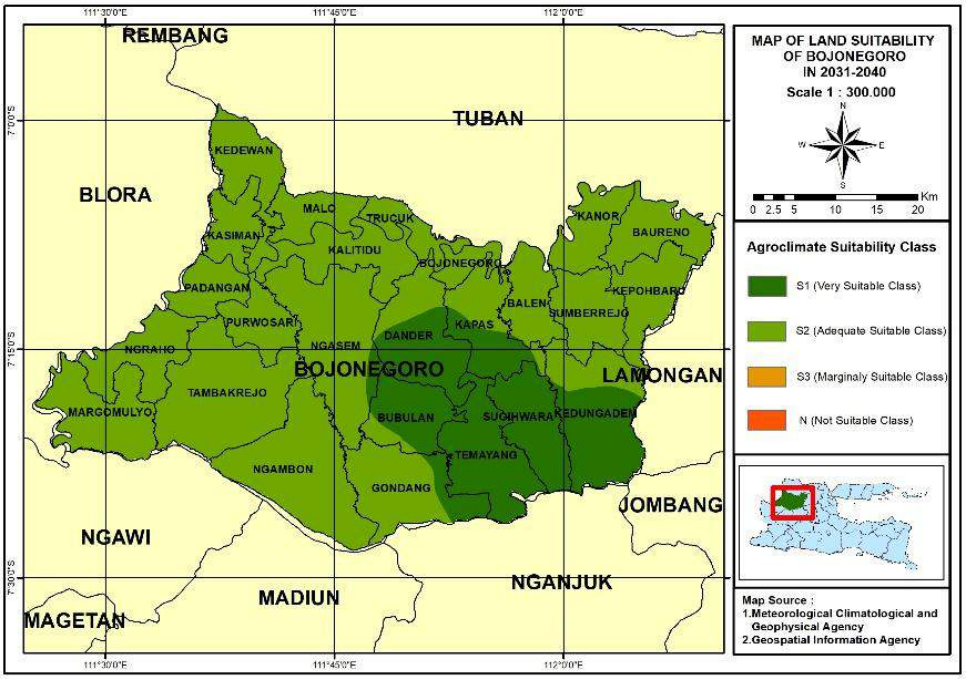

Figure 5. Map of Land Suitability Bojonegoro in 2031-2040

The suitability of agro climate land for paddy crops in Grade S2 (Adequate Suitable Class) in Bojonegoro region is increasing until 2040, while S1 class (very Suitable class) is decreasing. However, the changes are still in the class is very appropriate and quite appropriate, so that until 2040 Bojonegoro region is still suitable for paddy crops.

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SOCIAL IMPACT ASSESSMENT AS AN INSTRUMENT TO MAINTAIN RESILIENCE OF SOCIO-ECOLOGICAL SYSTEM IN A SPATIAL DEVELOPMENT

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Abstract

The development of an area and the spatial planning of a region has usually caused the impact to the environment and some aspects of human life such as traditions, settlements, and livelihoods. Spatial developments and constructions in an area will influence and transform its landscape and socio-cultural conditions, in which affected residents have lived, socialized, worked and performed their traditions for many generations. These transformations give rise to the question about the resilience of not only the economy but also socio-ecological aspects of the affected residents. In order to minimize the impact of spatial development, there is a need for a holistic approach to contextualizing the complexity of the impact of landscape transformation in order to manage the resilience of socio-ecological systems in spatial planning. In exploring this resilience, a social impact assessment method is used to understand and evaluate the condition and character of the area. Based on this assessment, spatial planning will be more acceptable to manage the resilience in a spatial development.
Keywords: Keywords: Social Impact; resilience; assessment; spatial planning;

1. Introduction

The development of public facilities, such as a road, has caused socio-economic impacts for people living and working there. This development is based on spatial planning of this area so that the development and its spatial planning have usually caused the impact to many aspects of a human life such as traditions, settlement, and livelihoods. Spatial developments and constructions will influence and transform their landscape and socio-cultural conditions, in which affected residents have lived, socialized, worked and performed their traditions for many generations. These changes will cause external stresses and disturbances to the residents so that they need some actions to survive not only in terms of economic issues but also a social one.

The important issue in this transformation is how far the affected residents adapt and face the external pressures and disorders as a result of the social and ecological change (Adger 2000). The fundamental aspect in resilience is a capacity of a landscape and the habitat inside it to absorb and reorganize spatial problems so that the area and its affected residents still retain essentially the same structure, identity, and function. The center of this absorption and restructure is the involvement of adaptability and transformability during

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the process of changes in order to maintain a person's socio-cultural and economic conditions (Walker et al 2004).

To understand the problems, every spatial planning and development need a social impact assessment to minimize the impact to the residents. In this assessment, there is a need for a holistic approach to contextualizing the complexity of the impact of landscape transformation in order to manage the resilience of socio-ecological systems in spatial planning. In order to assess social resilience, the questionnaire and interviews are carried out in the site of spatial planning and development into the affected residents. The samples will be collected using random and stratified random sampling. This method can then be used in conjunction with the oral research methods provided by questionnaire and detailed interviews for a deeper analysis and interpretation. Thus the paper argues that a discussion of the assessment in and of itself can contribute to a discourse about social resilience, sustainability, spatial planning and development, and can also be adapted, critiqued, built on for sites other than in Bali.

This paper begins with an exploration of the social impact assessment and managing resilience. The following section explores the social impacts of spatial planning of an excavation area that change into other functions. In this section, the sand excavation in Gunaksa village Bali is an example. Finally, the action plan is developed based on social impact assessment carried out.

2. Social impact assessment and managing resilience

Spatial planning and development usually cause multi-dimensional impacts to social and economic aspects of human beings, the environment, and biodiversity. In this condition, social problems increase because there are conflicts between economic and natural assets. In order to understand the impact, a social impact assessment is needed, in which based on Centre for Good Government (2006), it consists of:

- "Processes through which the government departments/agencies can better understand how the socio-cultural, institutional, historical and political contexts influence the social development outcomes of specific investment projects and sector policies
- The means to enhance equity, strengthen social inclusion and cohesion, promote transparency and empower the poor and the vulnerable in the design and/or implementation of the project
- The mechanisms to identify the opportunities, constraints, impacts and social risks associated with policy and project design
- A framework for dialogue on development priorities among social groups, civil society, grassroots organizations, different levels of government and other stakeholders

- Approaches to identify and mitigate the potential social risks, including adverse social impacts, of investment projects."

The abovementioned framework has demonstrated that the objective of Social Impact Assessment called SIA is to ensure that spatial and construction planning maximises their benefits and decreases their expenditures. However, the benefits and expenditures of social impact might be immeasurable and are often inadequately taken into justification by decision-makers, government, and developers. Through this assessment, the impact can be identified in advance. The government, decision-makers and regulatory authorities are able to take better decisions about the process, the method they use and the implementation of mitigation measures.

There are five main categories in the social impact assessment: (1) lifestyle impact; (2) cultural impacts; (3) community impacts; (4) Quality of life impact; and (5) health impacts (Centre for Good Government 2006). These five groups are sometimes overlapping one and the others to ensure that the assessment and estimation can produce specific policies and government actions to solve problems and to minimise social consequences. SIA ensures that the development interventions address key relevant social issues and involve a wide range of stakeholders. This assessment becomes a method to develop a framework for prioritizing, gathering, analyzing and incorporating social information and participation to produce the design and actions of development operations (Rietbergen-Mc Cracken and Narayan 1998).

The framework becomes a convenient way of conceptualizing social impacts that can be breakdown into several components. The affected residents' ways of life will assess how they live, play and interact with one another on a daily basis. The impact to their environment that includes the quality of the air and water residents use; the availability and quality of the food they eat; the level of hazard or risk, dust, and noise they are exposed to; the adequacy of sanitation, their physical safety, and their access to and control over resources. This environmental impact will relate to their health and wellbeing in which this aspect is related to diseases. The change of the environment and landscape of a region will also influence their personal and property rights, their culture and community as well as their political system and their aspirations. As explained above, the aim of this assessment is to ensure that the affected residents can return to equilibrium.

The way to return to equilibrium is the notion of the concept of resilience (Pimm 1991). In this concept, resilience related to the capability of a community to handle disorder of the system and reorganize the structure so that the system still maintains essentially the same function, structure, identity, and feedbacks (Walker et al 2004; O'Connell et al 2015). In order to manage resilience, the government is not the only one actor, but the interaction many actors, including the private sectors and not-for-profit organizations also have

important roles. Public participation and open communication between government and non-state actors especially the affected residents are important to build the trust and shared understanding among many stakeholders needed to effectively use resources and people (Lebel et.al 2006). Involvement of communities, especially, affected residents is very important to get what they fell, and how they manage their future after the development of public facilities such as a road in their land.

3. Spatial planning and development: the impact of enclosure of sand excavation of Gunaksa

Spatial plans and constructions in an area, especially the area where people live and work there for a long time, tend to generate socio-economic impacts to people especially the owners of the land, sharecropper or the owner of the traditional kiosks that are used as a location for economic activities such as an excavation and mining area. Such economic area has the potential to the impact of the environment and also the safety of the workers. This potential of the impact has already happened in the sand excavation in Gunaksa village of Klungkung Bali.

Figure 1. the sand excavation of Gunaksa Bali.

This area has become a sand excavation since the eruption of Mount Agung in 1963. This area was the area of lava sediment from the eruption so that the area has so much sand and stones. Since this event, this area has become the biggest sand and stones suppliers for constructions in Bali. Many people from other villages and other islands including Java and Lombok came and lived there as a place of livelihood (Figure 1). Working in this area did not need special ability and capacity so that many people came and worked in which they just brought simple tools such as a hoe and a shovel. Some modern vehicles were also used such as a loader and an excavator. This area has become the biggest excavation area in Bali in which more than hundreds people work there such as the owners and tenants of lands, sand diggers, truck drivers, excavator operators, small traders, the owner of kiosks or *warungs*.

Figure 2. the degradation of environment in sand excavation of Gunaksa Bali.

However, the excavation area has caused the degradation of land and the environment (Figure 2). The uncontrolled excavation in this area also has the potential to endanger the workers and the buildings around the area. Therefore, the local government closed the area for excavation activities and planned new

activities in this area such as harbor, recreation areas, tourism areas and water treatment areas.

The enclosure of this area has caused social and economic impact to affected residents and workers that have lived and worked there for almost 20 years. Many affected residents experienced the decrease of their income. This reduction of income then affected their fulfillment of their basic needs such as clothes and food in which almost 70% respondents will reduce the quality of their food. This condition will influence the others aspect of their life such as the education of their children and the healthy condition of their family. Therefore, the reduction of income will affect social aspects of people life including lifestyle, cultural activities, community relationship, quality of life and healthiness.

Therefore, it is important to do some integrated actions to rehabilitate and manage resilience of the area. In order to design the integrated actions, there are needed a social impact assessment so that the integrated actions undertaken can solve the social and economic problem of society. The actions are also able to manage resilience in this area.

4. Social Impact of the Enclosure of the Sand Excavation in Gunaksa Bali

A Social Impact Assessment (SIA) in Gunaksa was carried out through interviews and focus group discussions to gain participation from affected residents including small traders, sand diggers, and land's owners. After the enclosure of the sand excavation in Gunaksa, the affected residents experienced the decrease of their income. This decrease also influenced other social aspects of their life.

The lifestyle of the people is related to their expression in their workplaces and pattern of their leisure behavior (Kahle & Close 2011). This way of living of individuals is related to the economic environment in their daily life. Economically, they did not afford to fulfill their basic need including their food, clothes and the maintenance of their house or renting a house for their family. This will influence the affected residents' lifestyle in which some of them should move to other places. In this movement, the people entering to new places will face the process of adaptation in which for some people it is a difficult process.

Some examples of the difficulties and the changes of their lifestyle are demonstrated below. Before the enclosure, they were able to buy new clothes for their family every six months especially in Galungan and Kuningan days, the biggest ceremony in Bali. However, after the enclosure, they could not. In addition, they usually could buy good food from small restaurants for their family once a month, but after enclosure, they could not.. The other example is related to cultural activities in which usually before enclosure, they will prepare ceremonies and made offerings with little bit more expensive fruits of cakes, but after enclosure, they made with cheaper materials and fewer quantities.

The enclosure of the sand excavation is also changed community relationship because some of them should move to other places to get new workplaces. In their new places, they

should develop a new relationship with new communities and this needed some processes that were not too easy for some people and families. They should make some adaptation process and make some changes in their lifestyle to fit the new environment and communities. On the other hand, in the old place, where they lived, people will lose some of their good friends in which they used to work together for a long time and have already felt like family. They have lost their relationships and should develop new relationships with others.

The significant impacts are related to the quality of life and healthiness. This impact is related to the education of the affected residents' children and the healthiness of their family. In terms of education, some families (40%) reduced their education cost such as buying books, school clothes, and others cost for education. However, they tried to send their children to a school although this condition is very difficult for them. Similar to education aspect, the healthiness aspect has a similar phenomenon. Almost 45% affected residents reduced their cost for healthiness. If they were sick while they had no money at that time, they would go to a traditional healer first and then if they had or got money, they will go to the doctor. This condition was not good in which they would reduce their quality of life.

Therefore, if the abovementioned conditions happen for a long time, it is difficult for the affected people to manage resilience of their family. In this term, the effort, to maintain or to prevent the environmental damage by enclosing sand excavation in Gunaksa Klungkung, will influence a social system of a society lived there. Many social impacts will be faced by affected residents and their family.

The social impact assessment (SIA) will help the government to map social conditions of the affected residents and make some policies and action plans to help people manage and maintain their resilience. In this SIA carried out, many problems, efforts, and inspiration of the affected residents were collected.

Problems faced by affected residents are more related to the loss of their job that affects their livelihood. The following problem is that the affected residents are difficult to find a new job that fits with their abilities. They do not have other skills to get new jobs or they do not have the capital or are difficult to find credit to open a new business.

Based on these problems, the main action plan designed by local government is to create or to give job opportunities for the affected residents. The government plans many pieces of training for the affected residents based on their interest and abilities. During the training, the local government also plans any kinds of physical projects as a place for the affected residents to work as a carpenter, stonemason or crude work so that they still are able to feed their family. The policies for children education are the creation of foster care program for children facing problems in school fees and equipment or giving scholarships for the children of affected residents. In addition, the policies for the decline of the health

conditions are providing free of charge for health treatment facilities to affected residents and their family.

These action plans are expected to help affected residents and their family to maintain and manage the resilience of social-ecological system so that their quality of life can be improved or at least the same as before the enclosure the sand excavation.

5. Conclusions

The enclosure of excavation area, in which this is a place for people to live, work and socialize, will cause external stresses and disturbances to the residents therefore that they need some actions to survive not only in terms of economic issues but also a social one. To understand the problems faced by the affected residents, every spatial planning and development need a social impact assessment to minimize the impact to the residents. The aim of this assessment is to ensure that the affected residents can return to equilibrium and manage or maintain resilience. The enclosure of this area to prevent the environmental damage has caused social and economic impact to affected residents and workers that have lived and worked there for almost 20 years. The reduction of income then affected their lifestyle, cultural activities, community relationship, quality of life and healthiness. Based on these problems, the action plans designed by local government is to create or to give job opportunities for the affected residents, to create and implement foster care program and to give a scholarship. In relation to the health conditions, the local government has the policy to provide free of charge for health treatment facilities. These action plans are expected to help affected residents to maintain and manage their resilience.

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CONSOLIDATION DIRECTIVE OF SALT AGRICULTURAL LAND IN PANGKAJENE KEPULAUAN (PANGKEP) REGENCY, SOUTH SULAWESI

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Abstract

Salt is one of the strategic commodities in the agricultural sector. Indonesia's geographical condition has not been able to make Indonesia a sovereign country in the salt commodity. One of the causes is because the cultivation of salterns potential in Indonesia is not maximal yet. One of the central areas of national salt production is in Pangkajene Kepulauan. The wide of saltern in Pangkajene Kepulauan is 1.137,47 Ha (Meissarah et al, 2013). Along with the increasing number of national salt importing in 2017, it is necessary to consolidate the agricultural land in Pangkajene Kepulauan to maximize the national salt production.

The purpose of this research are; (1) identifying the land potential for the development of salt agricultural land in Pangkep Regency; (2) giving the consolidation directive of salt agricultural land to create the self-sufficient of national salt in Pangkep. The method used in this research is image data processing and field survey. The analysis used is spatial analysis and descriptive qualitative analysis. The results of this study are the potential land maps for the development of salt agricultural and the direction maps in national salt self-sufficient in Pangkep Regency.

Keywords: Agricultural, Salt, Land Consolidation, and Food Security

Introduction

The Unitary State of Indonesia is the largest archipelagic country in the world. Indonesia has 17,508 islands and 95,181 km of coastline (the fourth longest in the world after Canada, America, and Russia) (*World Resources Institute*, 2001). This condition is also supported as well as the vast territory of Indonesia's territorial sea covering 5.1 million km² which take about 63% of the total territory of Indonesia and added with Exclusive Economic Zone covering 2.7 million km² (Yusuf, 2007). The vastness of Indonesian marine territory indicates that the potential of marine resources is also very abundant. One of the marine potentials that can be utilized optimally is salt.

Salt as a marine potential is one of the strategic commodity in supporting the other sectors. Indonesia's geographical condition has not been able to make Indonesia sovereign country in the salt commodity. One of the causes is because the potential cultivation of salterns in Indonesia has not been maximized.

One of the national salt production centers is Pangkajene and Kepulauan Regency. Salt area in the Pangkajene and Kepulauan Regency is 1,137.47 Ha (Meissarah et al, 2013). Along with the increasing number of national salt importing in 2017, it is necessary to consolidate

the agricultural land in Pangkajene and Kepulauan to maximize the national salt production. The purposes of this research are; (1) identifying the land potential for the development of salt agricultural land in Pangkep Regency; (2) giving the consolidation directive of salt agricultural land to create the self-sufficient of national salt in Pangkep.

Methods

The methods used in this research are image data processing and study of literature. The data which have been used in this research are topography, hydrology, soil, water quality, climatic, and existing land cover data. As for the analytical techniques used are adapted based on the goals that will be achieved in this study.

The purpose of the first research uses spatial analysis method using overlay technique. Referring to the research that has been done by Poernomo (1992); Hardjowigeno and Widiatmaka (2007); Mustafa et al. (2008) in Achmadi (2013), the parameters used in assessment of overlay techniques on the potential land for salt ponds are topography, hydrology, soil, water quality, and climatic. The explanations of each valuation parameter are described below.

a. Topography

   According to Pantjara et al. (2008) in Achmadi (2013), a suitable topography for salterns is 0-4%.

b. Hydrology

   According to Poernomo (1992) in Achmadi (2013), semi-intensive and especially extensive aquaculture, the elevation of the land should be between or slightly higher than mean low water level (MLWL) and lower from mean high water level (MHWL). Meanwhile, according to Hardjowigeno and Widiatmaka (2007) in Achmadi (2013), the range of tidal amplitude suitable for the development of pond area is 0.5-3.5.

c. Soil

   Pantjara et al. (2008) in Achmadi (2013) says that soil texture which matches for salterns is sandy clay loam.

d. Water Quality

   According to Hernanto and Kwartatmono (2001) in Achmadi (2013), a good seawater has a relatively high salt content and not mixed with the flow of the river mouth. It would be better if the seawater is clear, not mixed with mud and waste. DIKA Deperindag (2001) also added in Achmadi (2013) that sea water should be wary of heavy metal pollution such as lead (Pb), copper (Cu), mercury (Hg) and arsenic contamination (As).

e. Climate

   Purbani (2001) in Achmadi (2013) says that the ideal weather conditions expected in the salterns are wind speeds more than 5 m/sec, and wind direction does not change, the air temperature more than 32 ^{o}C, the humidity lower than 50%, low rainfall, the low rainy

day and 100% solar irradiance that allows for high evaporation processes. The length of the dry season also directly affects the opportunity given to make salt with sunlight assistance. Wind speed, humidity, temperature affect the speed of water evaporation, the greater the evaporation the greater a number of salt crystals that precipitate. Rainfall (intensity) and rainfall patterns of distribution in the average year are an indicator that is closely related to the dry length that all affect the evaporation of seawater.

The parameters of saltern suitability assessment can be seen in table 1 below.

Table 1. The parameters and the saltern suitability assessment

No	Variables	Land Suitability Classes			
		S1	S2	S3	S4
1	Slopes of Land	0-2 %	>2-3%	>3-4%	>4%
2	Soil Texture	Sandy clay loam	Sandy clay	Clay dusty	Dust, sand
3	Rainfall	<1300	<1300	<1300	>1300
4	Distance From Coastline	>100-1000	>1000-2000	>2000-4000	>4000
5	Distance From River	0-500	>500-1000	>1000-2000	>2000
6	Land Cover	Saltern, Moor, Bushes	Paddy Field, Garden	Swamp, Farming Ponds	Settlement, Forest, Mangrove

Source: Achmadi, 2013

Information:

Class S1: Highly suitable. This land has no major restrictions for the management provided or has only limits that do not significantly affect the production and will not boost the input that was used to give.

Class S2: Moderately suitable. The land that has heavy constraints is for a sustainable use. The constraints will reduce the productivity or profit and increase the necessary inputs.

Class S3: Marginal Suitable. The land that has very severe limits is for a sustainable use. The barriers will reduce the productivity or profit and need to increase the required input.

Class N: Not suitable. This land has limits in such a way as to prevent a sustainable use.

The purpose of the second research uses descriptive qualitative analysis method and study of literature from the previous research.

Discussion

The condition of saltern in South Sulawesi spread in many Regional namely, Takalar, Jeneponto, Maros, and Pangkep. The total number of land parcels of saltern in South Sulawesi is about 5,565 plots (Meissarah et al, 2013). The ownership status of saltern in South Sulawesi is owned by folks, company, and government. Of the four regionals, Pangkep is the region with the highest salt production value compared to the other three regionals.

Pangkep has an area of 1,112.29 km² with a geographical structure that has beaches with karst hills along the sea coast causing saltern to extend along the coast. In general, the location of saltern in Pangkep spread in three districts, namely Bungoro, Labakkang, and Pangkajene. The topographic structure consists of low altitude 0-100 meters above sea level and upland from 100-1000 meters above sea level with the slope of 0 -> 30%. Air temperatures are in the range of 21 ° to 31 ° or an average of 26.40 °C. Wind conditions are at sea speed to medium, maximum rainfall average 265 mm/yr. The soil types of Pangkep are very varied; they are alluvial, Mediterranean complexes, latent, lithosol, and regosol. Land use is also done by ponds, paddy fields, and forests. More information about the land cover of Pangkep can be seen in Figure 1 below.

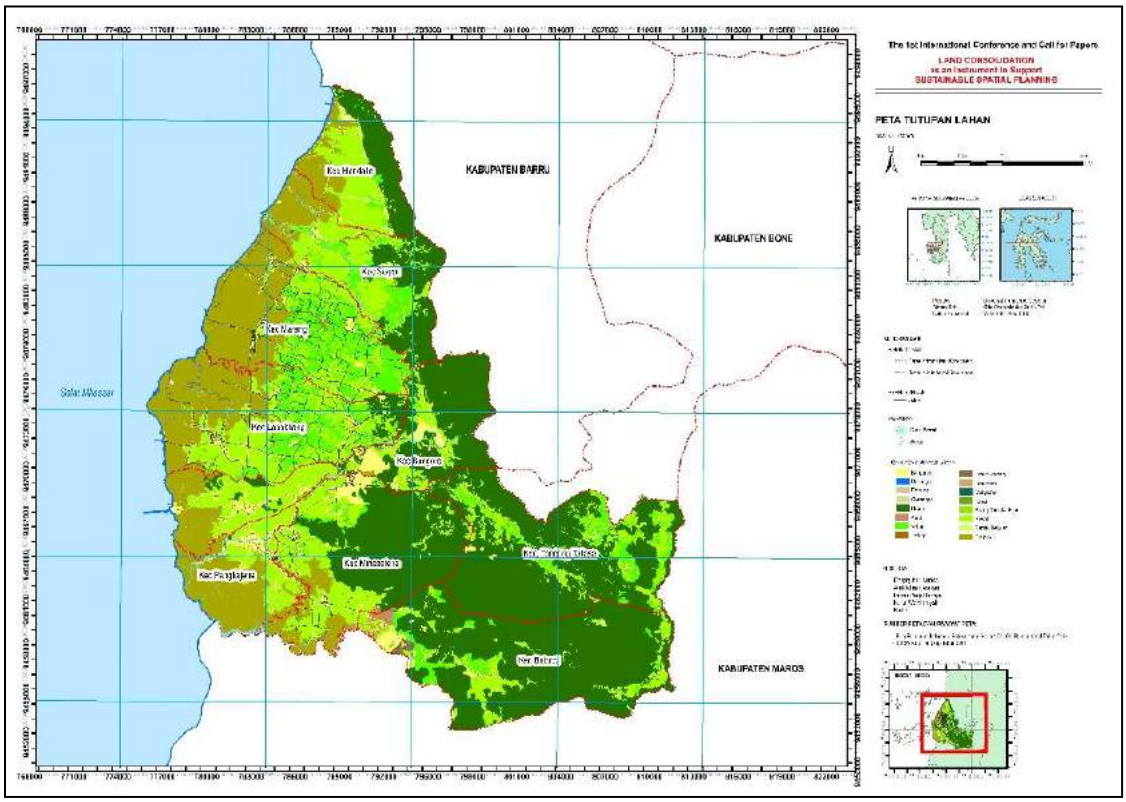

Figure 1. Map of land cover Pangkep

Pangkep is one of the central areas of national salt production. The salt area in Pangkep is 1,137.47 Ha and spread in several subdistricts, Bungoro, Labakkang and Pangkajene

(Meissarah et al, 2013). Based on the utilization of saltern in Pangkep, it is varied between pure salt, salt, and seasoned salt. However, most of the exploiting patterns that take place are mina salt, which can be used as salt land and also as a fish or shrimp farming field. Lands that are specifically used only for the exploitation of salt or pure salt, in terms of size and number of plots are relatively smaller.

