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Modeling the changes of Paddy field to Residential in Pringsewu District, Indonesia

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ABSTRACT

The increasing number of population which always increases every year and the existence of regions experiencing expansion in Lampung Province have an effect on the development of regional autonomy development. As the population increases, this area needs to be studied further both physically and socially. An increasing population will certainly increase land use for residential in an area. Meanwhile, the existing land availability is becoming increasingly limited. The increasing number of population will certainly increase the area of the residential area. Meanwhile, for the city area, it is necessary to plan land use as the development of various infrastructure needed by the community. The increase in population encourages changes in land use in urban areas as a form of meeting community needs. This study aims to determine the area of paddy fields that have changed into residential, the factors that affect the change from paddy fields to residential, and determine the patterns and directions of residential. This research was conducted using an overlay technique with analysis using a spatial approach. The results of the research are in the form of land use change models in 2015-2020, besides physical and non-physical factors that cause changes in paddy fields to residential and residential patterns that occur are clustered with the direction of development of residential to the west approaching the city center and public facilities. The conclusion in this study is that by making this model it will be easier to see the distribution of data, factors and patterns of land use change.

Keywords: Model, Spatial Data, Land Use, Distribution Pattern

Introduction

A geographic information system is a set of systems consisting of hardware, software and users who work together in analyzing geographic data with more accurate data results than using conventional systems (Bonham-Carter, 2014; Laka *et al.*, 2017). Using the results of the interpretation of aerial photographs (landsat), survey results, statistical data, and maps then processed using a computer equipped with Geographic Information System (GIS) software (Machault *et al.*, 2011; Modara *et al.*, 2014; Toscano *et al.*, 2019).

Modeling using a Geographical Information System is a computer system that has the ability to build, manage, store and display geographically referenced information, such as data identified by its location in a database (Prahasta, 2001; Burrough *et al.*, 2015). Based on the benefits of this GIS technology, it can be seen that every year it is clear what changes in land use occur (Rozenstein and Karnieli, 2011; Ridho and Taryono, 2018). The information

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presented from modeling using GIS is also very easy to understand by the general public (Swetnam, *et al.*, 2011; Mas, *et al.*, 2014). It is hoped that this land use change modeling can be used to carry out development policies in the future (Pribadi, 2006; Syafitri and Susetyo, 2019).

Model can be interpreted as a representation of spatial reality carried out by a modeler. In other words, the model is a link between the real world and the world of thinking which is done with the aim of solving a problem (Filatova, *et al.*, 2013; Lusy, *et al.*, 2020). The process of describing or representing a model is known as modeling. Spatial data modeling is a process of thinking through logical sequences. Modeling can also be explained as a process of receiving, formulating, processing, and displaying real world perceptions (Fauzi, *et al.*, 2009; and Setiawan, 2016).

The use of land in an area is a form of meeting community needs (Rupini, *et al.*, 2017; especially land use for residential (Moniaga, 2011; Sitorus, 2018). Residential is the main need for people in their lives. A good residential shows the level of welfare of the population in an area. In addition to its function for residential as the main need, land is also used to build infrastructure that will facilitate people's accessibility in their daily lives. People will tend to choose residential locations in areas close to urban areas because urban areas have adequate facilities to support community activities in meeting their daily needs (Jamaludin, 2015).

Agricultural land is the main target in meeting the need for shelter. So this encourages changes in agricultural land to non-agricultural, especially residential (Benu and Moniaga, 2016). Agricultural land is a very important sector to meet the needs of society and the state (Lambin, *et al.*, 2000; Ayu and Heriawanto, 2018; Mu'adi, *et al.*, 2020). This fact is one example of land use change which is increasingly worrying about its existence if there is no control from the government and the community (Kristianto, 2015; Indonesia, *et al.*, 2017). Land is a resource that will become increasingly scarce from year to year if its existence is not maintained, then humans themselves will suffer, especially for future generations (Raharja, 2012; Haumahu, 2018).

Land change is a change in the function of part or all of the land area from its original function to another function and has an impact on the environment and the potential of the land (Anggita; Ayu and Heriawanto, 2018). Increased population growth is one of the causes of increased land use, because every activity carried out by humans requires land (Harjanti, *et al.*, 2002; Wicaksono and Widiyastuti, 2019). The process of changing the use of paddy fields can take place more quickly if the cause is to meet the needs for the development of residential areas, industrial areas, trade areas, educational areas, public facilities and infrastructure, which are programmed by the government (Miswar, *et al.*, 2020).

The increasing need for land for both community and development needs has increased pressure on land resources in Indonesia (Hidayati, 2017). Solving these problems requires a strategic plan for land management and administration, so that the sustainable use of land can be controlled and prevent negative impacts (Sitorus, 2018).