The magnitude of this potential requires the cultivation of salt pond potential with the consolidation of agricultural land in Pangkep to maximize national salt production. Based on the potential and the problem, it is then required qualitatively and quantitatively identification. Identification to maximize the salt potential in Pangkep quantitatively by overlay method with parameters has been determined on the method. The result of overlay analysis that has been done can be seen in the following figure 2.

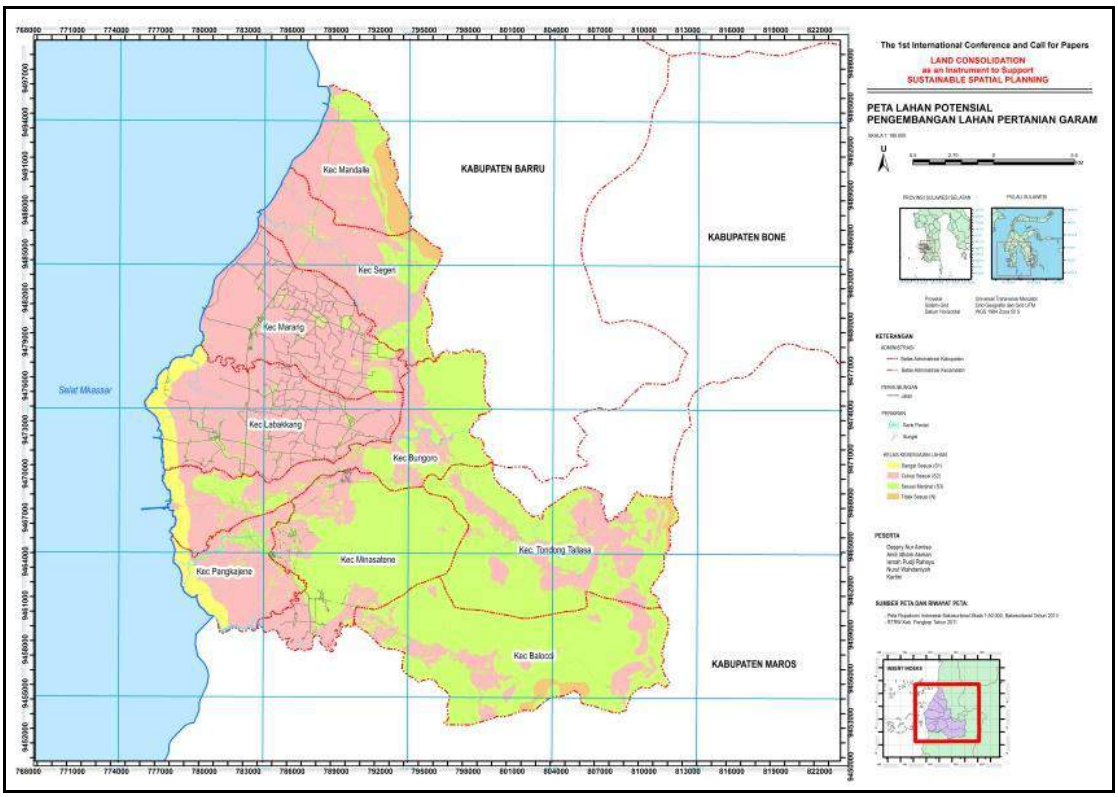

Figure 2. Map of Potential Land Development of Saltern

Table 2. Land Conformity of Salt Agriculture

No	Conformity Class	Wide (Ha)
1	N (unsuitable)	1.592,56
2	S1 (very suitable)	1.980,33
3	S2 (quite suitable)	39.200,84
4	S3 (depend on marginal)	35.212,64

Source: Analysis Result Year 2017

Based on the result of overlay that has been done, the area that is suitable for the development of saltern area is 1,980.33 Ha (S1) and quite suitable (S2) 39,200.84 Ha. This figure shows that the development of saltern in Pangkep is very potential in order to support national salt production.

The potential development of agricultural land class S1 salt (Very suitable) is located in three districts of Pangkajene, Bungoro, and Labakkang. These three areas are close to the seaside and have a <2% border. This greatly allows sea water to enter the pond area at high tide. In addition, these three sub-districts are strongly supported by the texture of sandy clay soil that allows sea water is not easily absorbed into the soil that can be accommodated above the pond. These three sub-districts are also not included in the protected area so it is very potential for extensification of saltern. Figure 3 below presents the focus of saltern development in Pangkep.

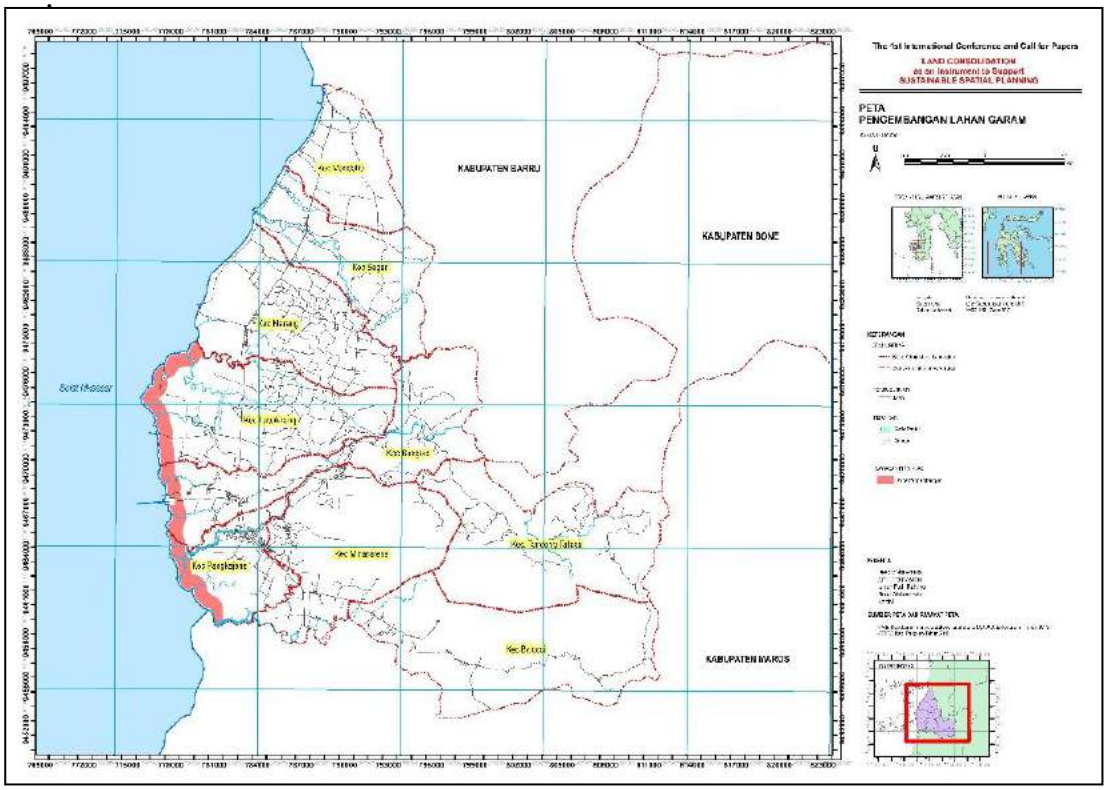

Figure 3. Map of Salt Land Development Zone in Pangkep

The development of saltern with sufficient (S2) and depend on margin (S3) yields have considerably lower productivity when compared to suitable land (S1) because it is located in a land area far enough from the sea. So for the development of the land, it still requires improvement efforts, especially in the provision of sea water.

Compared with the existing data of existing saltern in Pangkep, the area of salt utilized has a difference of 842.86 Ha with the salt area that should be utilized based on overlay

result. This indicates that it is necessary to extend the salt pond extent of 842.86 Ha in Pangkep.

In order to maximize the potential development of saltern in Pangkep, it takes a consolidation direction of salt farming land in realizing self-sufficiency of national salt in Pangkep. Consolidation activities can be done with the preparation stage, data collection, structuring, and construction phase (Premonowati, 2006).

Land consolidation is an overall land management program and is considered to solve the growing problems. This program is based on the results of a collective agreement. Therefore, formulating a common agreement becomes a challenge that needs to be given more attention. Success in this program is the arrangement of land ownership, so the land is more organized. With the arrangement of ownership, the existing barriers can be more easily overcome (Idham, 2004 in Isaac, 2011).

The direction of consolidation of salt farmland in Pangkep can be started with FGD (Focus Group Discussion) to discuss which land will be consolidated.

The discussion raised in conducting FGD is to show the existing land cover data on each saltern suitability area in Pangkep. For example, in the zone of the land suitability of high salt land (S1) has existing land cover in the form of ponds, swamps and some housing units. Each of these land cover plots' status of land ownership should be known so that they can re-arrange the salt pond area to conduct extensification activities. Extensification activities of salt ponds can be realized to be managed by smallholder salt farmers or by the private sector, depending on land ownership status.

If the land is identified as land owned by the folks then the land is developed into a saltern which is managed by the people. If the identified land is privately owned then it can certainly be developed into a saltern which is managed by private parties. However, if the land is identified as land owned by the government then its management can be done by the people or private. In this case, the decision to develop a saltern and the policy on the party who will manage it is returned to the landowner (Achmadi, 2013).

The result of mapping priority land of saltern shows that the land use in the area is very complex starting from settlements, industries, facilities and infrastructure, paddy fields, gardens, mangrove sand forests. Then, if the plots are reviewed, the number of lands is 1,610 land plots. Therefore, the development of pond land requires consideration of related regulation so that the location is making possible activities of the fishpond in the area. Many regulations are related to the management of protected areas which includes mangroves and forests in this research.

In regard to the management of protected areas, the regulations considered are The Presidential Decree No. 32 of 1990 on The Management of Protected Areas, Constitution No. 27 of 2007 on The Management of Coastal Areas and Small Islands, and The Government Regulation No. 38 of 2011 on The River. The Presidential Decree about The

Management of Protected Areas and Constitution about The Management of Coastal Areas and Small Islands protect the mangroves as a nature reserve area, and protect the beach borders such as the land along the ledges of a wide proportional to the shape and physical condition of the coast, at least 100 meters from the highest tide point towards the land. The Presidential Decree on The Management of Protected Areas and The Government Regulation on The River protect the areas around the springs at least with the radius 200 meters around the springs and river borders. (Achmadi, 2013).

The final result of salt agricultural consolidations in Pangkep is increasing the provision of supporting facilities and infrastructure in terms of salt production. Likewise, the efforts can be made to develop potential ponds with the provision of raw materials of seawater in large quantities, especially on quite a suitable land (S2).

Conclusion

Pangkajene and Kepulauan (Pangkep) has a potential land which can be optimized as a saltern. The result of overlay technique that has been done shows that the potential area for utilization saltern is 41,181.17 Ha. If this is compared with the result of the previous saltern, the saltern area used has a difference about 842.86 Ha with saltern based on overlay result. This indicates that it is necessary to extend the saltern extent of 842.86 Ha in Pangkep.

In order to maximize the potential development of saltern in Pangkep, it takes a consolidation direction of salt agricultural land in realizing self-sufficiency of national salt in Pangkep. Especially in this research, the consolidation of saltern which is done is still in the preparation and data collection stages.

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LAND CONSOLIDATION MODELING TO MAINTAIN FOOD SECURITY IN BADUNG AND GIANYAR DISTRICTS OF BALI PROVINCE

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Abstract

Conversion of agricultural to non-agricultural land use causes a decline in food security. Population density, land productivity, and social welfare are assumed as the factors causing this conversion. This research is aimed not only to know the influence of population density to land use conversion, but also the limit of food self-supporting happened in Badung and Gianyar Districts. Research used correlational method by taking samples from the survey of data in 2005 – 2015, and the population is all sub districts located in Badung and Gianyar districts where the land use conversion took place from year of 2005 up to 2015. Result of analysis using multiply regression shows that population density and social welfare influence the conversion of agricultural to non-agricultural land use. To analyze the limit of food security used variable of population increase, and conversion used exponential equality. The result of analysis shows that limit of food self-supporting in Badung and Gianyar districts will happen in 12,41 years future or year of 2027 with the size of agricultural land is 15,289.41 ha. Agriculture land consolidation takes place in the sub-districts of Abiansemal, Payangan, Petang, Sukowati, Tampaksiring, and Tegallalang. In the meanwhile, urban land consolidation is in the sub-districts of Blahbatuh, Gianyar, Kuta Utara, and Mengwi. This research can be used as agriculture land consolidation modeling for food security in other areas.

Keywords: land use conversion, food security limit, land consolidation.

1. Introduction

The land is one of the natural resources that have a strategic role in the development of food supply (Oktalina et al. 2016). Economic growth, population density, and the declining number of farmers are the factor that affects land-use conversion from agricultural to non-agricultural in urban and rural areas (Hidayat 2008). The land-use conversion is mainly influenced by the rapid construction development of settlements, city centers, education area, and government central (Dewi 2013). Also, the high rate population growth with its socio-economic status is one of the driving factors of increasing needs of land areas (Ruswandi, et al. 2007).

Developing countries experience the highest rates of agricultural land conversion comparing with developed countries. The literature review has shown that some of the causes of the transformation of farmland including population growth, economic growth, housing construction, infrastructure development, speculative activity (buying and selling)

of farmland (Govindaprasad and Manikandan 2014). As mentioned by Barati et al. (2015), the land-use conversion has caused some challenges in agricultural development and human life. In general, due to construction, the available land in urban and rural areas has become more limited. It raises issues of urban and rural land, including an uncontrollable increase in the conversion of land use from agricultural to non-agricultural due to the conflict of various interests (Sari et al. 2010). Instead of infrastructure development, staple food plantation such as paddy field is also dominating the land-use in most areas in Indonesia. The availability of land-use for rice field represents the food availability and food security in those particular areas. The debate on effective land-use either for infrastructure or agriculture has always been to be a serious problem (Bardhan and Tewari 2010). In modern life, the new building and infrastructure are necessary to build the civilized community; whereas the sustainability in food security also plays a crucial role to support a human being. Therefore, it is difficult to choose one of them, all of decision and policy by the stakeholders must cover all aspects in balance.

However, the fact shows that Indonesia experienced the rice deficit at 90 million ton in 2015. The further investigation in the field indicates that agricultural land has converted to the non-agricultural. In Bali Province, Indonesia, particularly in the administrative region such as Denpasar and Badung has been experiencing a land-use conversion at 0.34% (9,679 ha out of 563,666 ha) within 5 years (As-Syakur 2011). Also, the agricultural land has shrunk by 15,280 ha or 7.89% in Bandung Regency in the period of 7 years (1992-1999). The broad decline in farmland was followed by a decrease in rice production of 194,196 tons or at 24% (Ruswandi et al. 2007). Agricultural land conversion occurred in Gunungpati District (the suburb of Semarang) Central Java occurs due to population activities such as education and market along the main road (Dewi 2013). Land-use conversions do not only happen in Bandung, Semarang, and Bali; it also occurs in Ngawi where rice field area developments are likely to continue declining in line with the population growth and socio-economic activities. The paddy fields turned into houses and buildings (Hidayat 2008). The land-use conversion also happens in the other parts of the world; for example, a land-use conversion in Florida USA dominated the agricultural land and savannah which are located in rural areas due to rapid population growth (Ndez et al. 2012). Likewise, an analysis of the conversion of agricultural to non-agricultural land using the remote sensing in Qazvin Province, Northwestern Iran shows that within 20 years, 3.03% conversion of agricultural land into infrastructure mainly in the urban areas has occurred. Besides, in the countryside, the land has been converted into the local salt industry.

The rapid population growth is the primary factor of land-use conversion problems. The population density increases each year which is followed by the decrease of land area. The definition of population density is the total population divided by the area. The land-use conversion occurs as a result of the growth rates and population growth due to the

expansion of unplanned residential areas (Mallupattu and Reddy 2013). However, those problems do not directly trigger the conversion of land use from agricultural to non-agricultural land for the needs of the population. The conversion of land-use can be determined by using satellite imagery. Landsat Satellite Imagery was launched in 1972 under the name Landsat-1, whereas now it is upgraded to the series of Landsat-8 (Sitanggang 2010; Suwargana 2013).

In this study, we focused on the land-use conversion problems in Badung Regency and Gianyar Regency, Central Java. This study aimed to analyze the factors of population density to estimate the land-use conversion rate and food security limits in Ngawi. It is to guide government to set the policy to suppress the land-use conversion in regards to increasing food security in Badung Regency and Gianyar Regency

2. Research Methods

2.1. Research area

The study area was all the districts in Badung Regency and Gianyar Regency, Bali Province. A sample survey was conducted on March-August 2017 to collect population density data from Central Bureau of Statistics of Badung Regency and Gianyar Regency.

2.2. Data collection

Data were collected using satellite imagery Landsat-7 and Landsat-8. To determine the land-use conversion in 2005 and 2015, satellite imagery Landsat-7 and Landsat-8 were employed, respectively. Landsat-8 was launched in 2011 from Vandenberg Air Force Base California, with the glider Atlas-V-401. Landsat-8 is designed on approaching circular orbit near sun circle with an altitude 705 km, inclination 98.2º, period 99 minutes, coverage time 16 days. It brings sensor images Operational Land Imager (OLI) like Landsat-7. Landsat-7 was launched in April 1999. Landsat satellite imagery has near-infrared channels 1, and 7 channels appear reflective, with a spatial resolution of 30 m.

2.3. Data analysis

The land-use conversion and population density were used to calculate food security status and food security limits in Badung Regency and Gianyar Regency. The research applied a correlational analysis. The deciding factor of influence (relationship) conversion of agricultural land use to non-agriculture to population density was analyzed using partial correlation (Telussa et al. 2013). The partial correlation analysis formula is as follows:

$$t = \frac{r \cdot \sqrt{n-k}}{\sqrt{1-r^2}} \quad \text{..... (1)}$$

$$r = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{\{n\sum X^2 - (\sum X)^2\}\{n\sum Y^2 - (\sum Y)^2\}}}$$

n = Number of data

X = Independent variable

Y = Dependent variable

r = Partial correlation coefficient

n = Number of respondent

k = Number of variable

$t_{count}<t_{table}$, then there is no significant relationship.

$t_{count}>t_{table}$, then there is a significant relationship.

Next, data was analyzed by SPSS 16 for Windows. The impact of the land-use conversion of paddy field on the level of food security (rice) can be calculated with the needs of food (rice) per capita per year. For example, rice consumption by the average Indonesians reached 139.15 kg/capita/year in 2010 (Rikumahu et al. 2013). Therefore, to get the number of rice demands of Ngawi population is as follows:

Rice demands = ∑ population x 139.15 kg/capita/year .....(2)

It is necessary to know the yield loss on drying using drying to calculate the needs of dry milled grain rice (post-harvest). Post-harvest handling of rice is very strategic efforts to support increased productivity of paddy into rice. Contribution to the post-harvest handling of paddy rice production increase can be reflected in a decrease in yield loss and target them quality grain/rice corresponding quality requirements. Postharvest handling of rice is the high loss of yield; it happens at the stage of harvesting, threshing, and drying. The yield or yield loss on drying using drying by sunlight 61.6% (Raharjo et al. 2012), therefore that the productivity of rice per year to rice is as follows.

The productivity of rice per year = productivity of rice x planting season per year x 61.6%...(3).

The availability of food (food security) due to the conversion of agricultural land (paddy) and population growth can be described as a two-way relationship (bilateral) between the conversion rate ofpaddy fields use and rate of population increase. It means that the rate of paddy fields conversion affecting the rate of population density and rate population density also affect the rate of land use conversion or both are mutually reinforcing in the process of the need for land. Therefore the limit of food security (rice) will form two (2) equation (function) exponential. While the exponential equation in land-use conversion rate (f_{X1}) and the population growth rate (f_{X2}) according to Panigoro, 2013 as follows.

$f_{x1}= ae^{bx}$ ..... (4)

$f_{x2} = ae^{bx}$.....(5)

From 2 equations, i.e. formula (1) and equation (2), there will be anintersection point (x; y), and that intersection point is a food security limit in the area. Matlab R2010a software

was applied to get the intersection of two equations, equations of land-use conversion rate formula (4) and population growth rate formula (5).

2.4 Land Consolidation Modeling for Sustaining Food Security

Agriculture land consolidation is delineated through maps overlay. This kind of map is a result of several factors causing land use convertion. The references used are population density map, population welfare, and land productivity. Multiple regression test is done to identify the contribution of each variable to land use convertion. Calculation of partial test is applied to recognize the role and strength of each variable into built factor. The delineation of land consolidation through overlay technic is supported with scoring by using the following formula :

$$I = \frac{t_{maks} - t_{min}}{k} \quad \text{.....(5)}$$

I = Class interval ;

t_{maks} = Total score of maximum value variables (high);

t_{min} = Total score of minimum value variables (low);

k = Class numbers made (3 classes) according to the last result of agriculture land consolidation, namely: agriculture land consolidation, urban land consolidation, and buffer (those two land zones) consolidation

Saaty in Martanto (2012) mentions that scoring on each attribute in a variable may use *Analilytycal Hierarchy Proses (AHP). AHP* explains how to abstractize the structure of a system to learn functional relation amongst components and come into effect on system as a whole. This system is arranged to unify rationally the man's perception having closed relation with certain problem through a procedure to come to a preference scale amongst various alternatives. This analysis is shown to make a model of problem having no structure. Commonly, it is determined to solve measured problem (quantitative), opinion-need problem (judgement), and complex situation or unframed, in the situation of limited statistic information and data, or even there's no at all. Therefore, this system is qualitative based on perception, experience or intuition. Basic concept of AHP is the use of pairwise comparison matrix to produce relative weight amongst criterias or alternatives. A criterium will be compared to other criteria in case of the importance on goal achievement above. AHP approach uses scale from 1 to 9. Scoring value of 1 shows equal importance. It means that attribute value with the same scale has value of 1, whereas, scoring value of 9 figures out the attribute case of absolutely important compared to other attributes.

Within AHP, the determination of policy priority is done by catching ma's perception rationally, and then convert the intangible factors into common rule in order to be able to compare. Suggested weight to make pairwise comparison matrix is;

score 1 : equal important;

score 3 : slightly more important;

score 5 : strongly more important;

score 7 : very strongly more important;

score 9 : extremely more important (*extreme*).

Beside value in scoring, each gap value can be used as well, viz 2, 4, 6, 8. Some those values illustrate the relation of importance amongst odd numbers mentioned.

To make it clear, overlay technic through scoring and data sources can be seen on Table 1.

Tabel 1. Scoring and data sources

No.	Variable	Assumption of calculation	Grouping of research result (atribut)	Score	Data sources
1	Population density	Population density per sub-district	Less densed	9	Grouping based on formula (5) from data of each sub-district
			Densed	5	
			Very Padat	1	
			Partly suitable (medium)	5	
			Not suitable	1	
2	Percentage of community welfare	Percentage per sub-district	High	9	Grouping based on formula (5) of each sub-district
			Medium	5	
			Low	1	
3	Land productivity	Average land productivity per sub-district on rice of sawahs	High	9	Grouping based on formula (5) of data per sub-district
			Medium	5	
			Low	1	

Notes: Score determination with AHP from Saaty in Martanto (2012)

On each variable score will be obtained score total later on. The score total is as the base to determine land consolidation. Land consolidation is delineated based on score total obtained from map as the result of overlaying certain factors. The classification is determined based on the result of calculating class interval according to formula (6) as in The Table 2.

Tabel 2. Grouping of agriculture land consolidation

No	Consolidation	Score total
1	Agriculture land	$\geq (t_{min} + 2I)$
2	Buffer zone	$\geq (t_{min} + I)$ - $< (t_{min} + 2I)$
3	Urban land	$< (t_{min} + I)$

Notes: Agricultural Land Consolidation based on formula (5)

Assumption built is that Badung and Gianyar regencies with the highest total score is land for agriculture (eternal sawahs) which has low population density, low welfare percentage, and low land productivity.

3. Results and Discussion

Landsat satellite imagery is effective and efficient for agricultural forecasting, energy exploration, ecosystem monitoring, natural resource management, mapping of land-use/land cover, and environmental monitoring. Landsat-7 satellite imagery and Landsat-8 with a spatial resolution of 30 m can be used for creating maps of land-use/land cover effectively (Suwargana 2013). In this study, the results are in the form of land-use conversion, population density, field data, and the results of delineation/digitalization of satellite imagery. Data of population density and land-use conversion are used for estimating food security status. Population density variable obtained from the population and rural areas as well as the potential of monographs/village community. These variables can affect the operation of the pressure on land, due to the high rate of growth and population growth due to the expansion of unplanned residential areas (Mallupattu and Reddy 2013; Govindaprasad and Manikandan 2014).After delineation through Landsat satellite imagery, we can see the conversion of agricultural land to non-agricultural landfrom 2005 until 2015. The conversion of land-use in 2005 and 2015 was occurred by way of the overlay, overlapping, and stacking which is shown in Figure 1.

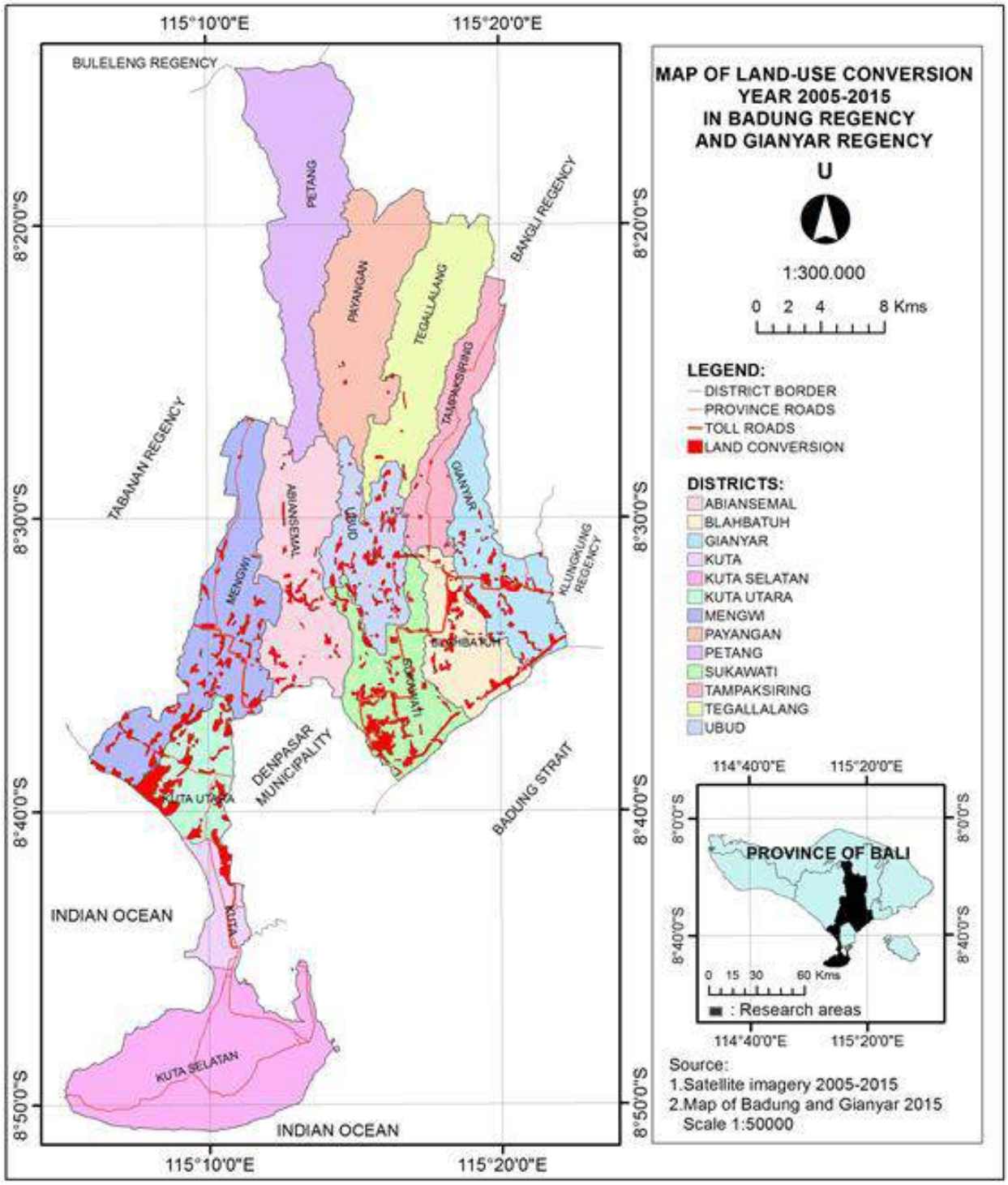

Figure 1. Map of land-use conversion in 2005-2015 in Badung dan Gianyar

The researchwas conducted in the administrative area of Ngawi. It lies geographically at 7° 14' 01"- 7° 37' 06" South Latitude, 111° 03'24"- 111° 42' 00" East Longitude. The land-use conversion from 2005 to 2015 is shown by black color, whereas the characteristic of the research area is presented in Table 3.

Table 3. Characteristic of research area in Badung Regency and Gianyar Regency

No.	Kabupaten	Kecamatan		Konversi		Kepadatan Penduduk (Jiwa/ha)	Kesejahteraan Masyarakat (%)	Produktivitas tanah (Ton/ha)
		Nama	Luas (ha)	(ha/ th)	(%)			
1	Badung	Abiansemal	6901	45.86	0.66	13.06	20	6
2	Gianyar	Blahbatuh	3970	57.27	1.44	17.19	28.2	6.2
3	Gianyar	Gianyar	5059	62.60	1.24	16	23	5.9
4	Badung	Kuta Utara	3386	171.48	5.06	34.29	28.65	6.3
5	Badung	Mengwi	8200	166.57	2.03	20	28.25	6.2
6	Gianyar	Payangan	7588	3.12	0.04	5.53	4.6	6
7	Badung	Petang	1150	2.67	0.23	8	15	6.2
8	Gianyar	Sukawati	5502	74.83	1.36	18	28.1	5.9
9	Gianyar	Tampaksiring	4263	9.28	0.22	8	16	6.3
10	Gianyar	Tegallalang	6180	7.75	0.13	7.35	10	6.2
11	Gianyar	Ubud	4238	36.07	0.85	16.82	21	6.5

Source : Central Bureau of Statistics of Badung and Gianyar

Administratively, the government of Badung Regency and Gianyar Regency consists of 11 districts (Figure 1 and Table 3). The widest administrative is Payangan (7588 ha), while the narrowest is Petang (1150 ha) as can be seen in Table 1. Kuta Utara experienced the most land-use conversion (5.06 %); whereas Payangan was the least (0.04 %). Moreover, the agricultural land area width was 50,476 ha, whereas the average conversion rate per year was 57.95 ha/yr (0.98 %). The average population growth rate per year was 3.25 %, and the average rice production was 6276.75 kg/ha (Central Bureau of Statistics of Ngawi, 2015, Table 3, and Figure 1).

Results of stacking-overlapping map of land-use in 2005 and 2015 were in the form of agricultural land-use conversion in every district in Ngawi. Results of delineation and digitalization of Landsat satellite imagery is tangible as the map. This map can describe the condition of the area (location) research on land-use conversion. The result of calculation from the relationship between X and Y (correlation coefficient) with SPSS is summarized in Table 4.

Table 4. Results of calculations of each dependent variable to the independent variables

Variabel	t	Sig T
1	2	3
Population density (X_1)	9.554	.0000
Comunity walfare (X_2)	-2.373	.0494
Land productuvity (X_3)	-.523	6173

Source: Data processing with SPSS 16 for Windows

Based on Table 4 it can be concluded that the independent variable (X_1 and X_2) affects the dependent variable (Y). The larger value of T (column 2) leads to the greaterthe effect of

land-use conversion. The direction of relations between the two variables is determined by observing the marks/grades (+) and (-). In this study, the value is (+) means that the dense population in a region; the more land-use conversion from agricultural to the non-agricultural area.

Food security (rice production) is one of the objectives to meet the food demands locally and nationally. Regarding food production through improved food security, it can be pursued by the improvement of rice production which is mainly produced from agricultural land (paddy). One food security strategy that should be considered is public policy in the form of diversification, and the direction of development by the potential of the area (Benu et al. 2013).

Conversion of agricultural land to non-agricultural land could hamper the agricultural production and detrimental to food security. The rate of conversion of agricultural land to non-agricultural land in Bangladesh based on field surveys covering 24 villages of the six divisions of the country per year was 0.56%, and among them was affected by population growth (Quasem 2011). Meanwhile, the land-use conversion in Ngawiwas smaller at 0.024%. It is becauseBadung Regency and Gianyar Regency has a low population growth rate at 3.25 % (Table 1), while the average population growth rate in Indonesia until 2012 was 1.25% per year (Ramdani 2015).

As a result of the rate of population growth and the increased consumption of rice, the demand for rice will be continuously increased. In compensating theexpansion of these needs, rice production both locally and nationally should be increased adequately. Therefore, the land became one of the natural resources that always been a subject of debate regarding its practical use (Bardhan 2010). Several factors which determine the conversion of agricultural land is the number of inhabitants and the location of farmland, which can cause a decrease in the availability of food, especially rice because the land is needed to meet the consumption of rice as a staple food (Harini et al. 2012).

Based on the data in Table 1, the land requirement in 2015 was the number of population in 2015 divided by the needs of rice using the formula (2) with a population of 845500 population/capita and average productivity of land per year 6276,75 kg/ha, rice production per year formula (3). Hence, the need for land as a result of the population is as follows.

Land requirement= formula (2) / formula (3)

= (845500 jiwax139,15 kg/jiwa/th)/((6276,76x2)kg/ha/th x2x 61,6%)

= 15214.276 ha:

Equation of land-use conversion rate as function (x) as the formula (4) is:

Equation of land-use conversion rate as function (x) as the formula (4) is:

x=0=> f(x1)= f(0)= aebo

23217,87=a

$x=12,3989 \Rightarrow f(12,3989)=23217,87eb^{12,3989}$

$15214,28=23217,87eb^{12,3989}$

$b=-0,033667$

$f(x1) = 23217,87\ e^{-0,033667x}$ .....(6)

Equations of land-use conversion rate as function (x) as formula (5) is:

Equations of land-use conversion rate as function (x) as formula (5) is:

$x=0 \Rightarrow f(x2) = f(0)= aebo$

$15214,28=a$

$x=1064,76 \Rightarrow f(1064,76)=15214,28eb^{1064,76}$

$23217,87=15214,28eb^{1064,76}$

$b=0,000397$

$f(x2) =15214,28\ e^{0,0003972x}$ .....(7)

From two equations (6) and (7) there will be a crossover point (x; y), and the point of intersection is a limit of food security in the area. To get the intersection of two equations we used Matlab R2010a software.

Equation 1 ..... $f(x) = 23217,87\ e^{-0,033667x}$

Equation 2.....$f(x) = 15214,28\ e^{0,0003972x}$

The intersections of the line (x; y) are (2027; 15289,41). The relationship between the width of the area and time to food security limit is shown in Figure 2.

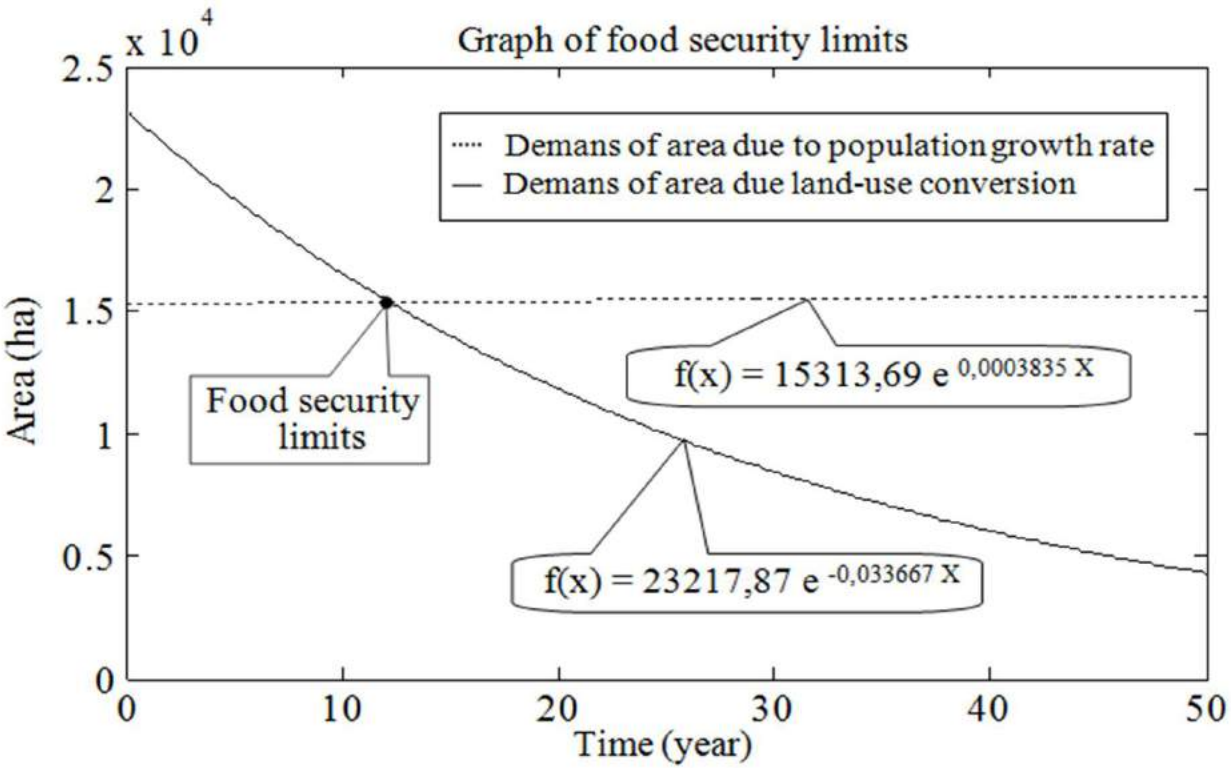

Figure 2. Graph of food security limits prediction in Badung Regency and Gianyar Regency

Cutting point coordinates (x; y) in Figure 2 is a "food security limit" is the meeting point between equation 1 and equation 2, means that in an area of 15289.41 ha and 2027 years to come to the area can only meet the need for food for its population. In other words, it cannot hold the export and import activity.

Based on the equation $f(x) = 23217{,}87\ ^{e\ -0{,}033667x}$ (land demands as a result of theland-use conversion rate) and $f(x) = 15214{,}28\ e\ ^{0{,}0003972x}$ (land demands due to increased population growth rate), it can be said that the process of land-use conversion and population growth are mutually reinforcing processes (occurring reciprocal relationships are mutually reinforcing). Therefore, as to achieve food security limit as shown in Figure 2, it requires a faster time, compared to only one single process.

This research shows that independent variables of population density (X1) and community welfare (X2) influence the dependent variable (Y), whereas, independent variable of land productivity (X3) does not. So, only those two independent variables influencing test of regression coefficient (partial test) on dependent variable are used as agriculture land consolidation data in the research area. Table 5.7 shows the data of land consolidation in the research area, and the score value of agricultural land consolidation of each independent variable is shown in Table 5.

Table 5. Characteristics of Research Area

No.	Sub Districts	Population Density		Community Welfare		Total of Score	Land Consolidation
		(caput/ha)	Score	(%)	Score		
1	Abiansemal	13.06	9	20	5	14	Agriculture
2	Blahbatuh	17.19	5	28.2	1	6	Urban
3	Gianyar	16	5	23	1	6	Urban
4	Kuta Utara	34.29	1	28.65	1	2	Urban
5	Mengwi	20	5	28.25	1	6	Urban
6	Payangan	5.53	9	4.6	9	18	Agriculture
7	Petang	8	9	15	5	14	Agriculture
8	Sukawati	18	5	28.1	9	14	Agriculture
9	Tampaksiring	8	9	16	5	14	Agriculture
10	Tegallalang	7.35	9	10	9	18	Agriculture
11	Ubud	16.82	5	21	1	6	Urban

Agriculture land consolidation as sustainable sawahs (rice field) which is hoped as rice warehouse in the research area is in sub districts of Abiansemal, Payangan, Petang, Sukowati, Tampaksiring, and Tegallalang. In the meanwhile, urban land consolidation as the area which is permitted for development is sub districts of Blahbatuh, Gianyar, Kuta Utara, and Mengwi. There is no buffer zone available in the research area.

This research can be applied as agricultural land consolidation for food security in other areas. To get more view, figure 3 shows about agricultural land consolidation.

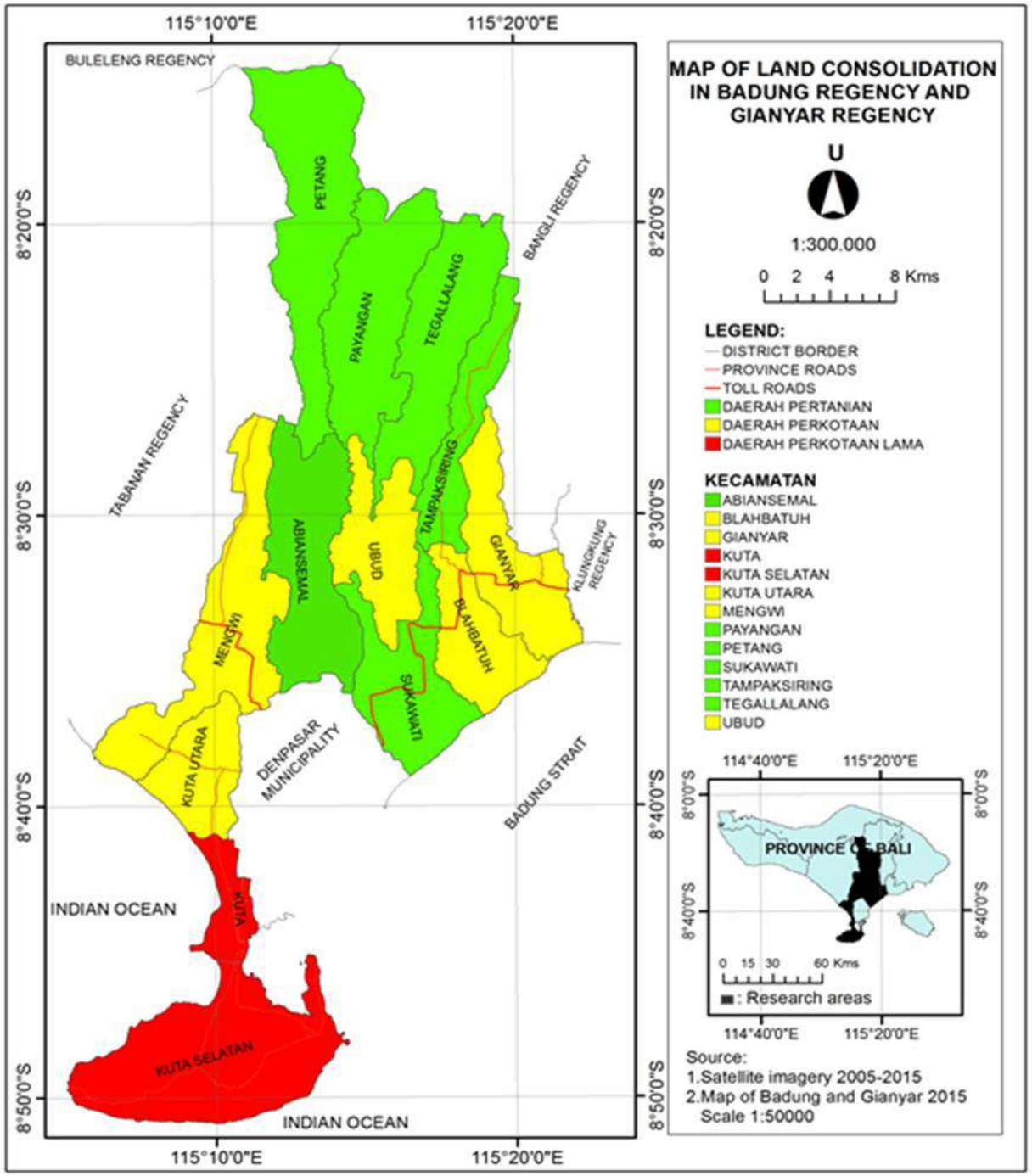

Figure 3. Map of land consolidation in Badung Regency and Gianyar Rigency

4. Conclusion

Convertion of agriculture to non-agriculture land use in the regency of Badung and Gianyar is influenced by population density. Whereas, food security limit in those two regencies will take place in 12.41 coming years, about year 2029, with agriculture land (sawahs) left will be only 15,289.41 ha.

Agriculture land consolidation takes place in the sub-districts of Abiansemal, Payangan, Petang, Sukowati, Tampaksiring, and Tegallalang. In the meanwhile, urban land consolidation is in the sub-districts of Blahbatuh, Gianyar, Kuta Utara, and Mengwi. This research can be used as agriculture land consolidation modeling for food security in other areas.

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Sub Theme 4

Land and Spatial Planning for Specific Area (Post-Disaster, Coastal Zone, State Border, Small Island and Outer Island

PUBLIC PARTICIPATION AND COMMUNITY DEVELOPMENT ON THE IMPLEMENTATION OF LAND CONSOLIDATION OF POST-DISASTER RECONSTRUCTION MANAGEMENT TOWARD "FUTURE CITY" INITIATIVE: LESSON LEARNING FROM THE GREAT EAST JAPAN EARTHQUAKE OF HIGASHI-MATSUSHIMA CITY, MIYAGI PREFECTURE, JAPAN

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Abstract

After the great east Japan earthquake occurred in March 2011 and followed by a tsunami, Higashi-Matsushima city suffered from severe damaged. Approximately 73% of the buildings were damaged, and total 3,349 hectares of the agricultural area was inundated. Regarding future tsunami occurred, the government then decided to relocate the city to a higher place, and reconstruct the city by adapting eco-city model called as "future city" of Higashi-Matsushita. The government commits to building the city from the scrap, implementing land consolidation to reconstruct livelihood of the citizens, and to rebuild the city based on the smart city concept. Together with local government, citizens were actively involved during planning and implementation stages. They established self-governing civil power right after the disaster occurred, conducting self-assistance to provide foods, shelters, and identification of missing persons. They also actively involved in city reconstruction program. They then decided to rebuilt and reconstruct Higashi-Matsushima based on community development concept. Public involvement meetings were implemented during the decision of relocation area, the creation of reconstruction plan, and people were actively involved to decide reconstruction planning for "new Higashi-Matsushima" that adapted to the sustainable environment, aging population (which became a big problem for Japan Government) and disaster-prevention. Moreover, reconstruction was also being carried out together with the citizens. They worked during the project as administrative staff and labor, which helped them to earn money to recover their living since most of the citizens lost their job and possessions by the tsunami. The lesson learning from Higashi-Matsushita city, however, provide a good example of the effectiveness of community empowerment to deal with post-disaster reconstruction program.

Keywords: public participation; disaster reconstruction; post-disaster land consolidation; tsunami; community development.