The population that continues to increase is a problem of social conditions that generally occurs in developing countries (Nugroho, 2011; Nasution, 2014). In general, developing countries have a high population growth rate (Birdsall, *et al.*, 2001; Hanushek, 2013) that can cause various problems (Rustiadi, 2001; Lestari, 2017). The population number changes from time to time. Population growth is influenced by several factors, such as births, deaths and population movements (Mantra 2000; Guo, *et al.*, 2005; Nyoman, 2013; Wijayanti, 2020).

The development of the population of countries in the world, especially developing countries, has been very rapid in the last decade (Solihat, 2018). The very rapid increase in population in a country will cause various problems (Ehrlich and Holdren, 1971; Peterson, 2017; Arvianti, *et al.*, 2019). Examples of existing problems include increasing unemployment, increasing poverty rates, food shortages, the emergence of slum residential, and increasing space and environmental needs (Suratha *et al.*, 2017).

Data from the Central Statistics Agency, the total area of Lampung Province is 35,288.35 km^2. The total population recorded in 2019 is 8,447,737 people, with the population density is 240 people per km^2. The population in Lampung Province has increased by 0.5% in a period of 4 years (Nursetianingrum, 2018). The high growth rate in an area is followed by the number of residential growth that continues to increase (Jayadi, *et al.*, 2017).

The increasing number of population which always increases every year and the existence of regions expansion in Lampung Province have an effect on the development of regional autonomy de-

velopment (Utami and Afriliana, 2018; Novita, 2020). Areas that play a role as centers for building facilities result in population growth approaching the expansion area which can cause changes to the existing land in the region (Nasional, 2007; Widodo and Winarti, 2020). The development of public facilities, such as educational facilities, health facilities, industrial facilities, trade, and housing which is increasing must be accompanied by an increase in population every year (Wahyuningsih, 2012).

Pringsewu Regency is one of the regency in Lampung Province which experiences population growth every year, especially in Pringsewu District (Miswar *et al.*, 2020). The increase in population has resulted in the area needing to be studied further both physically and socially (Rasyid, 2014; Husain, 2019). The population growth in the Pringsewu District area in the last 5 years can be seen in the following table.

Table 1. Total Population in Pringsewu District, 2015-2019

No.	Year	Total Population
1	2015	81.405
2	2016	82.327
3	2017	73.431
4	2018	84.088
5	2019	81.745
6	2020	82.142

Source: BPS Statistics of Pringsewu Regency, 2020

Based on Table 1, it can be explained that in 2015 the population in the Pringsewu District area was 81,405 people. The population is always changing every year. Meanwhile, in 2019 the population in Pringsewu District increased to 81,745 people. Likewise in 2020 the number continues to grow.

An increasing population will certainly increase land use for residential in an area (Desianingtyas, 2015; Rupini, *et al.*, 2017). Meanwhile, the availability of existing land is becoming increasingly limited (Herlindawati, *et al.*, 2018). The increasing number of population will certainly increase the area of the residential area (Kodoatie, 2007; Syahpin, 2012). As for the city area, it is necessary to plan land use as the development of various infrastructure needed by the community (Tanaya and Rudiarto, 2014; Mahi, 2016; Soleh, 2017). The increase in population encourages changes in land use in urban areas as a form of meeting community needs (Wahyudi, 2009; Dewi and Sarjana, 2015).

The development of residential that occurred resulted in the conversion of land functions in an area (Affan, 2014; Prasada and Rosa 2018). Land is part of the physical scope consisting of climate, relief, soil, water, and vegetation as well as objects on it, as long as there is an influence on land use, including past and present human activities (Budi, 2015). From the above problems, a model is needed related to changes in the use of paddy fields that become settlements (Susilo and Sudarmanto, 2012; Kulsum, *et al.*, 2015) in Pringsewu District. Modeling using Geographical Information Systems (GIS) is currently growing rapidly and merging into an aspect of spatial planning and environmental development, including processing data on land use change (Dewan, *et al.*, Rahman, *et al.*, 2012; Al-shalabi, *et al.*, 2013).

Materials and Methods

The research method used is a pure descriptive research method or survey. According to Arikunto (2006) a purely descriptive or survey method is research that really only describes what is present or occurs in a certain area, field, or area. The data that has been collected is classified or grouped according to its type, nature, or condition. After the data is complete, the next step is to make a conclusion. The population in this study were all areas in Pringsewu District that experienced changes in the use of paddy fields into settlements. The sample was not used in this study, therefore this study is a population study. The materials used in this study include: spatial data, non-spatial data/attribute data, and literature data from related agencies such as Bappeda, Environment, Public Works, and BPS. While the tools used in this research are: a set of computers with ArcGis software that supports the process of making a map of the distribution and type of land, the camera used in taking the image data of the research location in the field, GPS to collect the coordinates of the research location, the printer used to print the results research in the form of a map. The variables of this study are changes in paddy field use, population, data on changes in land use from paddy fields to settlements, is a process of changing paddy fields into permanent or temporary settlements, settlement distribution patterns, and the direction of changes in land use from paddy fields to settlements. The stages in the research include: (1)

the mapping stage, (2) the search and data collection stage, (3) the data processing stage, (4) the data presentation and description stage, and (5) the map usage stage. The techniques used in collecting data include: (1) literature study, (2) observation or survey, (3) interviews, and (4) interviews. The data is then analyzed descriptively using a spatial approach based on the previously created model.

Results and Discussion

The results showed that in Pringsewu District there were four types of land use in Pringsewu District, namely residential, paddy fields, wetland agriculture and dry land agriculture. The area of land use in Pringsewu District in 2015 and 2020 can be seen in the following table.

Based on Table 2, the most extensive land use in Pringsewu District in 2015 and 2020 was paddy fields. The area of paddy fields is one third of the total area of Pringsewu District, namely 1,677.08 hectares (34.92%) in 2015 and 1,603.92 hectares (33.4%) in 2020. While the smallest area of land use is wetland agriculture which covers an area of only 2.41% of the total area of Pringsewu District.

Model of Changing the Use of Paddy Fields to Residential in Pringsewu District 2015-2020

Paddy Field Area of Pringsewu District

The land use change model in this case is the area of paddy fields in Pringsewu District in 2020, recorded at 1,603.92 hectares or 33.4% of the total area spread over 15 villages in Pringsewu District. In 2015, the area of paddy fields in Pringsewu District was 1,677.08 hectares, which means that it decreased by 73.16 hectares in a period of 5 years. The changing area of paddy fields in Pringsewu District can be seen in Table 3 and Figure 2.

Table 2. Land Use in Pringsewu District, 2015 - 2020

No.	Type of Land Use	2015 (ha)	(%)	2020 (ha)	(%)
1	Residential	1.365,84	28,44	1.489,13	31
2	Paddy fields	1.677,08	34,92	1.603,92	33,4
3	Wetland agriculture	115,73	2,41	1.709,89	35,6
4	Dry land agriculture	1.602,64	33,37		
	Total	**4.803**	**100**	**4.803**	**100**

Source: Land Use Map of Pringsewu District in 2015 and 2020.