1. Introduction

Located in the northeast of Japan in Miyagi Prefecture, Higashi Matsushima is one of the cities that severely suffered from the great east Japan earthquake on March 2011. The earthquake occurred off the Pacific ocean of Tohoku, with the magnitude of 9.0, the biggest earthquake ever recorded in Japan, and 4th biggest earthquake of the modern world since 1900. The earthquake was followed by a tsunami, and the waves travel along the inland up

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to 10 km, with the wave height for more than 40 meters. Higashi Matsushima itself was attacked by the tsunami, when 8.6 meters of waves reached the coastal area, destroyed approximately 73% of all housing in the neighbourhood, killed 1.110 people while 24 were missing (3% from total population), and inundated for almost 45% of agricultural area (for total of 1.465 ha of agriculture land were inundated by the sea water). Among of all of the district in Higashi Matsushima, Miyato Island, and Nobiru District, that located near to the coastal area, are two of the districts suffered most damages compare to other, almost 90% of the infrastructures were destroyed (Future-City-Initiative, 2012).

After tsunami attacked, the city government did not function; most of the city officials were killed or suffered, while contact with the outside world was cut off. However, the citizens need to survive and reconstructed their life soon. Together they formed self-governing bodies consisted of citizen survivors, organized community-based recovery system to help the citizens after the tsunami occurred. Moreover, they reconstruct (as a more advanced and go beyond than city-recover) the new Higashi-Matsushima city as a "future city" as a more disaster-prone and eco-model city by maximizing citizen participation and community empowerment. Public involvement was emphasized during the relocation and reconstruction process, and city consolidation was implemented based on public participation (HOPE, 2012). The city then being consolidated into a more adapted to the disaster-prone area and developing a "future city initiative" model for a more sustainable life.

The story of Higashi-Matsushima, however, is a good example of survivors of the disaster that willing to start to rebuild and reconstruct their city from the scratch. Citizen participation plays important roles in the success of city recovery and the implementation of disaster-prone land consolidation. Public involvement during the process encourages the sense of belonging and getting involved in determining the city's future for their better life. This paper tried to illustrate public involvement process during the reconstruction of Higashi Matsushima City post the great east Japan earthquake.

2. Material and Methods

2.1. Materials

This paper was written based on literature study research. Some publications related to FutureCity initiative, public involvement for post-disaster reconstruction after the East Japan great earthquake were studied and assessed to learn about the community development process. Some materials were assessed through websites, videos and presentation slide from seminars and meetings. The materials were gathered and studied to find the approach and method implemented by Japan government, or Higashi Matsushima local government in particular, in implementing public participation for relocation and reconstruction process.

2.2. Methods

This paper was written based on literature study research. Some documents related to the implementation of "FutureCity" in Higashi Matsushima and recovery activities post the east Japan great earthquake were studied. The study was focused on the process of citizen involvement during the reconstruction and consolidation. The aim of the research is to understand how public participation was implemented during the post-disaster recovery to implement land consolidation. To achieve this, the research was divided into 2 (two) main questions:

1. How Higashi Matsushima recovered from the disaster and how was the design of "FutureCity" that was implemented?
2. How was public participation implemented for post-disaster recovery in Higashi Matsushima?

3. Results and Discussion

3.1. Results

3.1.1. The recovery process and the implementation of "FutureCity" as part of land consolidation for post-disaster recovery.

After the great east Japan earthquake occurred in 2011, March 11th and followed by a tsunami, Higashi Matsushima was severely damaged. This city was hit by 8.6 m height of tsunami waves. Approximately 3% of the total citizens (1.110 people) died and 24 were missing. Approximately 73% of housing in the surrounded area was damaged, accounting for total 11,077 houses. The number of evacuees was recorded as 15.185 persons, and the city has to affiliate 106 shelters during the evacuation process. All public facilities did not function, electricity was an outage, and contact with other cities was blocked. Furthermore, the city hall also did not function, since most of the city officials were killed or suffered from the disaster. They have no leader to lead them to deal with the crises, while the citizens have to survive with limited conditions. The citizens then have the initiation to form self-governing bodies, with the main role to organize the citizens to organize their life right after the disaster until support from outside came and during the recovery and reconstruction process. There are 8 self-governing bodies within the city, and each body established a community center based on their district. They are Oshio, Ono, Nobiru, Miyato, Omagari, Yamato-Nishi, and Akai Community Center. Each self-governing body has their committee, consist of a president, vice presidents, accountant, secretaries, executive committee, and staffs.

At first, they did self-assistance for the community in the city center. The provided temporary shelters, public kitchen, identified missing person and families, identified

loss and damaged after the tsunami, helped injured a person, and other activities to meet basic needs during the survivals. At this time, infrastructure was lost, communication was cut off, therefore communication between city center impossible to be conducted. The self-governing body focusing their tasks to arrange survival plan until help from outside came.

Then, after they can settle on the basic operational, the centers collaborate each other to perform mutual-assistance within the community. A more comprehensive survival plans were discussed, while they also established plans to reconstruct Higashi Matsushima, including relocation plan, establishing spatial planning for disaster management and built temporary housing for the people.

Nonetheless, Higashi Matsushima considers that they cannot stand by themselves alone. They need support from central government and other parts. On the other hand, March 2011 tsunami has changed Japan's policy on smart city and energy. The earthquake has made Fukushima became famous on all over the world since the disaster destroyed Fukushima Daichii Nuclear Power Plan that located in Fukushima city. March 2011 catastrophe also increases awareness of Japan Government to design and to establish a city that adapted to the disaster while forming a sustainable future city for the citizens. Therefore, public-assistance was set up: central government, local body, and city council collaborated with private companies from different scale, financial institutions, academic organization, Non-Governmental Organization and citizens to formulate new Higashi Matsushima city. They also form Higashi Matsushima Organization for Progress and Economy Education, Energy (HOPE), that has been inaugurated in October 2012, jointly by the Municipality, Social Welfare Council and Chamber of Commerce, whose its main roles were to collaborate with industry, academia, government and the citizens to work together on the implementation of FutureCity initiative. They organized meetings to design plans for city recovery by using Public Involvement method. They start with identifying some of the issues related to the recovery, that are:

1. Environmental recovery-reconstruction. Since most of the area was destroyed by the tsunami that damaged both private and public facilities, it is important for the city to recover the livelihood for a living. Due to the disaster-prone area, it is also important to design livelihood adaptable to the future catastrophe. The activities including debris removals, rebuilt buildings for housing and public facilities and other infrastructures such as roads, bridges and so on
2. Civil livelihood recovery-reconstruction. Most of the citizens lost their house, their belongings, and their living. Many facilities were swept away by the tsunami, and lots of people lost their jobs and occupations. Nonetheless, they should earn for living. The citizens then design livelihood recovery program,

with the idea that they should able to provide jobs for the victims, so during the reconstruction process, they can earn money for living expenses. One of the job creations during the reconstruction is tsunami waste collection and rubbles division. Rubbles from disaster were divided into 14 categories, and final treatment was divided into 19 rubbles that were categorized manually and has been done by the citizens worked for waste separation. They were paid to

3. The recovery program should be eco-friendly during the implementation and for the future design of Higashi Matsushima. The citizens agree to strictly minimize waste disposal during the reconstruction process, and the debris was recycled. There were 1.098 million tons of debris, accounted for 110 times of general waste generated annually in Higashi Matsushima), and total recycling rate of the disaster waste was 99.22%, including 2.160.800 tons of tsunami deposits that were entirely recycled. It was a hard work to short the waste based on categories since it has to be done manually. On the other hand, this waste separation gives opportunities to the citizens to get the job. Moreover, the citizens also agreed to redesign Higashi Matsushima as a "FutureCity", that more adapted to disaster mitigation and implement the concept of sustainability based on Sustainable Development Goals criteria. Land consolidation was designed to achieve sustainability.
4. Reconstruct and revive industrial sectors to encourage economic activities. Right after the disaster, Higashi Matsushima lost their economic activities, since all infrastructures were damaged. Moreover, for more than 50% of agriculture area was inundated and the commercial area was being swept by the flood. The city lost their economic function while economic activities play important roles for the living. Therefore, reconstruction program should be able to promote local events and small business for the citizens, while reconstructing the city.

The basic plan for the implementation of FutureCity in Higashi Matsushima came from the idea to reconstruction initiatives that 'go beyond recovery'. In Japanese term, recovery called as "fukkyu" – the act of returning something damaged to its former state, to the original situation, while reconstruction, or "fukko", described as the action of making something damaged better than before. The people realized that they were living in a disaster-prone area, with lots of earthquakes and tsunamis occurred since ancient time. They realize that they cannot change anything about the state condition of their nature, but instead, they can design their environment to be more adaptable for the disasters. Therefore, they set up some relocation action plan, consist of several activities including (Future-City-Initiative, 2012) :

1. Collective relocation and rebuilding life.

The basic plan of Higashi Matsushima's reconstruction was released by the local government on December 2011, 9 months after the disaster. The primary issue of the reconstruction is Disaster Risk Reduction (DRR) for a future tsunami. The city decided to implement Group Relocation Projects at several affected areas that potentially endangered by the future coming of the tsunami. For example, previously, Nobiru District had 800 houses and 2.300 residents before March 2011. During the tsunami, almost all houses were destroyed and over 500 people were killed. Nobiru District located at the coastal area with most of its area was exposed to the ocean. March 2011 experience then made the local government to reconsolidate and relocate the area into higher place. Previous Nobiru then has been set up into the non-residential area and has been designated as a commercial and industrial area to reduce the potential life lost for the next tsunami. For this purpose, large-scale relocation project had been implemented. The collective relocation was designated in 7 relocation sites in 5 districts complexes, accommodated for 1.288 households. The relocation places were designated in Yamoto Nishi (127 plots), Ushiami (74 plots), Murohama (22 plots), Tsukihama (22 plots) and Ohama (15 plots).

2. Urban planning to secure perpetual life

   For the purpose to reduce the impacts of the future tsunami, Higashi Matsushima implements the adjustment of urban planning to be more adaptive with disaster mitigation. Households located in potential tsunami-affected areas have been relocated to a higher place, while the current area was designated for commercial and industrial sites. This arrangement, however, hard to be implemented. They have to relocate people from their daily life to a new place with a new neighborhood. However, the designation of relocation site should be implemented by tackling 3 (three) keywords: (1) safe sites for collective relocation (2) Near JR station that provides for perpetual safety in 100 years, and (3) Can accommodate the entire community and respect the bonds between local people.

3. The design of FutureCity initiatives.

   People of Higashi Matsushima were badly suffered from the March 2011 disaster, they lost family, friend, neighbor, and most of the living. However, they agree to create better living with the disaster as the starting point, by creating a city that brings the concept of "human-centered" while creating new values to resolve the challenges of the environment and aging.

Reconstruction of Higashi Matsushima, however, encounter several problems regarding the social environmental condition in Japan. First, land consolidation for FutureCity initiative needs to relocate citizens collectively. To move neighborhood to another place collectively was challenging since the government has to find a suitable place in term of environment condition and area. Second, they also have to deal with aging population, as a common problem in Japan. Higashi Matsushima, like other cities in Japan, only have limited productive age, and most of the population are aged people. By the time of disaster, Higashi Matsushima lost more than 3% of its population. During the recovery process, the population keeps decreased, many citizens migrated to another city. Therefore, reconstruction process has a limitation on the number of human resources affecting many sectors of the project. Third, the characteristic of Higashi Matsushima as a disaster-prone area. The future city should be able to predict and mitigate future disasters to reduce the number of loss. Therefore, disaster-prone management should have been affiliated in the design of sustainability goal.

The policy of Japan government has been emphasized on the public involvement on a public work project. Therefore, in the reconstruction process and the design of FutureCity of Higashi Matsushima, public involvement was conducted to achieve common goals between stakeholders to achieve a "human-centered city".

3.1.2. Public participation for post-disaster recovery in Higashi Matsushima

The process of citizen's involvement during land consolidation after 2011 east Japan great earthquake in Higashi Matsushima is a good example of public participation in designing, implementing and monitoring public work project. During the process, no one was left behind. Public hearing and meeting to exchange opinions were implemented several times, to achieve mutual agreement within the citizens, government, and other involved stakeholders. The process of public participation, however, it is time-consuming and needs more effort, is important to achieve "human-centered city", a place where everybody wants to live there and everyone has vitality in the community. These two aspects are the key role of community development to foster the sense of belonging and the feel responsibilities since they were being involved in the decision making. The following Figure 1 shows the structure and content of reconstruction plan implemented in Higashi Matsushima, including how they affiliate public opinion and how they implement public involvement. The figure shows that on phase 1, public involvement was implemented to gather ideas on how to make a city that is resistant to disaster, promote industries that able to create work opportunities, as well as to create sustainable development.

This activity including conducting public hearing and meeting to create reconstruction plan, involving over 2000 citizens to exchange opinions, including farmers, fishermen, students including some sensitive communities like women and elderly. The process to gather people and formulate design from many ideas was challenging, since they came from different background and interests. Often, some groups did not willing to attend the meeting because of some reasons, and the committee should encourage them and provide a meeting place that comfortable for them to speak their ideas and getting involved in the process. For this purpose, they also established reconstruction facilitators which main responsibility was to provide assistance for the citizens during public involvement process. The assistance was implemented for the purpose of:

1. Facilitate local government and the community about planning and implementation of the reconstruction plan. They have to summarize the opinion from the resident, listening to their opinion from a wide range of background, encouraged the citizens to actively participated during the meeting and to support sharing information from the local government among the residents.
2. Accumulate lessons learned and cases through participation in the reconstruction process.
3. Derive the essence from the accumulation to formulate the future overseas assistance program.

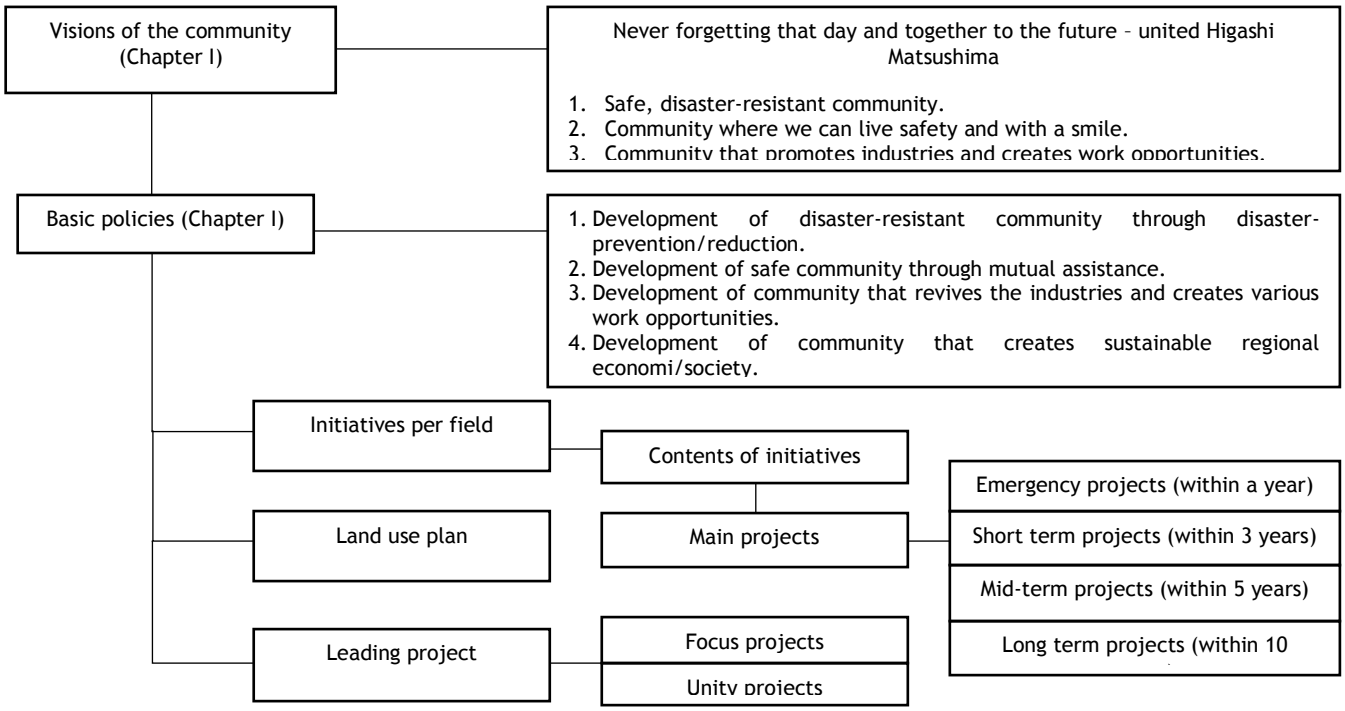

Figure 1 Structure and content of reconstruction plan, with the implementation of public participation as part of decision making process (adapted from (Future-City-Initiative, 2012).

In summary, public involvement in Higashi Matsushima was successfully implemented based on several reasons, which are:

1. Strong bond within the community to recover from the disaster and the willingness to reconstruct a new, better life. This bond, however, was already formed before the 2011 tsunami occurred. Social value within communities to have the same goal to achieve better future was important for public involvement process. By the disaster, the bond between them became stronger, since they feel that they share the same grieve and hope of better life.
2. Trust and respect between community, city council and the government. It is not easy to achieve common goal and understanding between different stakeholders to achieve agreement on the design and implementation of land consolidation through FutureCity.
3. The role of facilitators plays an important role to bridge communication between stakeholders. Sometimes, the stakeholders came up with the same idea but were communicated in different 'language' because they came with a different background. Sometimes, they also came up with the totally different idea and interests, and often most of them were conflicting each other. In this case, the role of facilitators is important, since they have to communicate ideas from different perspectives and draw the conclusion based on the agreement. The role of the facilitators including conducting research on how to encourage people to attend the meeting such as what kind of meeting that they will attend, when and where the meeting should be held, and how to encourage certain community to be able to deliver their ideas (such as is there any gender and age discretion, is there any sensitive community that should be represented, and other factors).
4. Commitment and determination of the government and city council to implement FutureCity and create a better living for everyone. The concept study of the FutureCity initiative first emerges on February 2011, initiated by Building Research Institute, Japan (Regional-Revitalization-Bureau, 2014). On December 2011, 11 cities in Japan were selected as model cities, 6 of them were disaster-affected cities of the East Japan great earthquake. The implementation of FutureCity demand high cost of money and resources (both human and natural). Without high commitment and full determination from the key actor to implement public involvement for land consolidation and reconstruction, FutureCity will not be realized. The determination and commitment came in form of funding assistance, policy and regulation, and also capable and sufficient human resources. Main stages of the creation of Higashi Matsushima are (1) preparation of the city's vision for regional energy policies, that has been implemented in 2012. After Fukushima's disaster, Japan government promote a new local power generation able to supply safe and stable energy by

introducing renewable energy, such as solar power, (2) Measures to promote renewable energy, by reinstate the energy-related subsidies and executing support schemes for installing renewable energy, and (3) creating a smart, disaster-resilient eco-town project through special sanction on supply (MOE model project 2014) (Regional-Revitalization-Bureau, 2014).

3.2. Conclusion

Public involvement is important to be implemented in public work. The advantages of public involvement are to create mutual understanding between stakeholders, including local government, central government, community, private sectors and other affected stakeholders. The bond between stakeholders is important to achieve a common goal, which plays the key role in the success of public work program. Nonetheless, public involvement needs more effort to be implemented, including time, money and human resources. The commitment of the government is the key role of the success of the implementation. Nonetheless, post-disaster reconstruction needs a fast, efficient project to as soon as possible recover people's life as it state condition. Therefore, an efficient public involvement process is important, and the presence of facilitators is crucial during the process, that can be different from one place to another. The understanding of social capital at the local level will effectively contribute to the success of public involvement. Nevertheless, public involvement is worth to be implemented if we commit to design a future-sustainable city to fulfill the need of present generation without neglecting the right and need of future generation. The example of public involvement in Higashi Matsushima was successfully implemented because they have social value as they are familiar with the process of community involvement for public decision-making. If this method will be implemented in a different region with the different social background, the understanding of the behavior of the community should be assessed and studied more to achieve the goal.

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COASTAL LAND CONFLICT IN COASTAL ZONE MANAGEMENT: A CASE STUDY IN NORTH JAKARTA COASTAL AREA

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Abstract

Law No. 1 of 2014 on the Management of Coastal Areas and Small Islands states that zones are spaces where their use is mutually agreed between various stakeholders and has been established. However, coastal areas in North Jakarta often have spatial use conflicts that result in erroneous coastal management policies. The cause of the conflict is the unclear direction of land use in the coastal area, including coastal spatial planning. This resulted is in fragmentation of coastal land. Coastal land fragmentation considerably impairs ecosystems practices, reduces the technical and economic efficiency of production, contributes to environmental degradation and obstructs or inhibits the use of modern coastal agricultural equipment. The objectives of this research are to analyzed land use conflict between Squatter and landowners based on regional approach and to formulate land use conflict resolution based on land optimization as well as the use of Coastal Land Consolidation and Spatial Planning to reduce land conflict. The research methods used are implementing General Algebraic Modelling Systems (GAMS) and SWOT analysis to formulate the strategic planning. The expected findings and significance of this research are to address land conflicts in coastal areas and to regulate land based on characteristics of coastal land based on spatial planning.

Keywords: Coastal Land conflict, land fragmentation, GAMS, SWOT

Introduction

Rudianto (2013) states that the occurrence of land use conflicts in the coast of North Jakarta between squatters and landowners can be resolved if there is mutual respect between them. Research conducted by Rudianto (2004) in 11 urban villages on the coast of North Jakarta shows that squats do not mind moving if there is adequate compensation in terms of finances and there is an alternative location worthy to offer. Conditions of research conducted by Rudianto in the past twelve years indicate that the problem of coastal land conflict is a central issue of coastal land use. It is indicated that the process of gentrification is a natural process that occurs in urban areas with the classification of metropolitan cities to megapolitan scale.

Conditions of research conducted by Rudianto (2004) in the past twelve years indicate that the problem of coastal land conflict is a central issue of coastal land use. Rudianto indicated that the process of gentrification is a natural process that occurs in urban areas with the classification of metropolitan cities to megapolitan scale. According to Glass (1963 in Gur, 2009) that gentrification is a process of changing socioeconomic status of an area

previously populated with lower incomes and replaced by a more affluent population as the region revitalizes and the development of activities and investment in the region. Such gentrification also occurs in north coastal Jakarta. Lerman (2006) argue that land consolidation leads to better economic performance, while land leasing is actually used as a market mechanism for consolidation, which benefits both lessees (through increased farm incomes) and lessors (through income from lease payments for their land). Furthermore, Ward *et.al* (2011) explained that under Jakarta current conditions, estimated damage exposure to extreme coastal flood events with return periods of 100 and 1,000 years is high (€4.0 and €5.2 billion, respectively). Under the scenario for 2100, damage exposure associated with these events increases by a factor 4–5, with little difference between low/high sea-level rise scenarios. This increase is mainly due to rapid land subsidence and excludes socioeconomic developments. Coastal flooding poses serious threats to coastal areas, and the vulnerability of coastal communities and economic sectors to flooding will increase in the coming decades due to environmental and socioeconomic changes. It is increasingly recognized that estimates of the vulnerability of cities are essential for planning adaptation measures. Ward et al (2011) recommend that the need for urgent attention to the land subsidence problem, since a continuation of the current rate into the future would result in a catastrophic increase in damage exposure.

In the span of twelve years, there has been a shift of environmental and land issues in the coast of North Jakarta. That is from Squatters to reclamation issues. At the beginning, Squatter spread in Jakarta north coastal areas is distributed on the coastal land. The squatters settled along the north coast of Jakarta occupying no man's land, leased land from individual landowners, reclaimed land, unused corporate land, but ownership as building rights, riparian lands indicated as state lands, and swamplands which have not been clearly utilized by the state. The invasion of land with such unclear ownership status has an impact on land conflicts between squatters and landowners with unclear status. These squatters come from various regions in Indonesia such as Central Java, East Java, South Sulawesi. The squatters are a group of people who fate in Jakarta with various types of livelihoods such as factory workers, fishermen, artisans, scavengers, boatmen, water sellers, honorary employees in government agencies, security officers, and parking officers in various corners of Jakarta. While the Squatters are always looking for opportunities to occupy the unused land, strong economies look for opportunities to buy problematic coastal areas and can provide economic benefits. The reason for this gentrification process is because the value of coastal land provides a promising economic value.