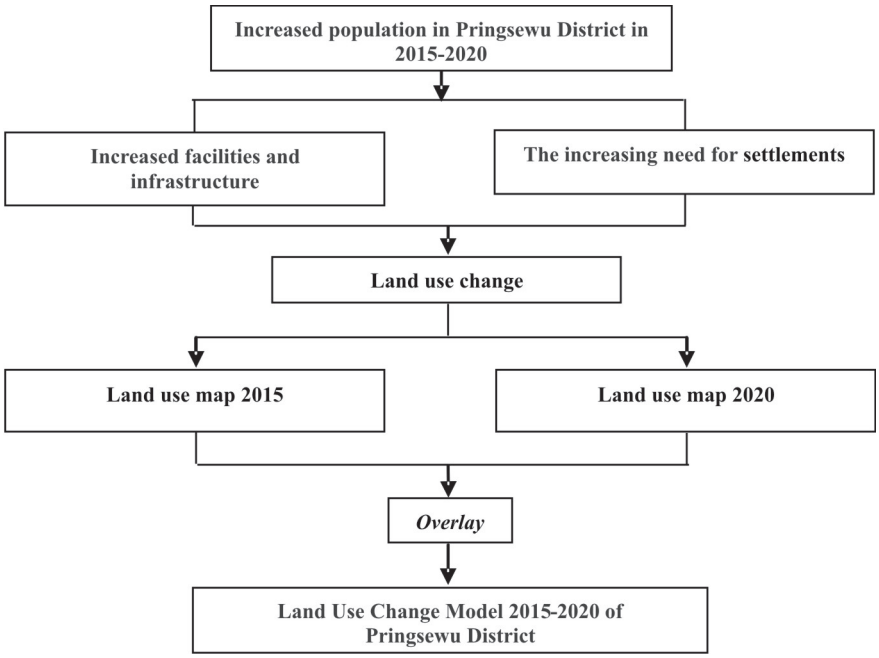

Fig. 1. Research Framework

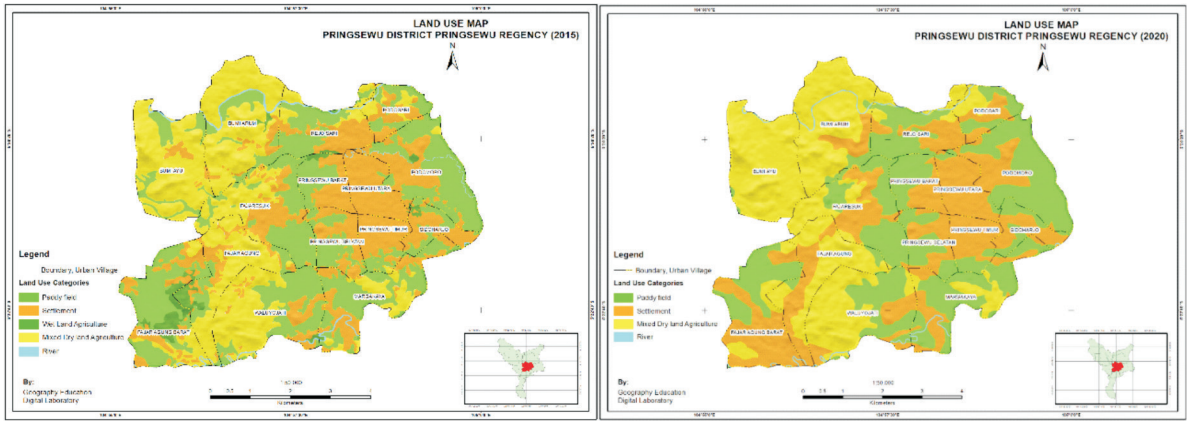

Fig. 2. Land Use Map 2015 and 2020

Based on data from Table 3, in a period of 5 years there has been a change in the area of paddy fields in each village in Pringsewu District due to changes in land use. The reduced paddy field area in each pekon can be seen in the following Table 4.

Table 3. Paddy Field Area of Pringsewu District 2015-2020

No.	Villages	Paddy Field Area (Hectares)	
		2015	2020
1	Pringsewu Timur	29,24	31
2	Pringsewu Selatan	86,49	99,10
3	Pringsewu Barat	70,76	96,75
4	Pringsewu Utara	4,2	12,25
5	Pajaresuk	188,81	201,53
6	Bumiarum	67,52	25,85
7	Podomoro	276,1	311,06
8	Sidoharjo	41,81	55,36
9	Rejosari	128,81	145,18
10	Podosari	63,3	53,96
11	Waluyojati	179,53	156,72
12	Fajar Agung	52,24	17,78
13	Fajar Agung Barat	221,11	157,59
14	Bumiayu	70,14	2,93
15	Margakaya	196,13	237
	Total	**1.677,08**	**1.603,92**

Source: Paddy Fields Map of Pringsewu District 2015-2020.

Based on data from Table 3 and 4, it is known that there is a reduction in the area of rice fields in 6 pekons in Pringsewu District, namely in Pekon Bumiarum, Waluyojati, Fajar Agung, Fajar Agung Barat, Bumiayu and Pekon Margakaya. Meanwhile, paddy fields that did not experience a reduction and instead increased were found in 5 pekon and 4 sub-districts in Pringsewu District. The distribution of rice fields in Pringsewu District in 2015 and 2020 can be seen in Figure 3.

Model of Changing Paddy Fields into Residential

Based on the analysis process of the existing information on the land use map for 2015 and 2020 which has been overlaid, it is known that the paddy fields that have been turned into settlements are

Table 4. Paddy Fields Area of Change in Pringsewu District 2015-2020

No.	Villages	Area of Changes in Paddy Fields	
		Total (ha)	(%)
1	Pringsewu Timur	+1,76	0
2	Pringsewu Selatan	+12,61	0
3	Pringsewu Barat	+25,99	0
4	Pringsewu Utara	+8,05	0
5	Pajaresuk	+12,72	0
6	Bumiarum	-41,67	2,48
7	Podomoro	+34,96	0
8	Sidoharjo	+13,55	0
9	Rejosari	+16,37	0
10	Podosari	+9,34	0
11	Waluyojati	-22,81	1,36
12	Fajar Agung	-34,46	2,05
13	Fajar Agung Barat	-63,52	3,79
14	Bumiayu	-67,21	4,01
15	Margakaya	-40,87	2,44
Area of Changes in Paddy Fields		73,16	16,13
Paddy Fields Area, 2015		1.677,08	100

Source: Paddy Fields Map of Pringsewu District 2015-2020.