In that era, the issue of land conflicts lasted very long, so the courts that resolved the coastal land disputes were very long. This is based on evidence that still lacks primarily relating to the status and history of land ownership. At that time there was an impression of the DKI government has not seriously overcome the conflicts of coastal land. It is proved

that the Squatters dwell in the coastal land as if they were legitimate settlers. This allegation is reinforced by the presence of a group of squatters who have identity cards, family identity cards, electricity bills and some have telephone accounts. The community of Squatters is led by the head of neighborhood association (RT)) and coordinated by the chairman of the neighborhood association (RW). This condition is very naive when viewed from the status of coastal land occupied by the Squatters who are willing to pay the rent for a certain period of time. The problem is, to whom the squatters are paying rent for the land. The results of the interview at that time, the Squatters pay rent monthly rent, per year to "someone" who is ruling in the area. Of course, the "person" has power, urgency, and legitimacy in that area. However, within the span of 15 years to date in 2017, the issue of Squatters turns into an environmental disaster issue, such as the impact of reclamation, floods, tsunami phenomena, subsidence symptoms and the occurrence of seawater intrusion. As stated by Ward.*et al* (2011) that coastal flooding poses serious threats to coastal areas, and the vulnerability of coastal communities and economic sectors to flooding will increase in the coming decades due to environmental and socioeconomic changes.

The objectives of this research are to analyzed land use conflict between Squatter and landowners based on regional approach and to formulate land use conflict resolution based on land optimization as well as the use of Coastal Land Consolidation and Spatial Planning to reduce land conflict, based on of shifting problems from squatters issues to environmental problems.

Materials and Methods

Fig 1: Research Site in the North of Coastal Jakarta

To measure conflict is actually very difficult because conflict is a concept that implies the occurrence of differences in perception, the disagreement so that the measurement of conflict can be done through economic variables as follows:

a. Distribution of income (Disparity). The income distribution between subdistrict residents and squatters' incomes will show the unfairness of pricing in the exchange mechanism mechanisms (Todaro, 1984, Arief, 1979).
b. Social justice with regard to ease of access for the marginalized, institutional support both formal and non-formal, the involvement of others to deal with conflicts. (Fraiser, 1999) and Social Systems which means the relationship between economic and non-economic factors. Non-economic factors will include attitudes, occupations and authorities, private and government bureaucratic structures and administrative structures, patterns of religion and beliefs, ownership systems, authority and integrity of government personnel, level of participation in decision-making and economic flexibility and social class.
c. Spatial Demand Size (Spatial Demand) is the location of the sellers where the price will be known that if the price is lower than the other location means the need for goods is very large and the buyer will buy and the market radius will be greater. (Hoover *et al*., 1985).
d. Marker Imperfection (the market is not competitive) due to (a) information asymmetry (Warneryd, 2000); (b) proprietary rights are unclear (Deininger, 2000) and externalities (McEachern, 2000).

The method of analysis used in this study using the approach of "Nash Bargaining Solution". The purpose of nash is to lay the axiom that between the interests of the Squatters and the landowners who have different interests but can do each maximization of interest. Squatters maximize land use, whereas, in the interests of land use, landowners can maximize their interests. Thus each interest maximizes its interests. For that, there needs to be a burden on each party.

The nash equitation can be seen as follows:

$$\eta_s = \sum_{s=1}^{n} P_o h_o - wL - rL$$

$$\eta_A = \sum_{A=1}^{n} P_o h_o - c_o I$$

$$\eta_A = \theta \eta_A + (1 - \theta)\, \eta_s$$

Where:

π_s = Profit of *squatter*

π_s = Profits of Land Owner

$P_o\, h_o$ = *economic revenue*

wL-rL = wages minus the value of land rent

$c_o I$ = Production coast

dan $0 < \theta < 1$

To formulate the optimization of land use conflict is formulated with reference to the objective function by using GAMS model. Optimization of coastal land use for conflict minimization as follows:

$$\max V \sum_{a}\sum_{b}\sum_{c}\sum_{d}\sum_{Aj}\sum_{T}\sum_{K}\left\{X_{abcdAjTK} * P - X_{abcdAjTK} C_{abdcjTK}\right\}$$

with constraint

$$\sum_{b}\sum_{c}\sum_{Aj}\sum_{T} X_{bcAjT} \leq Lj \qquad \sum_{a}\sum_{c}\sum_{Aj} X_{acAj} \leq \frac{Lj}{N}$$

where:

a	= user type	T	= used technology level
b	= resource type	K	= access to resources
c	= industry type	X	= output from resources
d	= extraction or conservation activities	P	= price
Aj	= the area where land activity occurs	C	= cost
Lj	= area	N	= population

To formulate a problem-solving strategy of shifting squatter issues to environmental degradation aspects due to reclamation activities, frequent flooding, subsidence symptoms, SWOT analysis used to formulate public policy. SWOT analysis is a form of analysis in area management that can systematically assist in the preparation of a mature plan to achieve goals, be it short-term goals as well as long-term goals. Another notion of SWOT is a form of situation analysis and also a descriptive condition. This analysis places the situation as well as the conditions as input factors, then grouped according to their respective contributions. One thing that users of this analysis need to keep in mind is that this SWOT analysis is merely an analysis aimed at describing the situation at hand and formulating policies to address the problems at hand.

Results and Discussion

The results of Rudianto's research (2014) showed that among the 11 locations studied along the north coast of Jakarta, it was identified that two locations were considered suitable to accommodate squatters based on the regression analysis of Pluit 2 and Marunda areas (see figure 2 below). A squatter who occupy the land in the area of Pluit 2 occupies the land owned Kopro Banjir area of 6 Ha. Squatter Pluit 2 comes from the Province of West Java (Indramayu, Subang, Cirebon) of 81%, while the squatters from Banten Province (Pandegelang, Tangerang) are 9.5%. Squatters from Central Java Province (Tegal, Pekalongan, Semarang) are 23.8%, East Java (Madura) is 14.3%, and from DKI Jakarta (Penjaringan area) is 9.5% and Sulawesi Selatan) of 4.8%. Based on the survey that the duration of a live squatter in Pluit 2 over 10 years amounted to 56.7%, and less than 10 years of 43.3%. Squatter work at Pluit 2 location is: industrial worker of 6.7%, trader 23.3%, a fisherman by

40%, boiling of shellfish by 30%. The sanitary conditions are very bad and there are a lot of flies. Squatter income in Pluit 2 is Rp. 1,094,000 above Regional Minimum Wage. The condition of the squatter building can be illustrated that the average building area is 51.2 m^2, the land area is 57.3 m^2. The walls of the house are made of boards of 63.3%, the walls are made of 13.3% cement, made of bamboo by 16.7%. And made of triplex of 6.7%. Power supply condition by PLN 40%, and utilizing other people network 60%. To obtain clean water obtained from mobile traders amounted to 93.3%, and wells of 6.7%. Squatter spending consists and: for average electricity per month Rp. 82,600, - for the average net expenditure per month Rp. 77200, - and for security Rp. 1200 per month. The land use conflicts occurring in Pluit 2 (Muara Angke) between the squatter and the North Jakarta Municipal government are related to the squatter occupying the Adem river which is using a canal flood. The land is under the management of the agency responsible for the flood. The existence of a squatter assessed by the government inhibits the function of time to drain the flow of water, especially the flow of water during peak flow. However. Squatters who occupy the area of Pluit 2 feel secure because the government of DKI rarely curb this area.

As for the Marunda Squatter area, which resides in Marunda Village occupies the land owned by the State of 71 Ha. A squatter is from West Java (Indramayu, Bekasi) 20%, from Central Java (Kebumen, Pekalangan, Tegal) of 13.3%, comes from DKI Jakarta (Cilincing) 4.7% and native Betawi by 50%. Long stay squatter above 10 years by 70% and less than 10 years by 30%. Squatter work in that location is mostly 26.7% of industrial workers, fish farmers 16.7%, traders 13.3%, fishermen 13.3% fishermen and others by 30% (consisting of mechanic, ojek (someone who offers services using a motorcycle to transport passengers), becak (rickshaw), housemaid and cleaning service) This area is not flooded and sanitary conditions are good. Average monthly squatter income of Rp 907,000, - above regional minimum wage. The condition of the squatter building can be described as follows: The average building area is 61.8 m^2, the land area is 114.5 m^2. The walls of the house are made of a board of 76.7%, the walls are made of 10% cement, made of 76.7% board and made of triplex by 10% and made of bamboo of 3.3%. The condition of electricity supply by PLN is 53,3%, utilizing other people network 40% and the rest use oil lamp equal to 6,7%. To obtain clean water is obtained from the mobile vendors 70%, from the PDAM of 23.3% and who utilize from the well water of 6.7%. Squatter expenditure consists of: for electricity average per month Rp. 30,300, - and for average water per month Rp. 32.100, - Land use conflicts between the squatter and the North Jakarta Municipal Government concerning the occupancy of the land at yellow village area of 71 Ha. A squatter who occupy the land feels that they are entitled to work on land owned by the local government because historically the land belongs to those who then freed by the government of West Java Province to the Government of DKI in 1973. This happens because the land is not managed by the local

government in the sense of being left so alone so that the community took the initiative to utilize and manage the land which is partly a pond land.

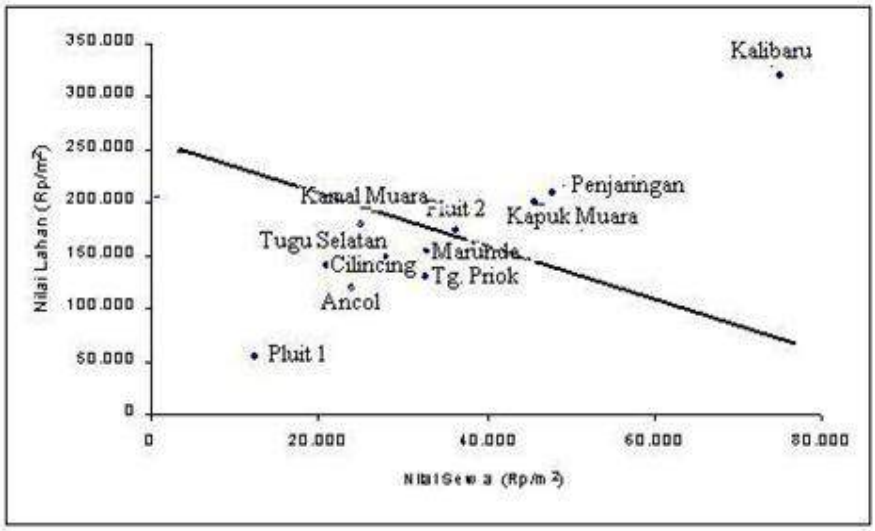

Fig 2. Land Frontier in North Jakarta coastal area

The picture above shows that the areas above and below "Frontier" are inefficient areas, so it can not be maintained. While Pluit 2 and Marunda are very close to "frontier" and are considered an efficient area. In accordance with the framework of the approach that areas that are considered efficient need to be maintained to be developed and arranged in a more humane, while the inefficient do not need and must move from the location that is currently occupied.

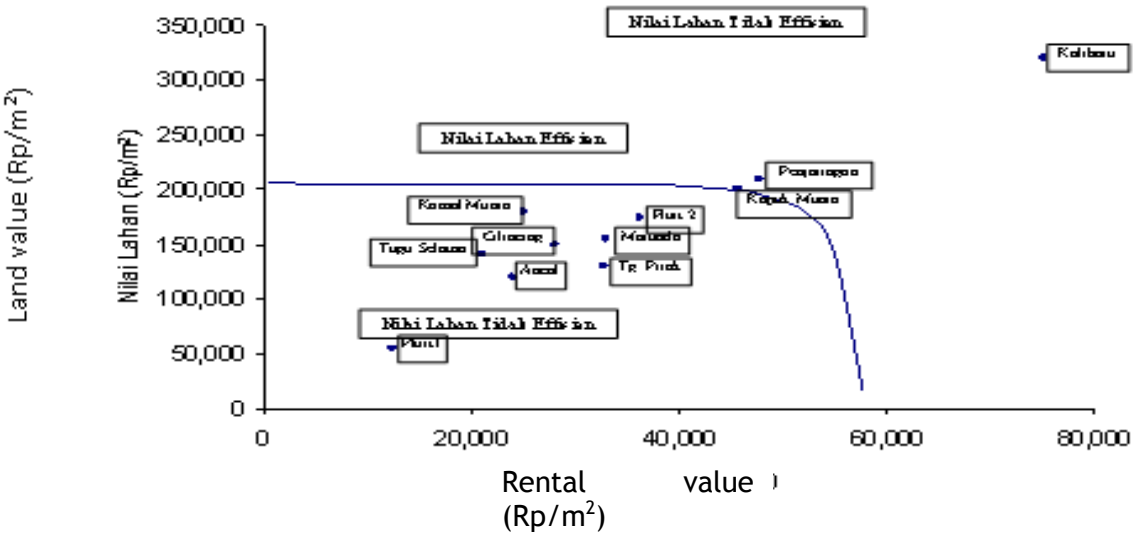

Fig 3. Land Rent Frontier

The above rent frontier curve results from the curve between the density of the building with the value of the land and the curve between the density of the building and the rent value. The rent frontier curve shows that an efficient area for squatters is Kapuk Muara and Penjaringan. Efficient means that the area is suitable for the squatters to occupy because the conflict is low compared with other areas where the level of conflict is very low.

Table 1: Optimal Rent

Location	NS-sq	NS-nsq	α	NL	LT	RO
Kamal Muara	25.000	35.000	0.714	180.000	8.10	1.041.872
Kapuk Muara	45.700	95.000	0.481	200.000	18.23	1.754.239
Pluit1	12.400	130.000	0.095	55.000	20.39	106.984
Pluit 2	36.250	45.000	0.806	175.000	9.61	1.354.340
Penjaringan	47.844	62.000	0.772	210.000	13.45	2.179.176
Ancol	24.000	33.000	0.632	120.000	11.22	850.672
Tanjung Priok	32.800	55.000	0.596	130.000	6.94	538.130
Tugu Selatan	21.000	90.000	0.233	140.000	13.03	425.720
Kali Baru	75.000	120.000	0.625	320.000	19.70	3.940.000
Cilincing	28.200	50.000	0.564	150.000	6.87	581.284
Marunda	33.000	50.000	0.660	155.000	22.38	2.289.403

NSsq = Squatter rental value (Rp / m²)
NSnsq = Non Squatter rental value (Rp / m²)
α = Rent differential obtained from --- NSsq/NSnsq
NL = Land's value (Rp/m²)
LT = length stay of Squatter (Year)
RO = Optimal rent (Rp/m²/Year)

By using regression analysis, it is resulted tabled figure 4 below with value of rent optimal is Rp. 1.389.279. There are six area namely: Kapuk Muara, Pluit 2, Penjaringan, Kali Baru and Marunda that have more than rent optimal. It is meant that squatters paid more rent per month.

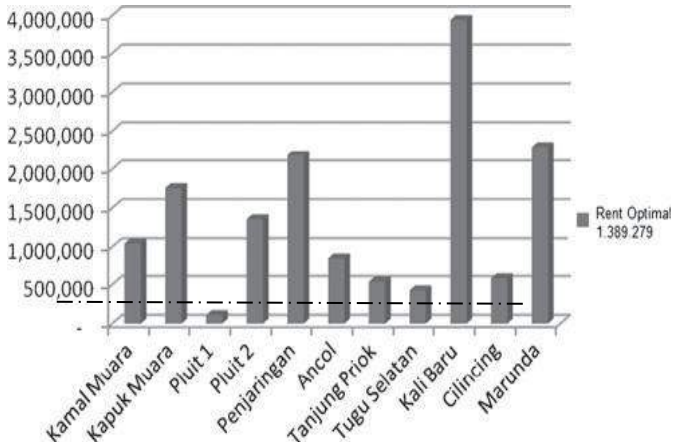

Fig 4: Rent Optimal Value in Squatter Coastal Land Area and the Average Rate of Rent Optimal

Rent optimal value shows that value RO for North Jakarta Rp. 106.984/m2/year. Whereas maximum value the figure is Rp. 3.940.000/m2/year.If we observe between rent to be paid by Squatter with optimal rent value indicated the big differences. It means that land occupied by squatter is inefficient. From 11 sample location, the average of rent optimal value for north Jakarta is indicated value Rp. 1.369.279/m2/year. The figure above gives information that optimal rent value is Pluit 2 with a location in Kampong Pangasinan of Muara Angke. Rationally value α (Rent differential) under 1.

Table 2: Squatter Locations Being Inside and Outside The Nash Equilibria Curve For The Cost of Order With Rent Value

No	*Squatter locations*	Regularity cost	Land value	Category		
				Win-Win	*Win-Lose*	*Lose-Lose*
1	Kamal Muara	21.000.000,-	25.000,-			√
2	Kapuk Muara	22.000.000,-	45.700,-			√
3	Pluit 1	14.000.000,-	12.400,-		√	
4	**Pluit 2**	**26.000.000,-**	**36.250,-**	√		
5	Penjaringan	25.000.000,-	47.844,-			√
6	Ancol	18.000.000,-	24.000,-		√	
7	Tanjung Priok	12.000.000,-	32.800,-			√
8	Tugu Selatan	16.000.000,-	21.000.-			√
9	Kalibaru	55.000.000,-	75.000,-			√
10	Cilincing	18.000.000,-	28.200,-			√
11	**Marunda**	**23.000.000,-**	**33.000,-**	√		

Source: Rudianto (2004)

Table 2 above shows that there are 3 (three) regions, namely win-win area, win lose area and lose = lose area. Win-win area means between squatters and landlords are mutually beneficial and no one is harmed. While win-lose areas are areas that benefit landowners and disadvantage Squatters, or lose-win areas are areas favorable to Squatters and harming landowners and lose-lose areas is an area that harms Squatters and landowners. The win-win areas include Pluit 2 and Marundan. The win-lose area covers Pluit I and Ancol areas. The area of lose-lose includes Kapuk Muara area, Kamal Muara, Penjaringan, Tanjung Priok, Tugu Selatan, Kali Baru and Cilincing.

When re-observation in 2016, it was found that there was a shift from win-win, lose-win areas to lose-lose areas. The main factor of the occurrence of the situation at 11 sampling sites on the north coast of Jakarta was caused by the government policy of DKI under the leadership of Governor Basuki Cahaya Purnama (Ahok). Evictions carried out in Jakarta, is not intended to increase the suffering of the poor. However, this is part of the AHOK Governor's policy of relocating slum areas in order to restore the function of a territory to fit its designation. However, this activity is not just displacing the poor and incapable, but AHOK has provided thousands of towers as a new residence of citizens whose condition is

much more decent and humane. The slum relocation program implemented in this case by the Provincial Government of DKI with the aim to fix Jakarta to be a comfortable, neat, beautiful and modern city, so as to be able to perform parallel to metropolitan cities in developed countries. The legal basis for evictions carried out by the DKI government is Law number 5 of 1960 which is then spelled out in Government Regulation number 51 of 1960. The Government Regulation stipulates that the prohibition of the unauthorized use of land without authorization or proxy has provided protection and a fair legal certainty over legitimate land ownership. Instead, sanction criminal sanctions against unlawful and unlawful parties controlling the property of another without the rightful authorization. Wards *et al*. (2010) stated that spatial and temporal variations indicate that the sources of land subsidence may also differ spatially. There is a strong indication that land subsidence in the Jakarta area is related to the high volume of groundwater extraction from the middle and lower aquifers, with secondary contributions by building/construction loading and natural consolidation of sedimentary layers. in addition, coastal areas in North Jakarta experience environmental degradation that is increasingly dangerous for the community. Continuous development conducted in the coastal areas of north Jakarta caused many problems. The construction of tall buildings puts heavy burdens on the ground. Excessive groundwater exposure causes the soil to become more fragile and eventually lead to subsidence or land subsidence. On the other hand, global warming is being followed by climate change continue to cause the situation worse. Global warming provides a slow but steady and permanent impact. Heating global has led to the melting of the ice at the poles. The temperature of the rising sea water causing seawater to expand so that sea water volume increases (IPCC, 2007; Diposaptono *et al*, 2009). Tidal flooding is a serious threat to the region of coastal areas in North Jakarta. As they can cause damage to settlements, public facilities, and land use. Global warming causes sea level rise. Meanwhile, land subsidence causes the land in the coastal area of North Jakarta to be lower than the sea level. So that the occurrence of pairs will cause floods or floods in coastal areas that inundate settlements and other land uses.

Table 3: List of Strength, Weakness, Opportunity, and Threats

List of Strength	List of Weakness
1. Power, legitimacy and urgent by DKI Government (S1); 2. Regional Development and Expenditure Budget from the DKI Government to create a multi-storey apartment in coastal area (S2); 3. Government Regulation number 51 of 1960 regarding The Government Regulation stipulates that the prohibition of the unauthorized use of land without authorization or proxy of legal certainty over legitimate land	1. DKI Jakarta order and cleaners are weak in supervision (W1); 2. The number of Squatters is increasing (W2); 3. Many coastal areas are sleeping land (W3); 4. Many coastal landowners are not utilized according to the spatial plan (W4); 5. Slum neighborhoods are increasing every year (W5)

ownership (S3).	
List of Opportunity 1. Squatters controlling program that resides in illegal land will be disciplined by DKI government (O1); 2. Construction of a giant embankment to cope with floods (O2); 3. The existence of a multi-storey apartment program (O3).	List of Threats 1. Prone to subsidence (T1) 2. Prone to flood every year (T2) 3. Reclamation Development (T3) 4. Rising of sea water level (T4) 5. Global Warming (T5)

Table 4: SWOT Strategic Issues

EKSTERNAL / INTERNAL	OPPORTUNITY 1. Squatters controlling program that resides in illegal land will be disciplined by DKI government (O1); 2. Construction of a giant embankment to cope with floods (O2); 3. The existence of a multi-storey apartment program (O3).	THREATS 1. Prone to subsidence (T1); 2. Prone to flood every year (T2); 3. Reclamation Development (T3); 4. Rising of sea water level (T4); 5. Global Warming (T5).
STRENGTH 1. Power, legitimacy and urgent by DKI Government (S1); 2. Regional Development and Expenditure Budget from the DKI Government to create a multi-storey apartment in coastal area (S2); 3. Government Regulation number 51 of 1960 regarding The Government Regulation stipulates that the prohibition of the unauthorized use of land without authorization or proxy of legal certainty over legitimate land ownership (S3).	STRATEGI S-O 1. Government of DKI supply apartments for squatters; 2. Government of DKI continues to develop a giant embankment to protect from floods; 3. Squatters received compensation from DKI government to move to apartments; 4. Government of DKI do not continue reclamation program	STRATEGI S-T 1. Government of DKI considers to protect north Jakarta coastal area from subsidence; 2. Government of DKI continues their programme from flood protection; 3. Government of DKI consistent to implement spatial plan for conservation plan
WEAKNESS 1. DKI Jakarta order and cleaners are weak in supervision (W1); 2. The number of Squatters is increasing (W2); 3. Many coastal areas are sleeping land (W3); 4. Many coastal landowners are not utilized according to the spatial plan (W4); 5. Slum neighborhoods are increasing every year (W5).	STRATEGI W-O 1. control of the population in the north of Jakarta coastal area by the government of DKI ; 2. Preparing for unutilized land coastal plan for conservation;	STRATEGI W-T 1. Government of DKI do not continue reclamation programmes; 2. Government of DKI prepare community development for disaster management in north Jakarta coastal area

Based on table 4 above then prepared internal strategy and external strategy. Therefore, in each SWOT variable, the weighting of internal and external strategic factors is assessed. Furthermore, IFAS (Internal Strategic Factors Analysis) and EFAS (External Strategic Factor Analysis) were prepared. While that includes external factors is opportunity and threat. While the IFAS matrix is a matrix that describes the composition of a list of internal factors that affect the performance of coastal areas by considering the internal factors of strength (Strength) and weakness (Weakness).