205.53 hectares. Changes in the use of paddy fields to settlements in Pringsewu District in 2015-2020 can be seen in the following table.

Based on the research results, in 2015-2020 there was a change in the use of paddy fields to settlements covering an area of 205.53 hectares or 12.05% (Figure 3). Table 5 shows the area of paddy fields that turned into settlements in Pringsewu District, which are spread across all villages in Pringsewu District.

Table 5. Extent of Changes in the Use of Paddy Fields to Settlements in Pringsewu District, 2015-2020

No.	Villages	Total Area (ha)	(%)
1	Pringsewu Timur	4,60	0,27
2	Pringsewu Selatan	13,31	0,79
3	Pringsewu Barat	1,26	0,08
4	Pringsewu Utara	4,19	0,25
5	Pajaresuk	10,47	0,62
6	Bumiarum	4,75	0,28
7	Podomoro	4,17	0,25
8	Sidoharjo	4,97	0,3
9	Rejosari	4,16	0,06
10	Podosari	2,87	0,17
11	Waluyojati	29,25	1,74
12	Fajar Agung	35,54	2,12
13	Fajar Agung Barat	70,65	4,21
14	Bumiayu	0	0
15	Margakaya	15,33	0,91
	Total	**205,53**	**12,05**

Source: Overlay Map of Changes in the Use of Paddy Fields to Residential in Pringsewu District, 2015-2020

Factors Affecting Changes in the Use of Paddy Fields into Residential in Pringsewu District

Land changes in Pringsewu District always change every year, especially paddy fields that have turned into residential (Verburg *et al.*, 2011; Fei *et al.*, 2018; Liu *et al.*, 2019). This happens because population growth is always increasing every year and followed by the increasing need for land for shelter (Blaikie and Brookfield, 2015; Limited land for residential encourages people to establish new residential on land that was not previously residential land such as paddy fields.

Based on data from table 2 obtained from the analysis of the land cover map of Pringsewu District in 2015 and 2020 which have been overlaid, it is known that in a period of 6 years the residential land has grown wider than other lands that have decreased. Over a period of 6 years, the paddy fields in Pringsewu District have been transformed into residential covering an area of 205.53 hectares (Table 4). This condition is due to the existence of supporting and attractive factors so that people are motivated to build residential on paddy fields. These factors are classified into 2 types, namely, physical factors and non-physical factors. The description of the factors causing the conversion of paddy fields to residential can be seen below.

Physical Factors

Physical conditions including climatic conditions, slope, soil conditions, geological conditions and hydrological conditions affect land use in an area. This is one of the reasons people build buildings to live in. Pringsewu District has a topography with an altitude of 30 meters above sea level. This area is classified as lowland (Widiawaty and Dede, 2018). This region has a wet climate. Rain that occurs throughout the year makes this area suitable for agricultural land. Soil types in this region are podsol, andosol,

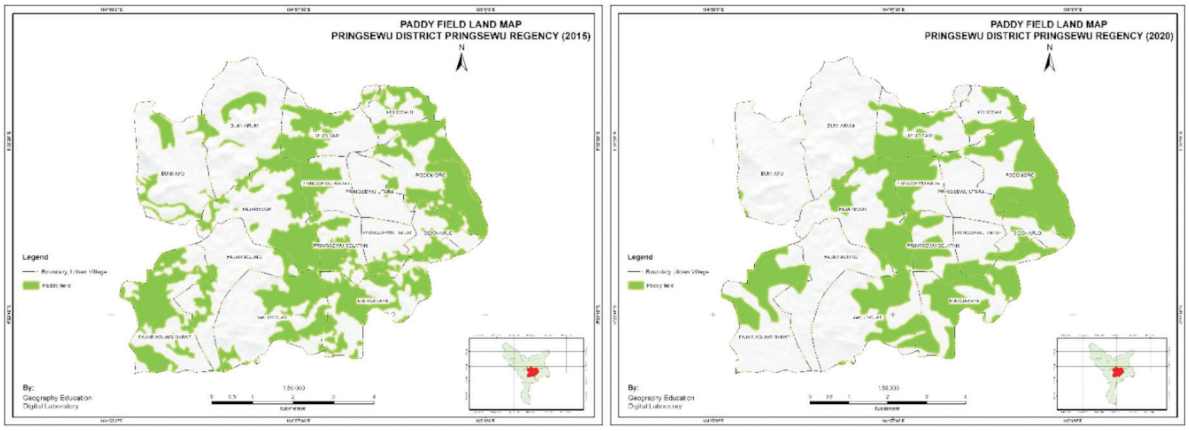

Fig. 3. Paddy Fields Map of Pringsewu District 2015-2020.

and latosol soil. The land is fertile soil so that it can be used by the community for gardening and for the manufacture of brick and tile craftsmen. The slope of this region varies with a slope of 0-65% consisting of flat to very steep areas. This area is dominated by a gentle slope, namely the 3-8% category which is 37.90% of the total area of Pringsewu District. The flat slope conditions make it a suitable place for residential settlements.

Non Physical Factors

Based on the results of interviews conducted with the owner of the house who built a house on a former paddy field, it is known that there are non-physical factors that are the reasons for building a house. The existence of public facilities is a supporting factor in changing the use of paddy fields to residential in Pringsewu District. Getting closer to public facilities is one of the push factors for the community to build a place to live. This makes it easier for residents to carry out their daily activities if they are close to public facilities. The intended public facilities include educational facilities, health facilities, economic facilities, and government facilities. Below is explained about the public facilities that support the change in the use of paddy fields into settlements in Pringsewu District.

Educational Facilities

Educational facilities are public facilities that are a motivating factor for residents to build new settlements. Pringsewu Subdistrict has quite complete educational facilities both public and private, including Elementary School/Madrasah Ibtidaiyah, Junior High School/Madrasah Tsanawiyah, and Senior High School/Vocational High School/Madrasah Aliyah. To be clearer, it can be seen in the table below.

Table 6 explains that there are quite a lot of educational facilities in Pringsewu District and are scattered to every village. Elementary School constitute the largest number of educational facilities and are scattered in almost every village. Pringsewu District which is the capital of Pringsewu Regency, so it is not surprising that there are many educational facilities in this area and it is dubbed the City of Education. This condition is what becomes attractive for building residential close to educational areas.

Health Facilities

The availability of health facilities is one of the factors that attracts people to build new residential. Complete facilities and affordable distances help residents to get maximum health services. The health facilities in Pringsewu District can be seen in the table below.

Based on Table 7, the health facilities in Pringsewu District are quite adequate. The location of the existing Public Health Center can be accessed easily from each existing villages. These adequate

Table 6. Educational Facilities in Pringsewu District

No.	Villages	Number of Educaional Facilities		
		Elementary School, equiv.	Junior High School, equiv.	Senior High School, equiv.
1	Pringsewu Timur	4	2	6
2	Pringsewu Selatan	4	6	2
3	Pringsewu Barat	6	-	3
4	Pringsewu Utara	2	2	2
5	Pajaresuk	4	1	-
6	Bumiarum	2	-	-
7	Podomoro	4	1	-
8	Sidoharjo	3	-	-
9	Rejosari	4	2	1
10	Podosari	-	-	1
11	Waluyojati	3	-	-
12	Fajar Agung	2	1	1
13	Fajar Agung Barat	1	1	1
14	Bumiayu	1	0	0
15	Margakaya	4	0	0
	Total	**44**	**16**	**17**

Source: BPS-Statistics of Pringsewu Regency

Table 7. Health Facilities in Pringsewu District

No.	Village	Number of Health Facilities		
		Public Health Center	Helper Health Center	Village Maternity
1	Pringsewu Timur	1	-	1
2	Pringsewu Selatan	-	-	1
3	Pringsewu Barat	-	-	1
4	Pringsewu Utara	-	-	1
5	Pajaresuk	-	1	1
6	Bumiarum	-	1	1
7	Podomoro	-	1	1
8	Sidoharjo	-	-	1
9	Rejosari	1	-	-
10	Podosari	-	-	1
11	Waluyojati	-	1	1
12	Fajar Agung	-	-	-
13	Fajar Agung Barat	-	-	1
14	Bumiayu	-	-	1
15	Margakaya	-	-	1
	Total	**2**	**4**	**13**

Source: BPS-Statistics of Pringsewu Regency

health facilities also attract residents to build new houses close to health facilities.

Economic Facilities

The existence of economic facilities can support the economic activities of the community in Pringsewu District. Below are the economic facilities in Pringsewu District, it can be seen in the following table.

Table 8. Economic Facilities in Pringsewu District

No.	Type of Economic Facilities	Total
1	Traditional Market	11
2	Credit Union	10
3	Bank	18
4	Store	453

Source: BPS-Statistics of Pringsewu Regency

Economic facilities help residents to meet their daily needs (Mohit, *et al.*, 2010; Harahap, 2013). Residents can buy daily necessities and sell agricultural products at the market (Kato, 2013; Cohen and Reynolds, 2015) in Pringsewu District. The economy of the population in Pringsewu District has also been helped by the existence of savings and loan cooperatives and banks. The location of existing economic facilities is very easy to reach. This condition encourages the community to build a place to live in that location.