Table 5: SWOT Weighted Matrix

Internal Factors	Weight	Rating	Score
Strength			
1. Power, legitimacy and urgent by DKI Government (S1);			
2. Regional Development and Expenditure Budget from the DKI Government to create a multi-storey apartment in coastal area (S2);	0,18	4	0,72
3. Government Regulation number 51 of 1960 regarding The Government Regulation stipulates that the prohibition of the unauthorized use of land without authorization or proxy of legal certainty over legitimate land ownership (S3).	0,14	4	0,56
	0,14	4	0,56
Numbers	0,46		1,84
Weakness			
1. DKI Jakarta order and cleaners are weak in supervision (W1);			
2. The number of Squatters is increasing (W2);	0,09	3	0,27
3. Many coastal areas are sleeping land (W3);	0,09	4	0,36
4. Many coastal landowners are not utilized according to the spatial plan (W4);	0,14	4	0,56
	0,09	3	0,27
5. Slum neighborhoods are increasing every year (W5).	0,14	3	0,42
Total	0,55		1,88
Total	1,01		3,72
External factors	Bobot	Rating	Skor
Opportunities			
1. Squatters controlling program that resides in illegal land will be disciplined by DKI government (O1);	0,09	3	0,27
2. Construction of a giant embankment to cope with floods (O2);	0,25	4	1,00
3. The existence of a multi-storey apartment program (O3).	0,05	4	0,2
Total	0,39		1,47
Threats			
1. Prone to subsidence (T1);			
2. Prone to flood every year (T2);	0,18	4	0,72
3. Reclamation Development (T3);	0,18	4	0,72
4. Rising of sea water level (T4);	0	4	0
5. Global Warming (T5).	0,18	4	0,72
	0,05	3	0,15
Total	0,59		2,31
T o t a l	0,98		3,78

Rangkuti (2009) explains that strategy is a tool to achieve goals. The main objective is that governments and other stakeholders dealing with the coastal areas can look objectively at the internal and external conditions of the region so that governments can anticipate changes in the external environment. Strategic planning is important to gain competitive advantage and to have products that are in accordance with the wishes of consumers with the optimal support of existing resources. The figure below explains how to strategize by considering the relationship in the SWOT factor.

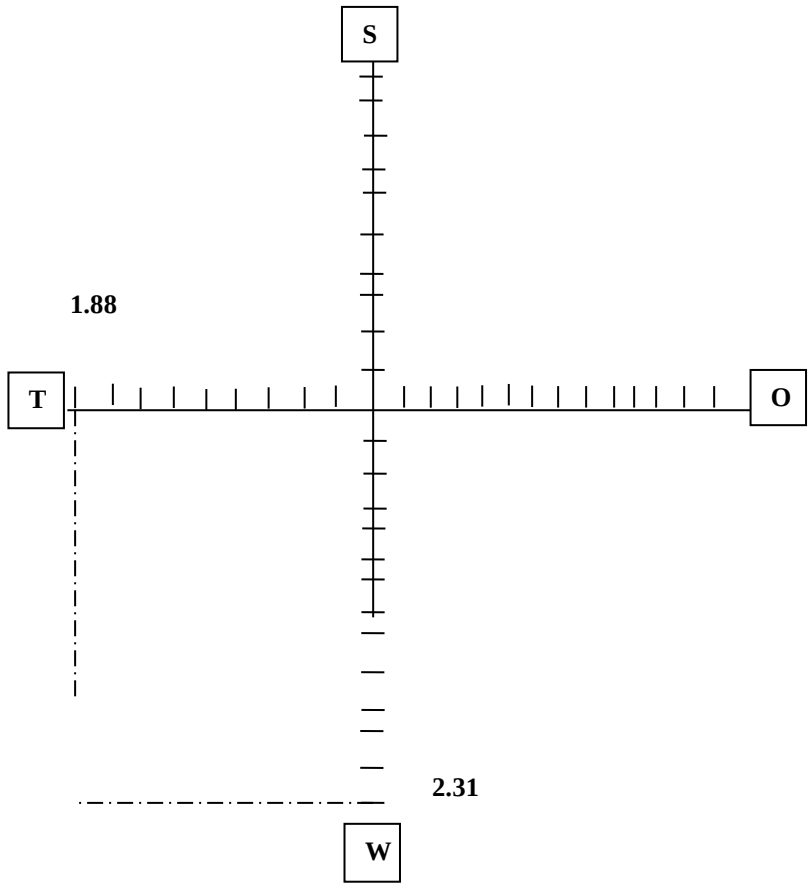

Figure 5: quadrant SWOT analysis

From the Figure 5 above, it can be seen that the weight of each variable is S = 1.84; W = 3.72; O = 1.47 and T = 3,78. The difference between S - W = 1,84 - 3.72 = **-1,88** is the X-axis. While the difference between O - T = 1,47- 3,78 = **-2,31**. It is indicated in quadrant IV (negative, negative). In quadrant 4 it is indicated that the DKI government is weak in supervising the increasingly growing Squatters on the north coast of Jakarta. DKI government faces a big challenge in this area and it is considering the coastal problems of North Jakarta. It has become more complex both for the aspect of the degraded environment and a socio-economic problem which more and more need of land a place to live. This problem is increasingly heavy if the government of DKI provides an opportunity for the reclamation process. The reclamation process will obviously alter marine hydro

oceanography patterns that will directly affect the ecosystem and habitat in the bay of Jakarta. Development that continuously uses reclamation approach is considered as a "time bomb" of environmental issues and socio-economic issues of culture in the future. Therefore, it is needed the policy to cope with both aspect, namely aspect of Squatters and environment issues as follows:

1. The government of DKI does not continue reclamation programmes. Based on Sampono *et al* (2012) stated that the adverse impact of the reclamation project is not enough to stop the project. Instead. It is getting more aggressive with plans to build 17 new islands in front of Jakarta Bay. The perception of fishermen on reclamation activities leads to negative impacts on fishery natural resources, fishing areas, boat lanes, and cultivation activities. According to fishermen (as stated by Sampono *et al*, 2012) that the main negative impact is on natural resources, especially fisheries. One of the most affected activities resulting from reclamation Jakarta Bay is a fishery activity. Population working in the fishery sector in Jakarta in 2009 was 2,366 boat owners and 16,581 workers. Based on population status in Jakarta there are 10,268 fishermen fixed and 8,678 migrant fishermen. High population of fishermen has resulting in insufficient facilities and infrastructure available including housing for the fishermen, so that side of the canals for ship repair has been used also for settlement. Fisheries activity is currently dominated by mini purse seine (payang), purse seine, rampus net, gill net, chart and traps (bubu). Fish that became the target of catching fish baronang, kerapu, mullet, julung-julung, cendro and so on. In addition to typefish, the green shell is one of the many commodities cultivated in the coastal waters of North Jakarta.
2. The government of DKI prepares community development for disaster management in north Jakarta coastal area. Chandra et al (2013) stated that the area that is at the level of risk of rob flood is very high up to less risky and the riskiest sub-districts are Cilincing Sub-district, Koja Sub-district, and Tanjung Priok Sub-district. The hazard zone in North Jakarta's coastal area is divided into five classes ie non-hazard zone, slightly danger zone, danger zone, danger zone, and very dangerous zone. Hazard zone classification ie, no hazards (2.83% of total area), slightly hazard (4.22%), enough hazards (30.18%), hazards (44.4%), and very hazardous (17.44 %). Based on the level of hazard, Cilincing, Tanjung Priok, Koja, and Pademangan. Zoning of disaster risk level in the research area is classified into five classes ie no risk zone, least risk zone, risky zone, high-risk zone and high-risk zone. The risk zone classification is not at risk (0.04% of total area), slightly risky (7.91%), risky enough (25.58%), at risk (34.41%), and very risky (28.57%). Based on the level of risk, the sub-district with the greatest risk is Cilincing Sub-district. To that end, the Government of DKI needs to prepare technical guidelines for disaster management in the coastal area of North Jakarta with initial socialization in sub-district of Cilincing, Tanjung Priok, Koja, and Pademangan.

3. Attention has been focused increasingly on the conflicts between landowners and squatters development. In order to prevent the land fragmentation, some legal measures have been taken which chance according to existing government regulation. In that way, the size and the number of optimum land coastal have been limited by the laws. Coastal land fragmentation considerably impairs ecosystems practices, reduces the technical and economic efficiency of production, contributes to environmental degradation and obstructs or inhibits the use of modern coastal land use.

Conclusions

To analyzed land use conflict between Squatter and landowners based on regional approach, the government of DKI should consistent to implement Government Regulation number 51 of 1960 and breakdown to DKI government Law number 5 of 1960 in order to prevent the land fragmentation. From an economic point of view, coastal land fragmentation is the main weakness of the general coastal natural resources that have adverse economic and social consequences – it reduces coastal community incomes and prevents the accumulation of capital for investments that could improve the efficiency of fisheries practices.

At present, although the North Jakarta coast faces severe pressure from anthropogenic processes and intensive natural processes, the DKI government should have resolved the gradual problem of North Jakarta's coastal land. This is done because the Government of DKI experiencing limitations, both limited financing, and limitations of security and order officers. Therefore, it is suggested that the DKI Government prepare the master plan of North Jakarta coastal space to determine the priority of handling the area that needs to be handled first. For that criterion that can be used is the level of complexity of the problem both in terms of land conflicts and aspects of the disaster.

Ali (2015) explains that coastal area spatial management and utilization activities can have positive impacts both socially, economically and environmentally. However, the negative impact is if the planning is not in accordance with the realization in the field so as to cause economic losses, social turmoil in the community, and environmental damage. As long as follow rules, rules, norms, and laws then Utilization of coastal space a necessity. Therefore, the most important solution concerning the future of land coastal activities is an improvement of coastal land in north Jakarta. The improvement in the context of land consolidation is integrating fragmented land, doing the necessary works for land leveling, reorganization of the squatters and the planning of environmental management, providing the necessary giant wall to protect coastal land from the rising of sea level.

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BAMBOO CLUMPS AS A NATURAL BARRIER OF VOLCANO PYROCLASTIC FLOWS (VOLCANO MITIGATION SYSTEM IN KHENDIL'S HILL, POST-DISASTER AREA OF MERAPI VOLCANO)

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Abstract

Mount Merapi is one of the most active volcanoes in the world and located in Sleman, DIY, Indonesia. In the eruption of 2010, the pyroclastic flows deviated from the track and caused a big damage around Mount Merapi. It also made a big diversification in Merapi morphology, the crater is widely opened to the southeast area. Based on the local belief around Mount Merapi, the bamboo clumps was used as a natural early warning system. Which where on the previous research, this earth science investigation had a goal to design a natural barrier of pyroclastic flows using bamboo clumps as one of a natural mitigation system implementation in Khendhil's hill and other southeast areas. In this research, four methods were used in the process, they are interviews, literature reviews, mapping and observations, and modeling with software simulations. The research results were that the people around Mount Merapi still believe that bamboo forest was dominated by Bambu Petung, could survive from the pyroclastic flows. The bamboo grows up and naturally distribute after the eruption around the southeast area of Merapi. Also, the research area has fertile soil contents and could make the bamboo growth well with range area up to 548 ha (hectare). Others, to optimize the function of bamboo as a natural barrier of pyroclastic flows, the distance among bamboo clumps should be in 6x10 meters, which could reduce the probability of damages area until 40-50% from the simulation.
Keywords: pyroclastic flows, bamboo, natural barrier, southeast area

1. Introduction

Merapi volcano (Indonesia) is one of the most active volcanoes in the world. The type of eruption in Merapi is different with another volcano in the world and called Merapi Volcano Type. The explosion had the VEI (Volcano Explosivity Index) in range of 1-3 and the radius of the damaged area around 4-15 kilometers. Merapi had the last eruption in 2010 when the volcano produced its largest and most explosive eruptions with the booming and pyroclastic flows in more than a century. It was the second most deadly in the historical record of this volcano, claiming over 380 lives. Its also made a big diversification in Merapi volcano morphology and caused the pyroclastic flows from Merapi volcano deviated from the track and destroyed the dense forest from the cliff of Gunung Kendhil until Kinahrejo (the upper southern slopes of Merapi volcano).

The volcano was more hazardous because the range time of the explosion in four up to eight years and it's over from the range time since the last eruption in 2010. The different crater morphology in nowadays would make the pyroclastic flows and surge more easy to destroy the southern slopes because the crater also opened into the south direction.

Related to a volcanic eruption, there is a local belief which is a bamboo forest was used as a natural early warning system. The sound produced when bamboo culm was burned by pyroclastic flow could be used as an alarm and bamboo also could be resistant to the high temperature. On previous research, it has been proven that bamboo forest could survive from the pyroclastic flows caused by Mount Merapi eruption. The root of the bamboo survived because the base temperature was low enough to prevent it from burning, which was shown by its strength and elasticity. The high temperature caused by the gas would tend to flow upward due to the effects of the buoyancy and boundary condition phenomena. So, bamboo could grow fast after the eruption. Bamboo also has the mechanical traits such as elasticity and could restrain the volcanic materials. In addition, bamboo also has many benefits, such as deterrent of the landslide, water storage, and windbreaker.

According to the specification and benefits of bamboo, there wasn't a scientific data that supported the potency of bamboo as natural mitigation in a volcano eruption. Therefore, this research aims to design a mitigation system from the bamboo forest as a natural barrier in Merapi eruption based on the local belief and considered the side benefits of bamboo. These data will be used for further research to develop the benefits of bamboo in the environment and mitigation system. Also, optimize the potential of bamboo for Merapi volcano in the real life through the government and another nature organization.

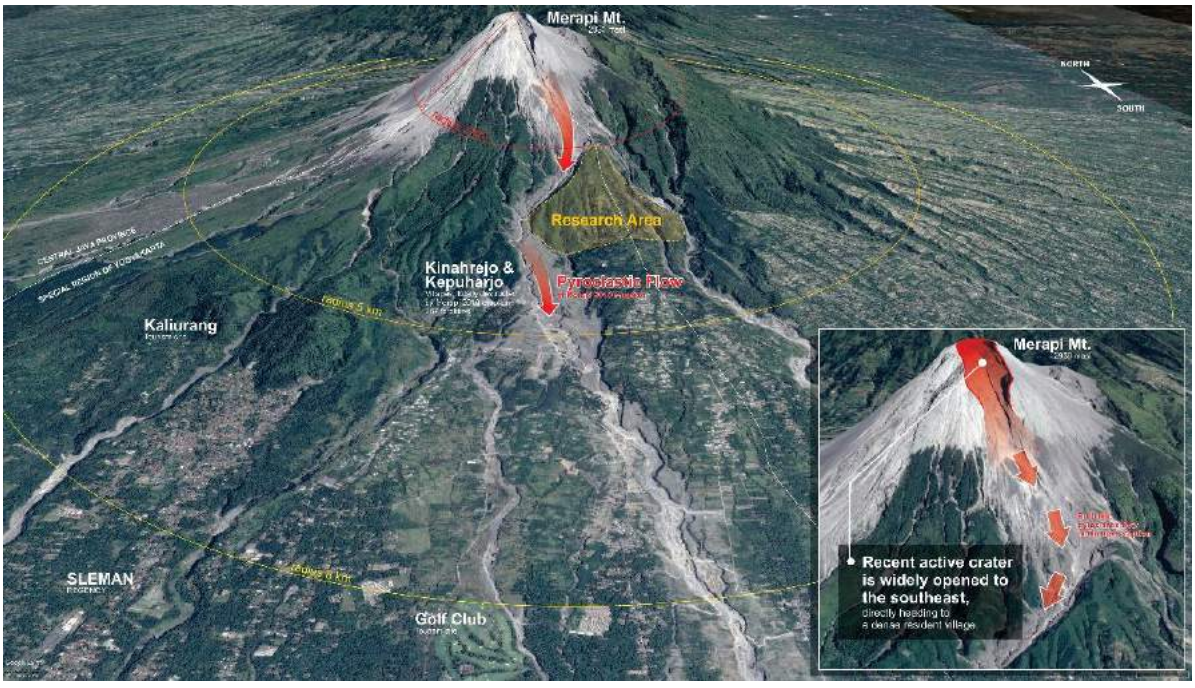

Figure 1. Merapi's condition after the last eruption in 2010. The crater is widely opened to the southeast area and it could be as a prediction for the next eruption.
Source: taken from Google Earth

2. Analyzing Used of Bamboo Based on The Habitat and Local Belief in Merapi

2.1 Based on the local belief

The purpose of this method was to determine the persistence of the local belief and the function of bamboo to drag the pyroclastic flows or early warning system when eruption happened. The data were obtained in two ways, interviews and questionnaires. The respondent took the shopkeepers which still inhabited the Kinahrejo peaks until now. Besides, the researcher made an interview with employees in BPPTKG, rescue teams of Mount Merapi, and travel guard of Merapi lava tour. There were also 20 randomly people in Residential of Karangkendal (in Kinahrejo) answered the questionnaires.

2.2 Based on the mapping and observation

In this method, the researcher observed the bamboo forest to see the distribution of bamboo in Kinahrejo peaks.

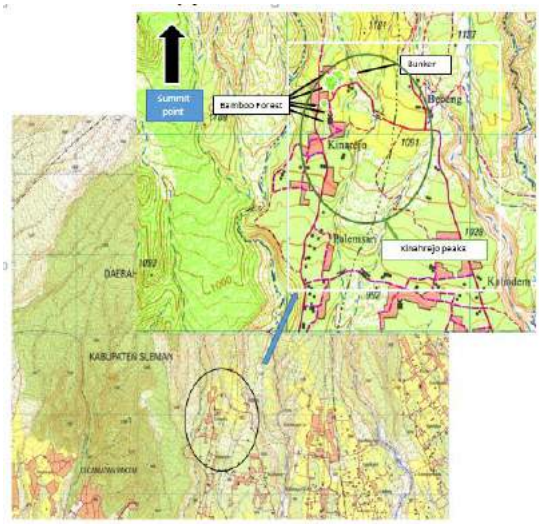

Figure 2. The result of mapping and observation about the distribution of bamboo in Kinahrejo (southeast area in Merapi volcano). Source: The local government in 2012

Otherwise, the researcher found five points distribution of bamboo forest that grows naturally in Kinahrejo peaks and its vicinity. The range area of bamboo forest from 12 m^2 to 32 m^2. Besides, the type of bamboo also identified. The bamboo forest dominated by Bambu Petung (*Dendrocalamus asper*).

From the ecology side, bamboo was very good for the greening and availability of water in the observing areas. In addition, bamboo has a suitable trait for this research because of sympodial shape. The trait of bamboo also resists of the high temperature and gust. Also bamboo could prevent the landslide. So, bamboo could be compatible as a pyroclastic flows barrier system in Mount Merapi.

3. Analyzing the Base Data from Software Simulation

3.1 Distribution of pyroclastic flows temperature and velocity in the focus area

In this method, the researcher used the software simulation and physics with the approaching method. The aim of this step is to analyze the strength and forces around the bamboo while its collision with the pyroclastic flows.

This analysis used the Inventor Professional (Student Version) to make the model of Merapi and bamboo, then the Autodesk Simulation CFD (Computational fluid dynamics) to do the simulation of pyroclastic and bamboo, and FEA (Finite Element Analysis) to analyze the data.

Fluid pyroclastic flows with 1000 degree Celsius temperature down from a peak altitude of 2,930 meters above sea level at a speed of 500 km/h. Free surface flow simulation was to describe the interaction of pyroclastic flow with the air. Then, setting of heat transfer that permits heat exchange between the air and the hot cloud of sand surface slopes in conduction and convection. This simulation was carried out for 100 seconds.

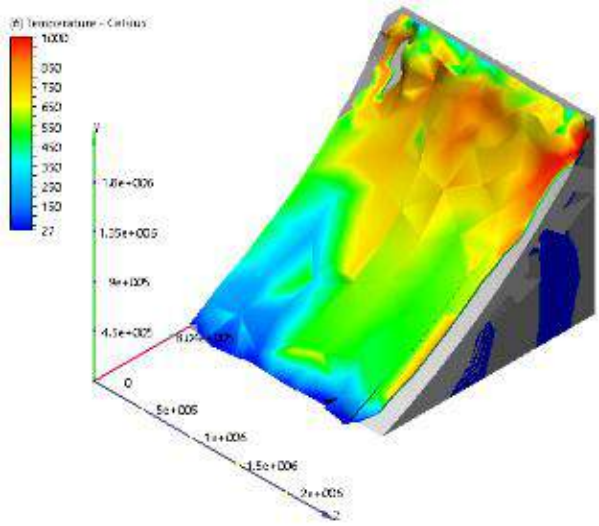

Figure 3. The 3D distribution of pyroclastic flow's temperature in the focus area using software simulation.

In the picture above process flow, it can be seen that the flow slide down the distribution of temperature and speed vary per share. This work shows that the boundary condition is approaching the situation in the region.

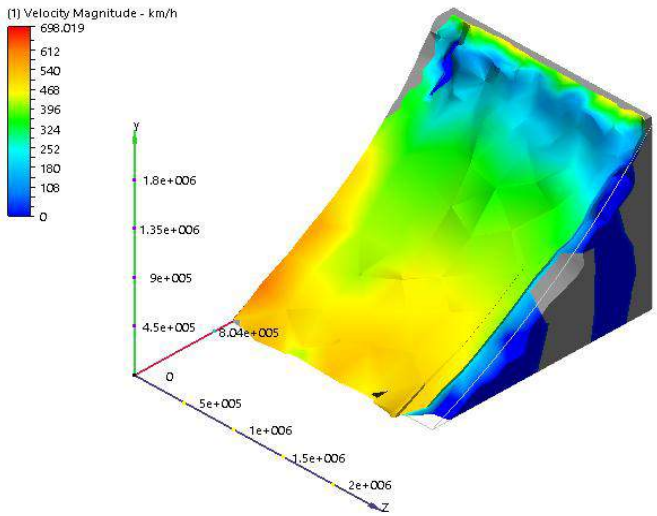

Figure 4. The distribution of temperature used in 2D. From the image above could be seen that the temperature at the top of the mountain reaches 1000°C on the surface near the ground and

after reaching an altitude of 1200. Then, the temperature is in the range of 350-150°C at the boundary between the liquid and the surface.

In this distribution can be seen that the temperature is at a distance of up to 8.000mm vertical base temperature drastically decreased.

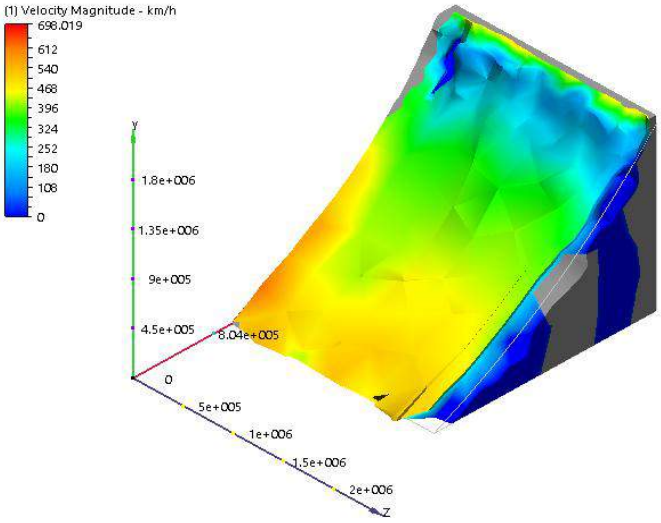

Figure 5. The 3D distribution of pyroclastic flow's velocity in the focus area using software simulation.

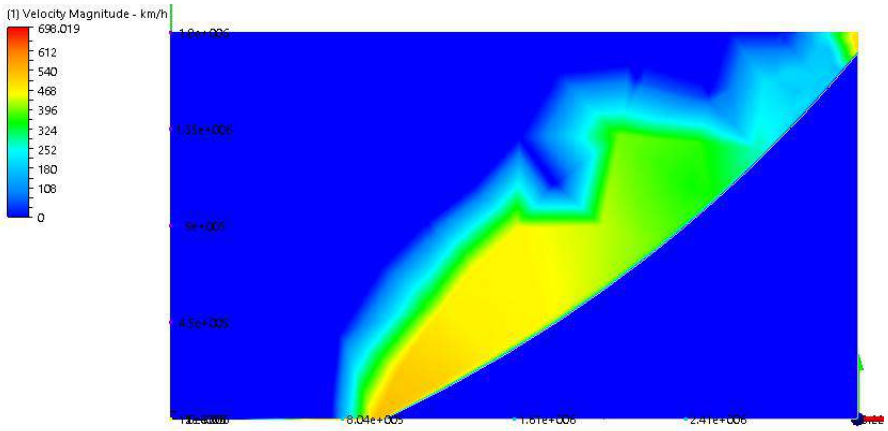

Figure 6. The distribution of pyroclastic flow's velocity in 2D. In the picture above could be seen that the slow speed at the top, it is because of pyroclastic flows at the top moved from bottom to top and at the shore of the crater will clump pyroclastic flows that have low speed.

From the above simulation, we can get data on the average of temperature and velocity at an altitude of fewer than 20 meters (the average height of the bamboo), there is:

The temperature in 1.200 above mean sea level = 220 °C, the velocity in the 1.200 above mean sea level = 250 km/h

3.2 Calculation of the pressure, velocity, and temperature's distribution through the bamboo

Bamboo on the slopes of Merapi, with an altitude of 1200 meters above sea level with temperatures hit by pyroclastic flows and velocity according to the data obtained from the first

simulation. Bamboo with a diameter of 174 mm and a height of 20 meters in distance between 20cm bamboo to depict a tree that grows in the wild in the nearby.