Government Facilities

The availability of government facilities in Pringsewu District makes it easier for the community to carry out their daily activities. Government facilities are referred to as offices of government agencies. The offices of government agencies in Pringsewu District are quite complete including the

Table 9. Direction of Residential Development in Pringsewu District 2015-2020

Villages		Direction of Residential Development
1	Pringsewu Timur	South
2	Pringsewu Selatan	West
3	Pringsewu Barat	West
4	Pringsewu Utara	East
5	Pajaresuk	West
6	Bumiarum	West
7	Podomoro	North
8	Sidoharjo	East
9	Rejosari	North
10	Podosari	North
11	Waluyojati	West
12	Fajar Agung	South
13	Fajar Agung Barat	South
14	Bumiayu	Permanent
15	Margakaya	West

Source: Overlay Map of Changes in the Use of Paddy Fields to Residential in Pringsewu District, 2015-2020

Pringsewu District Office, the Pringsewu Regency Regional Government Office, the UPTD Education Office, the UPTD Public Works Office and other government agencies. The condition of the availability of adequate government facilities encourages residents to make settlements close to these locations.

Residential Patterns and Directions Due to Changes in the Use of Paddy Fields into Residential

Residential patterns provide information on where residents live in an area (Kustianingrum, *et al.*, 2015; Saraswati, *et al.*, Pelambi, *et al.*, 2016). Based on the results of research in Pringsewu District, the pattern of distribution of residential in this area is a clustered pattern. According to Bintarto (1976), clustered residential patterns are characterized by the distance between residential being close to each other (Esch, *et al.*, 2014; Esch, *et al.*, 2017). The pattern of clustered residential in Pringsewu District is seen to be closer to government and market areas. This condition is because the community chooses to build a place to live close to that location so that residents can easily fulfill their daily needs because it is close to existing public facilities.

Pringsewu District is classified as a lowland area because the area is flat and has almost the same elevation. Lowland areas are preferred by residents to establish a place to live. The lowland location is also suitable for agriculture, plantations, animal husbandry, industrial activities and business centers. Development in the lowlands is faster than in other regions. The existence of complete public facilities has pushed Pringsewu District, which is the capital of Pringsewu Regency, to become an economic center. This condition makes it easier for residents to carry out their daily activities in life.

The diverse population activities indicate the heterogeneity of the livelihoods of the population. Farmers, traders, laborers and office employees are examples of livelihoods in lowland areas (Jamaludin, 2015; Yempormas, 2019). People in lowland areas cultivate agricultural land using the rainy season because land conditions in this area are highly dependent on the season (Abdurachman, *et al.*, 2008; Idjudin, 2011; Arsyad Mulyani, *et al.*, 2015). People in lowland areas usually wear thin clothes because the temperature in Pringsewu District is