Simulation of flow was steady or unsteady flow to describe when pyroclastic flows have reached a steady temperature, speed and time into a tree. Steady flow used for computing efficiency and accuracy of the results.

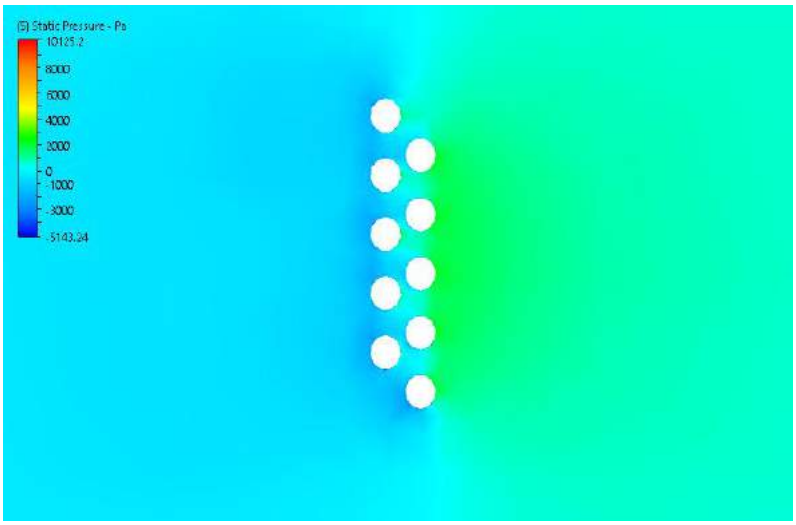

Figure 7. 2D models of pressure distribution from software simulation.

From the picture above, we could say that between the two rows bamboo is the speed difference is quite high compared to other parts. It is, therefore, a turbulent flow between the bamboo rows. The flow coming from the release of pressure on the first lines should increase but be restrained by the second line, causing the flow of spin and speed.

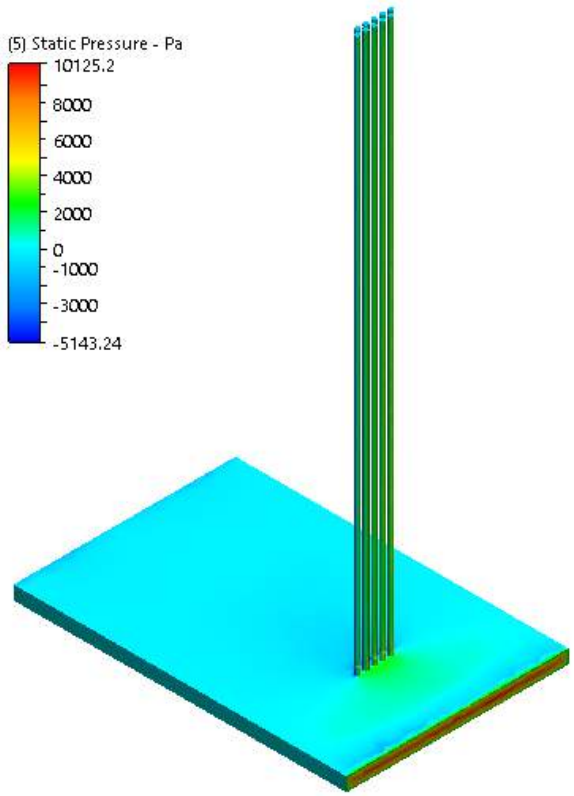

Figure 8. The distribution of pressure that passed the bamboo.

In this simulation included two rows of bamboo arranged like the picture, so it is clear that the pressure on the back of the bamboo decreases as retained by the front of the bamboo.

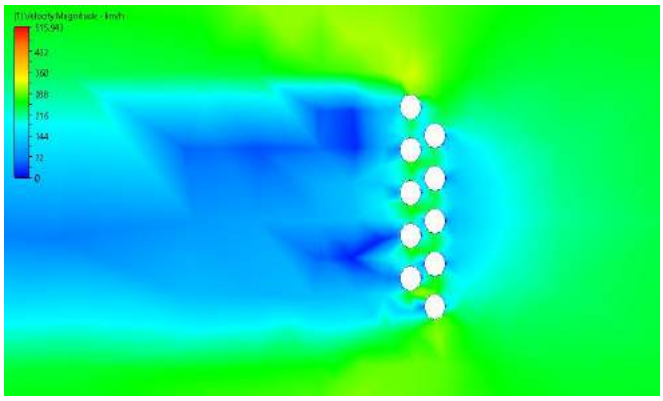

Figure 9. Velocity's distribution of pyroclastic flows through the bamboo in 2D.

From the picture above, we could say that between the two rows bamboo is the speed difference is quite high compared to other parts. It is, therefore, a turbulent flow between the bamboo rows. The flow coming from the release of pressure on the first lines should increase but be restrained by the second line, causing the flow of spin and speed.

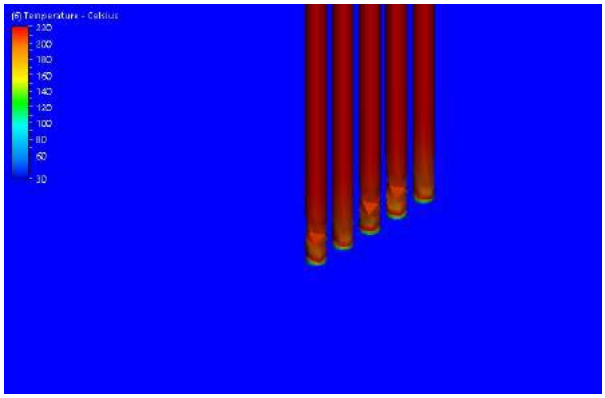

Figure 10. The distribution of temperature when the pyroclastic flows passed bamboo in the surface.

It could be seen that the temperature in the surface was so high and could make the bamboo burned. However, when looked at the distribution of the pyroclastic flows temperature at the first line, we could say that the temperature at the bottom (near the surface) was low, making it possible for is alive and does not burn on the bottom. From the simulation results obtained that a bamboo with a diameter of 174 mm and a height of 20 meters would have a total thrust load of 12574,6N for dealing directly with pyroclastic flows at the first line of and 11252, N for which is one behind the first row.

As for the things that may be:

1. Rows of bamboo closed would reduce the mechanical imposition.
2. The bamboo location in the back of the line, the smaller force of pyroclastic flows which crashed.
3. The temperature at the root was very low even if exposed to high-temperature pyroclastic flows at the first line, so it would not burn on the piece. The low temperature is caused by

the high temperature of the air would tend to flow upward due to buoyancy effects besides that it is caused by a boundary layer phenomena.

3.3 Calculation of the strains and deflection

The analysis was performed on a single bamboo stick with a diameter of 174 mm, the thickness of 35 mm and a height of 20 meters with imposition pressure force caused by exposure to pyroclastic flows at the first line which gathered data from the previous first simulation. Then, roots embedded in the ground. The mechanical properties of materials adapted to data sewers. The reeds were first hit by pyroclastic flows from the first line.

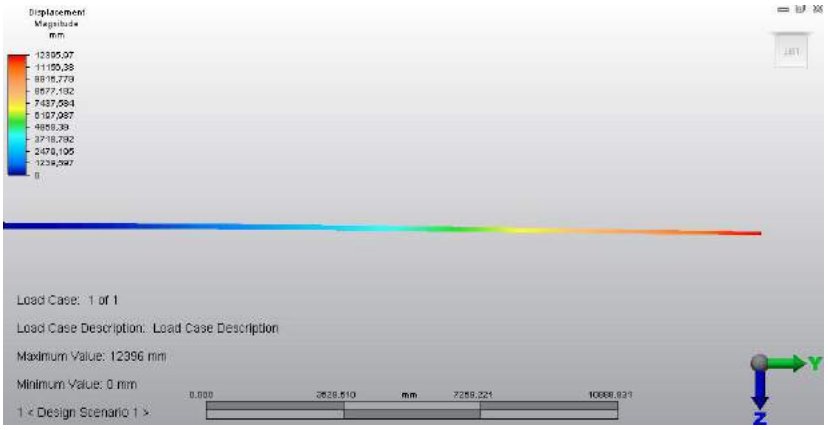

Figure 11. The deflection distribution of the bamboo after the simulation.

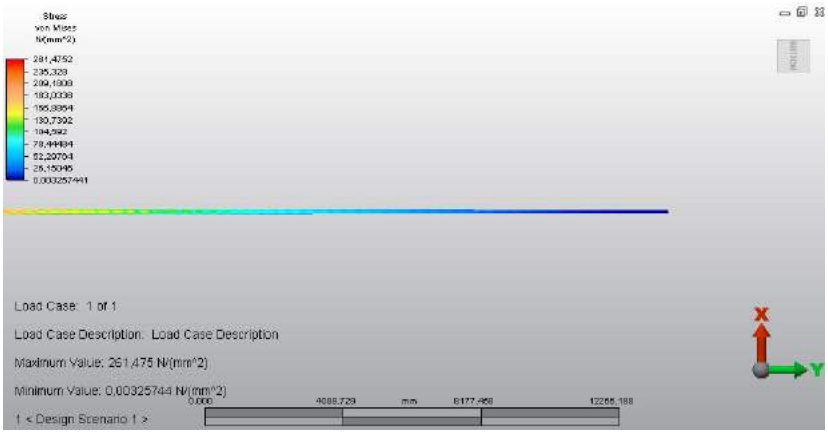

Figure 12. The strains distribution of the bamboo after the simulation.

After obtaining the temperature distribution of data and velocity pyroclastic flows at the first line at a height of 1,200 meters above sea level and the distribution of pressure, voltage, and deflection, the next step is to analyze the voltage on a bamboo stick to compare the results with the results of the first simulation software. This is by to the stress and deflection analysis can be used with mathematical calculations. Results of computing (first simulation. software) on a matter should be approached with math to determine the level to the validity of the data obtained. The data used was the data from Bambu Petung mechanical properties. The formula used in the calculation of the mathematical theory of stress and strain was based on the formula of stains.

$$\sigma = \frac{F}{A}$$

When given strain, the material would undergo a change in form (disability). The addition of this length is measured by the strain parameter, namely the change in length divided by the length of the first.

$$\varepsilon = \frac{\Delta L}{L_0}$$

$$\sigma = E\epsilon$$

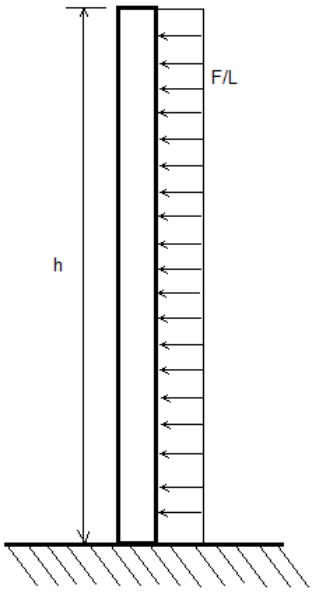

Figure 13. The illustration of calculation.

Assumptions:

Diameter 174 mm, thickness 35 mm (diameter and an average thickness of Bambu Petung), outer radius = 0.087 m fingers in = 0.052 m, h = 20 m (average height of creel petung), w = 12574.6N / 20 m = 628.73 N / m (based on simulation results).

$$\sigma = \frac{2\,.628.73\,.20^2\,.0.087}{3.1428\,.(0.087^4 - 0.052^4)}$$

$$\sigma = 278.61 \text{ MPa}$$

This value is close to the results of computing. As is well known, limits the maximum voltage that can be held by bamboo petung was 105Mpa, therefore, in this situation would break. And with the same diameter and thickness, the height of the bamboo petung survivors was:

$$105.10^6 = \frac{2\,.628.73\,.h^2\,.0.087}{3.1428\,.(0.087^4 - 0.052^4)}$$

With the height of bamboo in 12,13 meters, it can be concluded that plants shorter with the same diameter will not be easily broken. For with a diameter of 175mm and 35mm thick, safe height was around 13.13 meters.

The deflection of the late principal amounted to:

$$d = \frac{w.L^4}{8.E.I}$$

$$d = \frac{w.h^4}{2.E.\pi.(r_{luar}{}^4 - r_{dalam}{}^4)}$$

$$= \frac{628.73\ .\ 12.3^4}{2\ .26.10^9\ .3.1428\ .\ (0.087^4 - 0.0175^4)}$$

d = 1,761m

d = the deflection in the top of bamboo (m)

E = elasticity modulus (GPa)

3.4 Calculation the distance and drag force among the bamboo

The researcher used the software simulation to calculate the distribution of drag force. Firstly, the researcher determined the variable such as the coefficient of vertical and horizontal plant distance. Secondly, the clumps were designed in a simple form of circles. Thirdly, input data from the mechanical and physical traits of Bamboo Petung. The goal of this calculation to analyze the accuracy of the planting distance to the drag force. It was ordered to make a more effective barrier system.

To calculate the accuracy of distance, the researcher found the value of lateral (A) and longitudinal (B) distance of bamboo with a simple design in the picture below.

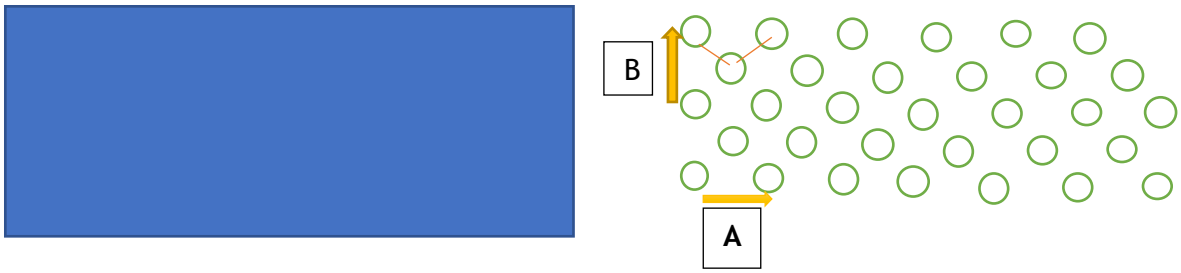

Figure 14. The design of bamboo clumps.

A'= A/d = lateral distance of bamboo
B'= B/d = longitudinal distance of bambo
d = diameter of bamboo

By using the CFD and made a variation of A' and B' (diameter is constant), the result of the simulation are :

The comparison between variables a and b to (x,y)

Table 3.1 The distribution of drag forces (X) and the planting distance (Y) with variation of lateral distance among the bamboo

A'	X	Y
2	26707	0,295
3	20621	0,167
4	17834	0,072
5	17094	0,055
6	16116	0,038
7	15178	0,02
	A'=5	

Table 3.2 The distribution of drag forces (X) and the planting distance (Y) with variation of longitudinal distance among the bamboo

B'	X	Y
2	16697	0,032
3	16616	0,046
4	16948	0,054
5	17094	0,055
6	17030	0,057
7	16606	
	B'=5	

X = drag forces A' = A/D
Y = the plant of distance B' = B/D

From the table, it can be concluded that value of A' and B' are more efficient is having an equal value or approach each other. Based on this, it can be concluded that the value of A' and B' are the most efficient is (A', B') = (5,5), because A' and B' to (x,y) at a value of 5 have the same result.

So, it could be as an effective system if we make a difference with the lateral and longitudinal distance among the bamboo clumps. Also, we could analyze data using Microsoft Excel and graph.

The result above could be easier to know the different impact of variation a and b using the chart below.

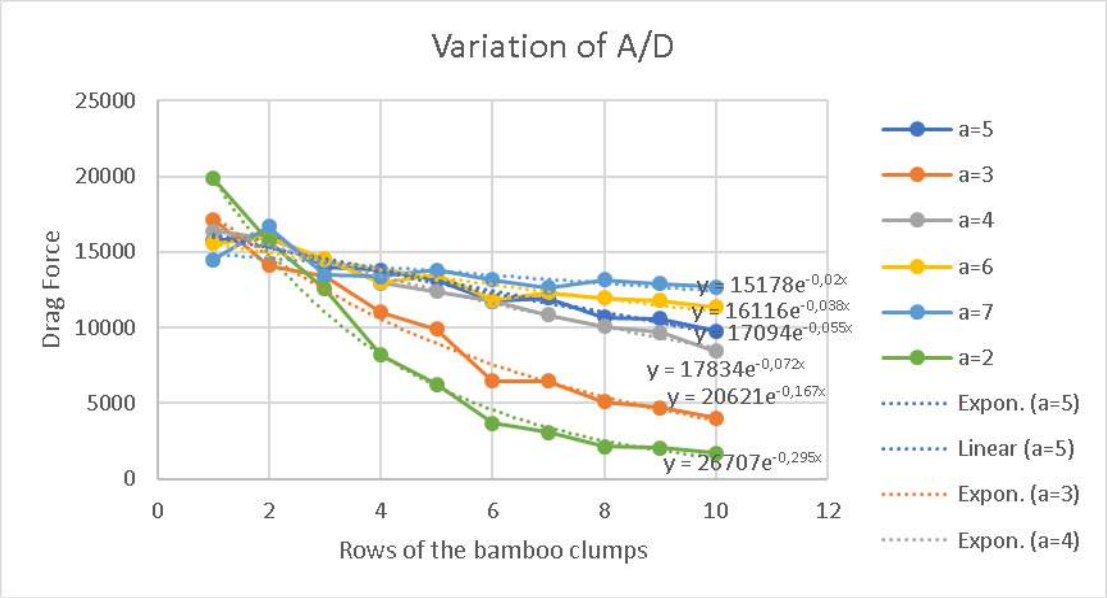

Figure 15. The distribution of simulation with variation of lateral distance (A')

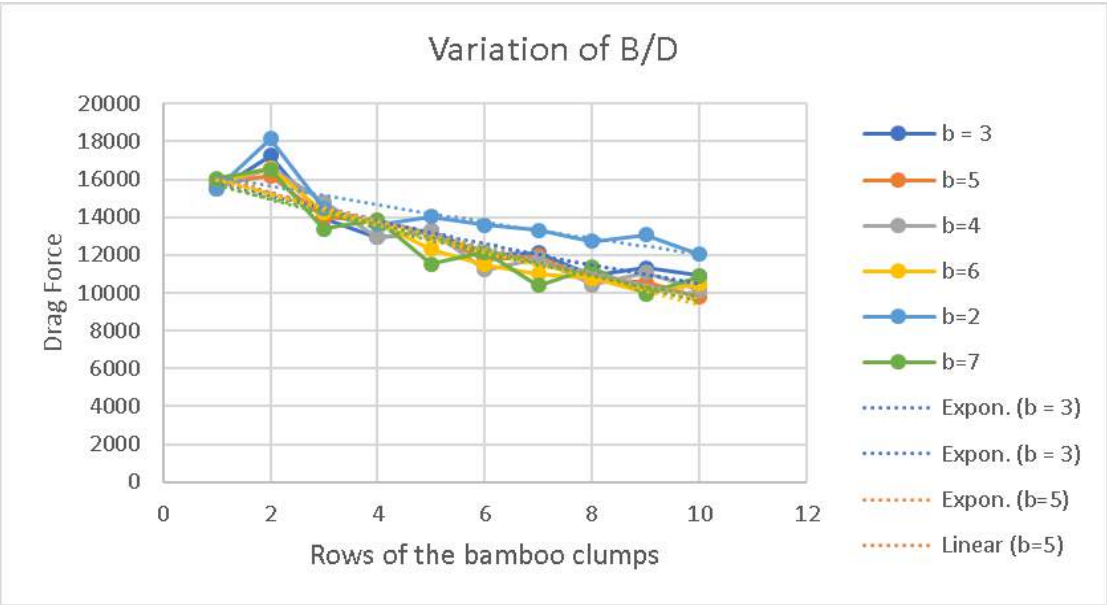

Figure 16. The distribution of simulation with variation of longitudinal distance (B'

The result of distribution on variation A' showed the different forces. The value of the drag forces was significant in every variation of A'. It concluded that the variation of A' would make many different impacts.

From the chart of variation B' distribution, the researcher found the variation of B' did not have a specific difference. So, it was able to conclude that plant distance in variation B' was not very influential for this barrier system.

3.5 *Calculating the value of drag force with formula of external flow*

This analysis used the external flows theory with the original formula below.

$$F = \frac{1}{2} . \rho . v^2 . A . c_d$$

Researcher calculated the value of drag coefficient with software simulation. The program named Computation Fluid Dynamics (CFD). The calculation used the data of bamboo traits such as density, viscosity, the area, and diameter of bamboo.

The value of drag coefficient used CFD :

$$c_d = 2.92755.a^{-0.435}.\exp[(0.0608 + 0.1425b)e^{-0.519a}]$$

After that, to found the value of drag force, the researcher put the data about bamboo traits into the formula.

ρ=1.22 kg/m^3
A= π.d.h = π 0.2m*20m = 4 π m^2
v= 69.44 m/s

So, the value of drag force is :

$$F = 1.463775.\rho.v^2.\pi.d.h.a^{-0.435}.\exp[(0.0608 + 0.1425b)e^{-0.519a}]$$

By using the approach method, the value of drag force on the barrier system of 1.200 meters above sea level and diameters of bamboo is 0.2 meters, $F_{max} \approx 34.443{,}99\ \pi.\ c_d$ N.

3.6 Calculating the high of pressure that occurred on the system

The high of bamboo stalks with 12.13 m and a diameter of 17.4 cm would be broken by the force of 12574.6 N. Therefore, obtained the value of the pressure at which bamboo would be broken in the amount of:

$$P = \frac{F}{A} = \frac{12574.6}{0.174 * 12.13}$$

$$= 5.875{,}4322/\pi\ kPa$$

The horizontal distance was taken by the previous journal about a normal distance of bamboo clumps. Besides, the value of horizontal distance was not very influential. So, the researcher made the horizontal distance in 6 meters.

Otherwise, the vertical distance had a big impact on this barrier system. Then, to calculate, the vertical distance used the formula of drag force and pressure.

$F = 1.463775.\rho.v^2.d.h.a^{-0.435}.$ $exp[(0.0608 + 0.1425b)e^{-0.519a}]$
Diameters of bamboo = 3 meters High of bamboo = 15 meters

P.A = F

5.875*(3*15) = 264,375 kN

$$264{,}375 = 1.463775 * 1.22 * 69{,}44^2 * 3 * 15 * a^{-0.435} * exp[(0.0608 + 0.1425 * 2)e^{-0.519a}]$$

$$0.6822 = a^{-0.435} * \exp(0.3458 * e^{-0.519a})$$

The value of b ignored

$$0.6822 * a^{0.435} = \exp(0.3458 * e^{-0.519a})$$

$$\ln(0.6822 * a^{0.435}) = 0.3458 * \exp(-0.519a)$$

The researcher calculated the value of formulation above by using two curves and found the intersection.

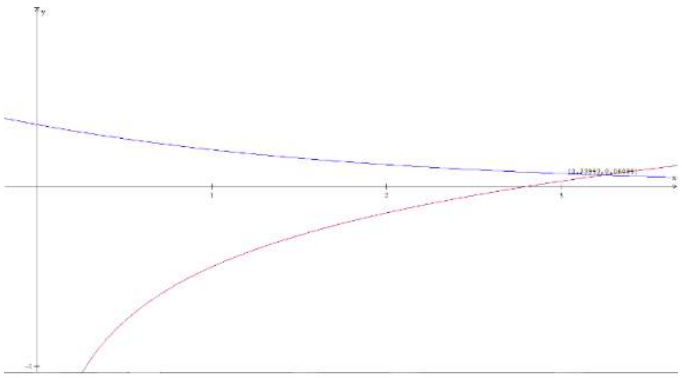

Figure 17. The curve to calculate the value of a (constant)

From the curve, Red curve [value of : $\ln(0.6822 * a^{0.435})$] and blue curve [the value of : $0.3458 * \exp(-0.519a)$], the values obtained is : **A = 3.243.**

So, from the equation of A = A' xd = 3.243*3 meters, the value of A' (constant) would be in 9.729 meters ≈ **10 meters.**

From the above calculation, it can be concluded to make the barrier system used bamboo, it should be planted in is a maximum distance of **6m x 10m** in order to work on the forces that have been previously calculated. The result of the above calculation indicated that the clumps in the rearmost row still safe and clumps on the front row would be burned on the pyroclastic flow conditions occur. On another side, if we made the distance of the row more closely would reduce the number of rows damaged.