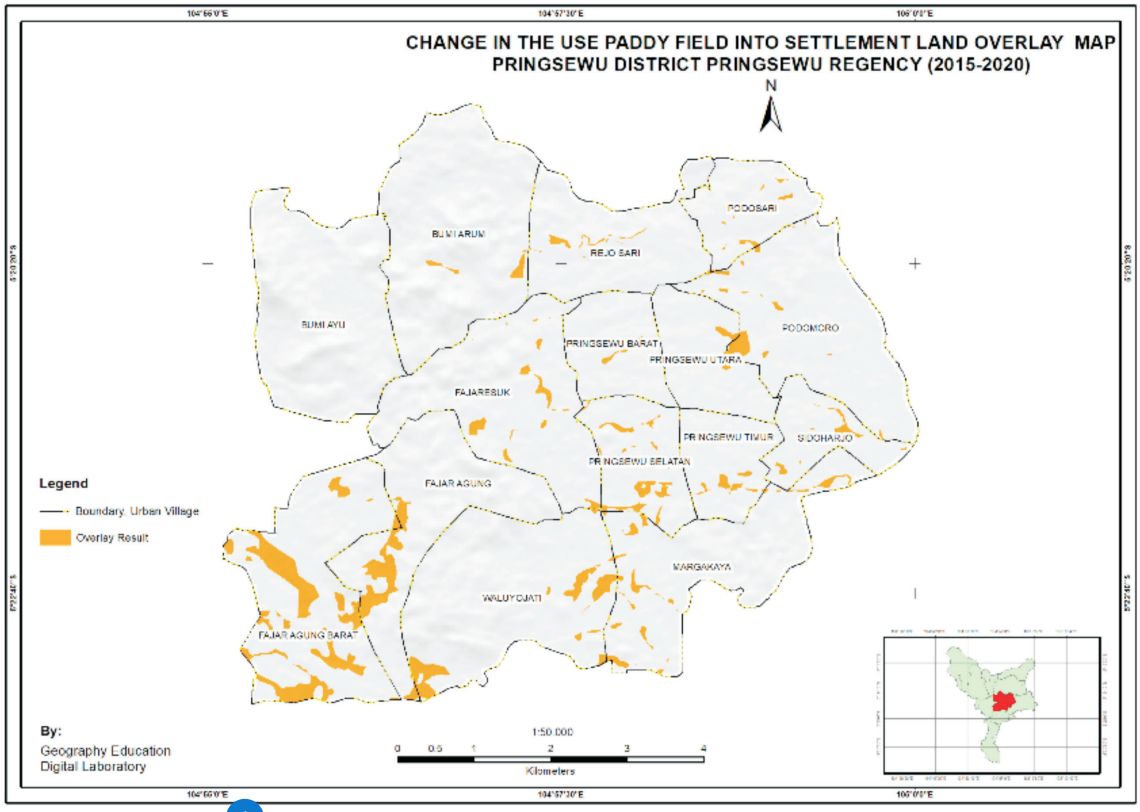

Fig. 4. Overlay Map of Changes in the Use of Paddy Fields to Residential in Pringsewu District, 2015-2020

quite hot. The shape of the houses in this area is made with lots of ventilation and the roof is made of earthen tiles to reduce the hot temperature.

The availability of activity centers and convenience in transportation in Pringsewu District is an attraction for residents to settle in this area (Prasetya and Sunaryo, 2013; Wulandari and Setyowati, 2020). Therefore, the population in this area is increasing and the demand for land for settlements has also increased. Other lands such as rice fields and forests that maintain the balance of nature are decreasing and replaced by multi-storey buildings (Fajriany, 2017; Serang, 2018; Husain, 2019). This can lead to reduced water catchment areas which can cause flooding in the rainy season and drought in the dry season. In addition, the conditions above can cause social problems such as unemployment, pollution, crime and other community diseases (Lailia, 2014; Sari, *et al*., 2021).

The population and all its activities are centered in the lowlands (Atta, 2017; Haq, 2020). Almost all of the big cities are located in this area, therefore the population is also bigger than other areas. From the explanation above, it is concluded that Pringsewu District is a clustered residential. The direction of residential development is the direction of increasing residential in area. The direction of residential development in Pringsewu District can be seen from the distribution map (Fadilla, *et al*., 2017; Aulia, *et al*., 2019; Trisno and Amin, 2021). Residential in 2015 and map of residential distribution in 2020. The direction of residential development in Pringsewu District is known based on the cardinal directions, namely west, east, south, and north. Based on the map of the direction of residential in 2015-2020, it can be seen the direction of the residential that occurred. The direction of residential development in Pringsewu District can be known through an overlay analysis of the 2015 residential map and the 2020 residential map so that the following data can be obtained.

Based on the map of the residential distribution of Pringsewu District in 2015, it can be seen that the direction of residential development from the Pringsewu District residential in 2020. The two maps are then overlaid so that we can know the direction of residential development that occurs in Pringsewu District. The area/development direction of residential in Pringsewu District in 2015-2020 can be seen in the following table.

Based on data from table 9, it is known that the direction of residential development in Pringsewu District in 2015-2020 consists of east, west, south, north, and there is one village that has not experienced a change in residential direction. Based on the explanation above, it can be concluded that in Pringsewu Sub district, there is a more dominant development in the direction of residential towards the west. This condition is because the existing villages have developed more to the west than to the other directions. Many residents build houses near the city center which are close to public facilities and the land previously used was rice fields. So that it triggers the development of residential due to the conversion of paddy fields into buildings.

Conclusion

Based on the results of the research that has been done, the following conclusions can be drawn.

1. The area of paddy fields that turned into settlements in Pringsewu District during 2015-2020 is 205.53 hectares or 12.05% of the total area.
2. The factors causing the change of paddy fields to settlements in Pringsewu District consist of two types, physical factors and non-physical factors. The dominant physical factor is the slope. Most of the slopes in Pringsewu District fall into the sloping category with a slope class of 3-8%. Meanwhile, non-physical factors are caused by the existence of adequate public facilities that encourage people to build houses closer to public facilities.
3. The residential pattern that occurs in Pringsewu District is classified as a clustered type. The residentialpattern is centered in Pringsewu District because the distance between residential points is very close. Whereas the direction of residential development in Pringsewu District is towards the west approaching the city center and public facilities and so that accessibility to agricultural areas is easier.

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