4. Analyzing of Probabilities Generated by the Bamboo Levee's System Used the Software Simulation

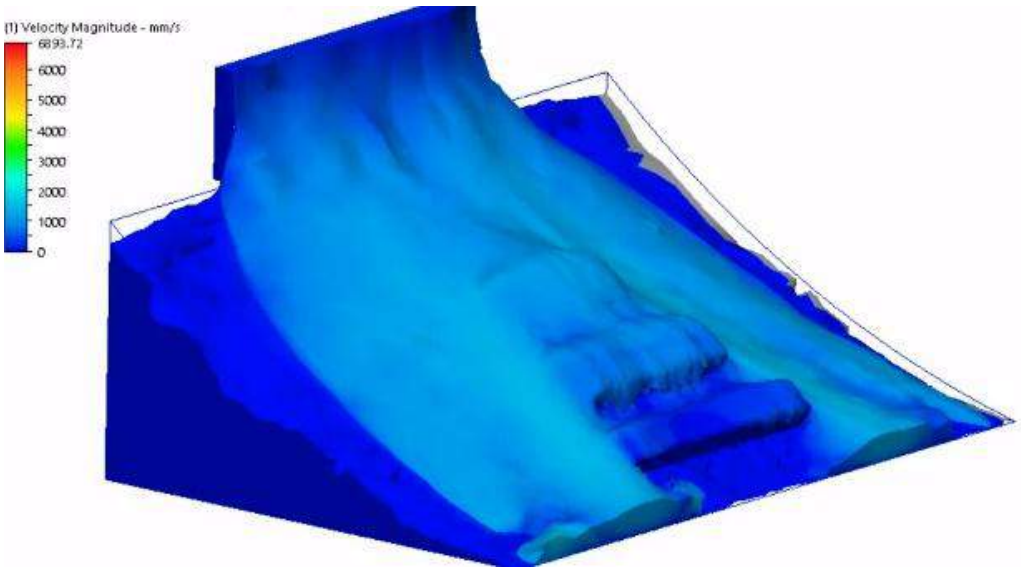

Figure 18. The final results of simulation the pyroclastic flow passing through the bamboo.

From the simulation results above, the average condition (most often occurs) obtained the affected area is about 40-50% (its seen from the end of the simulation in the figure above). Data could not be obtained accurately because the conditions are not steady-state or fluctuated.

To obtain a probability of occurring, we used the standard normal distribution approach for this eruption to occur naturally. The calculation uses the standard normal distribution applies the standard normal distribution table of numbers that have been defined. Probability analysis using the normal distribution is as follows.

Table 4.1 The distribution of percentage and the probabilities that could happen in that system using normal distribution theory

The percentage of damage area (%)	Zx	Probability of occurrence
0-20	-2.25 ; -1.25	0.1056-0.0122 = 9.3%
21-40	-1.2 ; -0.25	0.4013-0.1151 = 28.6%
41-60	-0.2 ; 0.75	0.7734-0.4207 = 35.3%
61-80	0.8 ; 1.75	0.9599-0.7881 = 17.18%
81-100	1.8 ; 2.75	0.997-0.9641 .3%

Based on the results of these calculations, would have taken the percentage of damage that has the highest chance of occurrence, the damage amounted to 41-100% with 55.78% probability of occurrence.

5. Desain Area of Natural Barrier Using Bamboo in Merapi Volcano

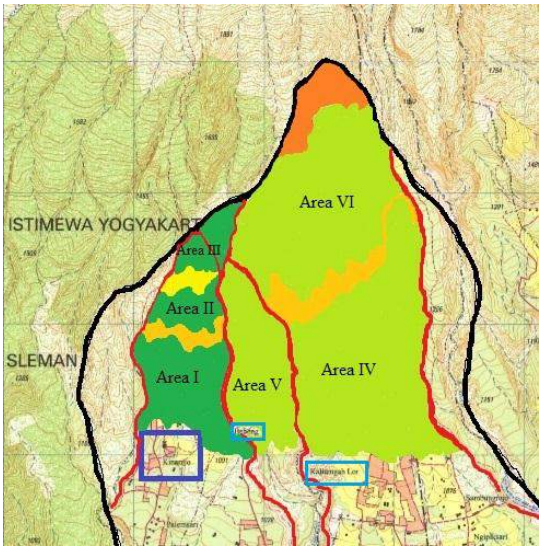

Figure 19. The design area of natural barrier in the Khendil's Hill and Kinahrejo peaks (±5.489.583 or 548 hectares). The researcher made the area with considering of contour, soil condition, natural growth bamboo's population, and lithology.
Source: The local government in 2012.

6. Soil Condition In Research Area

The researcher used the soil sampling and laboratory check methods to determine the contents of soil around research area. The soil sampling was taken from several areas in Khendil's Hill (southeast area of Merapi volcano). Also used the observation method to know the condition (lithology) in that area. So, from the result of laboratory check, it can be concluded if the bamboo in growth well in the focus area caused by the nutrition of soil.

Table 6.1 The soil contents of soil sampling in Khendil's Hill using the laboratory check

Contents / Value	N (total) %	P (available) ppm	K (available) me/100g	pH H_2O	Water content %
Minimum	0.04	428.72	0.08	5.56	7.47
Maximum	0.12	677.03	0.11	5.88	23.38
Average	0.23	893.42	0.21	6.18	42.12

Conclusion

1. Bamboo clumps can be used as a natural barrier of pyroclastic flows as shown by simulation of the bamboo plantation which can reduce the damaged area by 40-50%.
2. The bamboo clumps could grow effectively depend on vegetative bamboo growth rate as revealed by simulation analysis.

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LAND CONSOLIDATION FOR MERAPI SLOPE AREA AFTER MERAPI ERUPTION FROM LOCAL WISDOM PERSPECTIVE

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Abstract

After eruption Merapi 2010, many problems have related to the ground occurred in Sleman district. The problem after the eruption of them is a loss of document owned by the community and the pin of the land boundaries between that area. Pattern space areas Merapi divided into 4 zones transverse from the top of was savanna zone collectively, spill over zone, zone the cultivation and zone occupancy. Until now the policy taken the government is to do re-existence and land consolidation in the affected area of eruption Merapi. The further studies are required so that can be applied in the that experienced similar phenomenon what is happening in affected eruption Merapi. Consolidated land in Yogyakarta, especially in the after eruption Merapi are close with local wisdom knowledge so pressing incident. This study focused on the victims of the eruption Merapi the cultivation and zone occupancy. Zone cultivation referred to are the area that is used for farming while zone occupancy is a residential area. This report is written with study library of various literature and associated research, where the results of the study are the foundation for conducting observations field. Research is aimed to determine the influence of local wisdom in taking a decision to do consolidated land in the after the eruption. Expected results from the study are to know the links between the role of local wisdom the consolidation land and the return of land rights and the pin of the land in the after Merapi eruption.
Keywords: Keywords: Land Consolidation, Local Knowledge, Merapi Eruption, Zone The Cultivation, Zone Occupancy

1. Main text

Javanese, land is considered as one important thing, because of Javanese is an agrarian which has an equal value with human pride (Soedarjo, in Anggraeni 2012). Mount Merapi erupted in 2010 that caused damage to various infrastructures in *Daerah Istimewa* Yogyakarta and Central Java, agricultural land and facilities, and infrastructure in the area.

Daerah Istimewa Yogyakarta has a certain management land system and it is different with the others. According to Anggraeni (2012), there are 3 types of land :

1. The land is used and owned by Western (Europian and East Asian), is converted to rights of the land according to Basic Ordinance Laws (*Undang-Undang Pokok Agrari*) that based on the law of the national agrarian.
2. The land belongs to the sultanate and *Pakualaman* which has been owned the status by individual or village rights and is controlled by local regulation.

3. The land belongs to the sultanate and *Pakualaman* and under the authority of sultanate and *Pakualaman* which in terms of mastery and usage are regulated by Rijksblad Sultanate and *Pakualaman*.

1.1 Data of Damage Caused by Mount Merapi Eruption

Daerah Istimewa Yogyakarta, especially around Mount Merapi, has a certain history, after the eruption, management of earth and land. Behind its beautiful, actually, mount Merapi consist of damage. Mount Merapi is one of an erupted volcano that occurs more than 20 times, since the 1900s, such as 1930, 1961, 1969, 1954, 1997, 2001, 2006, and 2010 (Nugroho and Sutaryono, 2015). The eruption in 2010 is the biggest eruption which causes some serious problems with physical damage in the area around Mount Merapi, especially the land.

The eruption occurred in 2010, causes a huge damage at 4 districts (Sleman, Magelang, Klaten, and Boyolali) in *Daerah Istimewa* Yogyakarta and Central Java. A few years later, a type of eruption of Mount Merapi is effusive, which is seen from the existing of a cluster of lava, which is formed a hot cloud (Wedhus Gembel), that is slid up to 7 km radius (BNPB, 2011). A number of victims and damages of every district can be seen on the map.

Pict 1. The map of districts and the victims, refugees, and damages that are caused by Mount Merapi. Source : bnpb.go.id

The data from BNPB shows that Sleman district is the worst damage with 2.339 houses in Cangkringan and Ngemplak sub-district, which the damage is caused by a pile of sand

and hot clouds that effecting in damage to the structure of the house, especially the house made of wood (BNPB, 2011).

Tabel 1. Result of damage eruption price

No	Sektor	Kerusakan (Rp. Juta)	Kerugian (Rp. Juta)	Total Kerusakan dan Kerugian (Rp. Juta)
1	Pemukiman	599.307,54	27.343,60	606.651,14
2	Infrastruktur	581.534.13	125.937,97	707.472,10
3	Ekonomi	403.065,92	1.289.445,25	1.629.511,17
4	Sosial	89.427,93	33.044,27	122.472,20
5	Lintas Sektor	12.030,00	396.728	408.758,00
	Total DIY + JATENG	**1.685.365,52**	**1.872.499,0**	3.557.864,61

Source : BNPB, 2011

1.2 An Analysis of Post-Eruption Merapi

The characteristics of spatial the mount Merapi area are divided into 4 zones: *savanna zone collectively spills over the zone*, *zone the cultivation*, and *zone occupancy*. The most detriment is zone residence. The agricultural land is also the hot clouds subject which affects the damage to a productive agricultural land around Mount Merapi.

Pict 2. The damage of residence is caused by hot clouds
Source: BNPB, 2011

Gambar 3. Lahan pertanian terkena dampak abu vulkanik

The materials are volcanic, hot clouds and a flood of lava come out since the eruption, that was split out by mount Merapi and damaged the land and infrastructure. The damages are in various places, in conversion disaster-prone areas (KRB) as well as areas that are outside hazard-prone areas and conservation areas.

The post-eruption volcanic material causes some problems such as the boundaries of land ownership are lost. Reorganized of land ownership is necessary to do, local government and the general public. The damage is also occurred in agricultural and forest, especially the national park of Mount Merapi. Recovery of people's land can use agroforestry Engineering approach, while the governments can use forestry approach, that in the form of reforestation of protected forests, and areas of water and to recover the biodiversity of the area (Rahayu *et al*, 2014)

Pict 4. The example of recovery of land with agroforestry method on society's land
Source: Rahayu et al, 2014

1. Local Wisdom in Land Consolidation

Land consolidation includes various restructuring the land, including the rights become necessary and directly involved the owner itself. The purpose of land consolidation is the realization of mastery and orderly use in accordance with the ability and its function in the land order (Hasni, 2008).

According to Hasni (2008), the rule of land consolidation, based on BPN (*Badan Pertahanan Nasional*) number 4, 1991 about land consolidation is stated as:

- Land consolidation is the land policy regarding restructured mastery and land usage for development purpose, in improving the environmental quality and maintenance of natural resource that is involved the society.
- Society participation active in realizing the agreement of land ownership rights and land tenants. The country that becomes the object of the land consolidation (PKT) to relinquish rights to land and mastery the land, that some of them reorganized into a new unit and will be returned to people and some others for a donation of road infrastructure and other facilities, and financing implementation of consolidation.
- Giving rights to a new land that conducted in accordance with the laws which applies a particular provision relief for participants of the land consolidation (PKT) about finance obligations.

Daerah Istimewa Yogyakarta has certain rules about mastery and land usage which exist in Rijkzblad sultanate and P*akualaman*. There is an institution of the palace that is worked in taking care of the land problem, that is an institute of *Kawedanaan Ageng Purnakawan Wahono Sarto Griyo*. One of the institutes in the palace that determines the land of palace policy (Anngraeni, 2012). Application of land consolidation in the area of the subject to the disaster of Mount Merapi is one of the efforts to return the area that can be reused by the society. Land consolidation is important in raising up an awareness about the importance of the arrangement of mastered, owned, and reused the earth, which is a simple philosophy that underlying land consolidation. The land consolidation is the best done in the area of post-disaster because can build a relation between elements of land. The increasing of efficiency and usage productivity the use of land that is included orderly and regularly of mastery and usage of the land will be reached if society be the participants who agree with the concept of land consolidation (Nugroho and Sutaryono, 2015)

Acknowledgements

A thank you from the writer to all of the participants who involved in helping to solve the problem.

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LAND CONSOLIDATION AS A SOLUTION FOR DENSELY POPULATED AREA (CASE STUDY IN KOTAGEDE YOGYAKARTA)

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Abstract

The growth of natural settlements, in the absence of land planning and arrangement often creates problems with space utilization in densely populated areas. The high building density without regard to road accessibility, the availability of open space and the availability of shared space not only affects the low level of environmental health but also affects the level of community vulnerability in the event of a disaster. The research was conducted in densely populated area of Kotagede. The research method is done by spatial approach using Geo Eye Image and conducting field survey. The results showed that the growth of settlements without land control caused high levels of vulnerability where 41% of households are in a very vulnerable condition. Narrow road conditions and poor road accessibility also make it difficult for residents to evacuate in the event of a disaster. Control of land through land consolidation can certainly be used as a solution to organize residential areas and reduce the impact of risk in the event of a disaster.
Keywords: land control, land consolidation, Disaster risk reduction

A. Background

The natural growth of settlement without any rules of the land utilization for street access, public facility, and social facility causes densely populated settlement and the decreasing of the environment quality. This condition is mostly found in urban and sub urban areas where they become the center of economy and settlement.

The regulation and the control of land utilization must be applied. The solution of this problem is zoning or the policy of land consolidation toward the densely populated settlement or the region that is predicted to be densely populated settlement.

A study toward the settlement that grows naturally is done at *Sayangan Hamlet*, *Jagalan, Banguntapan Bantul* because this area was densely populated settlement in 2006 when the earthquake occured at *Sayangan Hamlet*. The level of population density reaches 11.941 people/Km^2 (Population Census, 2010) with close distance (around 1-2 meter), the narrow road (0,5 m -2 m) and the street is curvaceous. Because of the earthquake that occured on May 27th 2006, this region suffered from destruction. There were 150 traditional houses (*joglo*) and 88 houses that were destructed by the earthquake. The consolidation of land policy can be a solution for overcoming the densely populated settlement. This solution is expected to create qualified and sustainable settlement. But, this is a challenging solution to be applied.

B. Densely Populated Settlement in Kotagede

Sayangan Hamlet is one of the parts from the old Mataram Kingdom. This area is a center for economy and trading activity especially silver craft. In the past, *Sayangan Hamlet*

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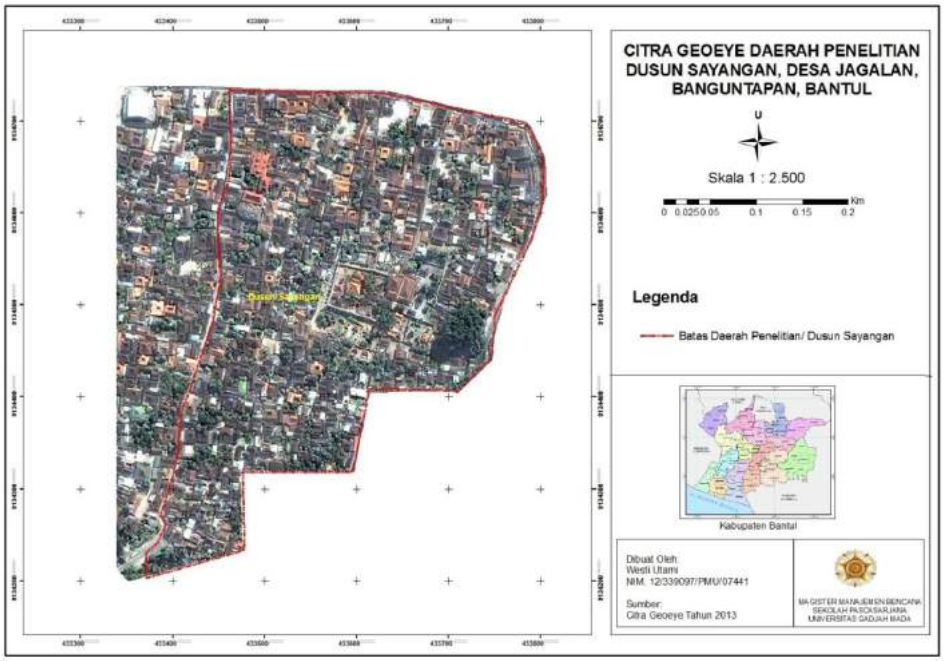
was inhabited by rich merchant. Because there were so many thieves at that time, the high wall was built to protect the kingdom. Nowadays, the high wall is fragile and this endangers citizen. This area is densely populated settlement with 3364 residents, 912 heads of family (The Monography of *Desa Jagalan*, 2013). The high densely populated settlement, the narrow street, the dense settlement pattern are the causes that this area is susceptive toward the earthquake. The houses that are located together, the minimum of opening space to avoid the remain of earthquake, the narrow aisle (0.5 - 2 m) and the high wall that is easily cracked will make the citizen difficult to evacuate themselves from the earthquake. This is the condition of *Sayangan Hamlet* from Geo eye Image that is depicted in picture 1.



Picture 1. Condition of Sayangan Hamlet from Geo Eye Image (Geo Eye, 2013)

C. The Problem of Dense Settlement

Based on the research that was done in 2014, it stated that From the opening space ownership census shows that 38,7% of households do not have open space and only 18% from 365 households have opening space for more than 100 m^2. The households who do not have opening space will find difficulty in evacuating themselves if earthquake occurs. The unavailable of opening space causes some hoeseholds are rather vulnerable in facing earthquake. From the census that is done, there are 127 houses (34,6%) that have wide access with road length for 1,5 meter. Only 8,2% and 6,5% of households who have road width of 3 meter. The households who are in narrow street are in the center of dense village. In order to reach this area, people usually walk, ride bicycle or motorcycle. The narrow street is impossible for two motorcycles can pass. Some wide streets (more than 3m) and the good condition of streets are owned by several houses that are in Modokoro street, the

west side street of market, the road to mataram mosque, and the road of border Sayangan and Bodon village. Based on cross tabulation result, the level of vulnerability in environment and physical vulnerability shows that most residents (154 households) are vulnerable in physical and environment aspect. They are in level 2 of vulnerability level. There are 13 households who are extremely vulnerable physical and environment. These 13 households should be very careful if there is an earthquake. They must be very careful if they evacuate themselves because they are in the vulnerable house and there is not opening space around their house. The narrow street and the unavailable of opening space will make them difficult to evacuate if there is an earthquake (Utami, 2014).

From the previous research shows that many densely populated settlement experiences environment degradation and the high susceptive health environment. So, if the earthquake or wildfire occurs, this region has a higher risk compared to other regions. The picture of densely populated settlement and citizen is presented at picture 2.

- densely populated settlement very hight
- do not have open space

road length only 1 - 1,5 meter

Picture 2. Condition in Sayangan Hamlet from Geo Eye Sattelit

Narrow road (1 – 1.5 m)

Densely populated and unavalaible open space

Picture 2. Densely populated settlement in Sayangan Hamlet

D. Land Consolidation as the Solution for Densely Populated Settlement

The densely populated settlement problem in *Sayangan Hamlet* can overcome by zoning solution and also land consolidation. The land consolidation can be done toward the cluster area that still has open area by removing the barrier wall so the street access is wider, having sufficient light, and having environment that can be maintained. While, for the house that has limited and narrow land, the consolidation of horizontal land will be hard to do. In order to overcome densely populated and old settlement, the vertical land consolidation can be done.

Picture 3. Land Consolidation In Sayangan to support avaibility open space and road save

The horizontal land consolidation can be done through: cutting, shifting, breaking, exchanging, combining, and eliminating. The easier way to do is by unpacking the barrier wall and it can be used to broaden the land and open a new land. The arrangement of the land ownership, mastery, use and utilization and also the magnitude of land consolidation, can be done from the funding of government (*APBN /APBD)* or from the society itself such as: land contribution for development /Sumbangan Tanah Untuk Pembangunan (STUP) and land replacement cost of development/Tanah Pengganti Biaya Pembangunan (TPBP) scheme. For *Land Consolidation* participants who do not have land for *STUP* and *TPBP* can replace with the money based on agreement. Condition Sayangan Hamlet with fragile walls and narrow road is presented at picture 3.

The land consolidation must involve the local government, land office, and community. The local governmnet has authority to organize the layout and zoning area and it also has role in infrastructure such as road development, the water tunnel, and others.

The land office has an authority in managing the land ownership, authorization, use and utilization. The division of authority and organization in applying LC follows the LC implementation that consists of control team (province level), coordination level (regency/city level) and the task force of unit.

The process that must be done in land consolidation must be through socialization, agreement of community/*Land consolidation* participant, the measurement and mapping, the location establishment, object and subject identification, the topography measurement and land use mapping, block plan making or pra design spatial, discussion about new settlement arrengement, the release of the claim of land from the participant, the land affirmation as land consolidation object, relocation/stacking out/the design movement to field, the construction/formation of road body, the redistibution/publication of land right and certification decree.

While for the densely populated settlement in *Sayangan Hamlet* with the size of building area is around 40 m^2 and the building condition that is not good, the settlement arrangement can be done through vertical land consolidation.

E. Conclusion

1. The uncontrolled settlement that is not maintained well causes the emerge of settlement and the crowded amount of citizen. This condition can cause the degradation of environment and health.
2. The crowded settlement with narrow accessbility and also the limitation of opening space has a high correlation toward the physical vulnerability and the environment so if there is disaster (earthquake/fire), this region has a higher risk.
3. The settlement in *Sayangan Hamlet* is unique for this region was established since the Mataram kingdom with traditional joglo building and old wall that surrounds house and citizen's garden, so it forms labyrinth with narrow street.
4. The policy that can be done for the settlement that has room but it is closed by the wall can be done through land consolidation by demolishing the wall so it can be used for dilating the street and creating the opening space for public.
5. The land consolidation for densely populated settlement and the settlement that is predicted will be dense is necessary to be done for creating a better quality ennvironment. The optimum use of the land utilization will also create a sustainable environment.
6. For the dense population that has size of land/house 40 m^2 and does not have open space with the unoroper house condition can be applied through vertical land consolidation.

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One of the consequences of globalization is the change of urban and rural area throughout the world, including Indonesia. Globalization boost up urbanization, leaving problems of traffic congestion, the emergence of slum areas, and the degradation of quality of life on social and spatial aspects. On the other hand, globalization also changes the rural area: it is abandoned, massive agriculture land conversion is inevitable, and it also loses its capabilities as urban buffer zone. Nonetheless, this condition seems inevitably. Statistic shows that by 2045, urban population is predicted as 82% from total number of population in Indonesia. This condition indicates that sustainable spatial planning for urban area is crucial. Land consolidation for urban renewal is needed to achieve inclusive city, and to improve capabilities of the city to adjust with those changes, whether from spatial perspective or social and economic. With the current state of urban growth, land consolidation is needed to readjust land utilization, use, tenure and ownership, specifically in developing country such as Indonesia.

One of the parameter of sustainable development also requires sufficient national food production. Food resources are crucial to ensure food security for a nation. This condition can be achieved through agricultural intensification by implement efficient technology, or by agricultural extension through agricultural expansion. Food security requires sufficient agricultural area, both in its quality and its extent ...

Limited spatial allocation for settlements, reinforced by the need of settlement area as one of the consequences of urbanization, triggers the emergences of slum area and squatter settlements in urban areas. Vertical land consolidation (VLC) is one of the alternative solutions to provide proper settlement area with this limitation. VLC is one of the effective tools to deal with urban expansion, and should be integrated in spatial planning, both technical and juridical.

By this conference, we hope that sharing ideas, findings, critical thinking and experiences from participants with different backgrounds and expertizes can contribute to the development and improvement of land consolidation in Indonesia for better living improvement for everyone. Lastly, we hope you enjoy this program, and bring back many advantages from what we learn from this conference.

LCSSP Committee

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