

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

Dedy Miswar<sup>1\*</sup>, Agus Suyatna<sup>2</sup>, Wan Abba Zakaria<sup>3</sup>, Endro P. Wahono<sup>4</sup>, Yarmaidi<sup>1</sup> and Diana Ardiyanti<sup>1</sup>

<sup>1</sup> Department of Geography Education, University of Lampung, Indonesia

<sup>2</sup> Department of Physical Education, University of Lampung, Indonesia

<sup>3</sup> Department of Agriculture, University of Lampung, Indonesia

<sup>4</sup> Department of Civil Engineering, University of Lampung, Indonesia

(Received 6 August, 2021; Accepted 23 September, 2021)

## 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

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<sup>2</sup>. The total population recorded in 2019 is 8,447,737 people, with the population density is 240 people per km<sup>2</sup>. 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*

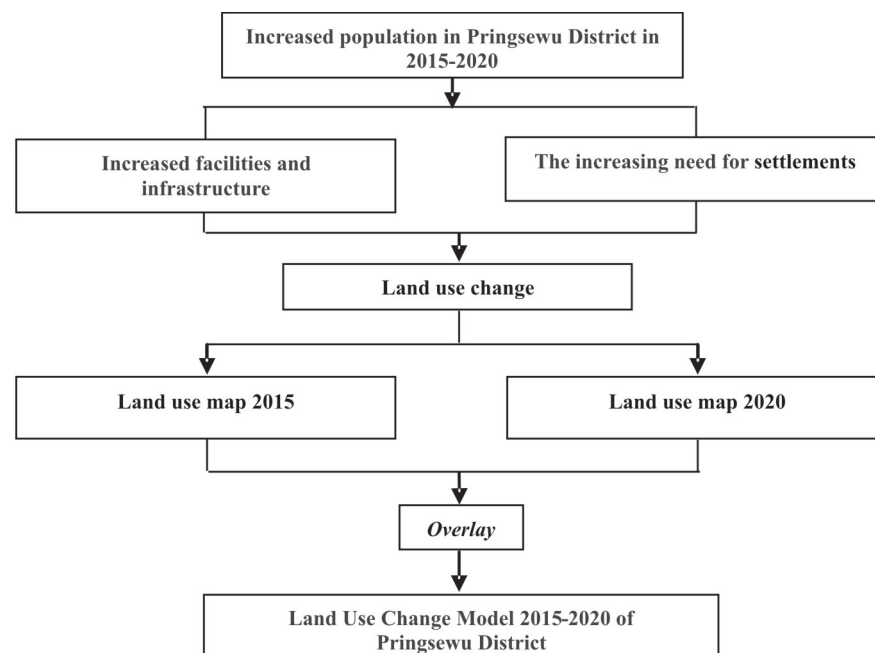
#### Paddy Field Area of Pringsewu District

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      |              |            |
|     | <b>Total</b>         | <b>4.803</b> | <b>100</b> | <b>4.803</b> | <b>100</b> |

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



**Fig. 1.** Research Framework

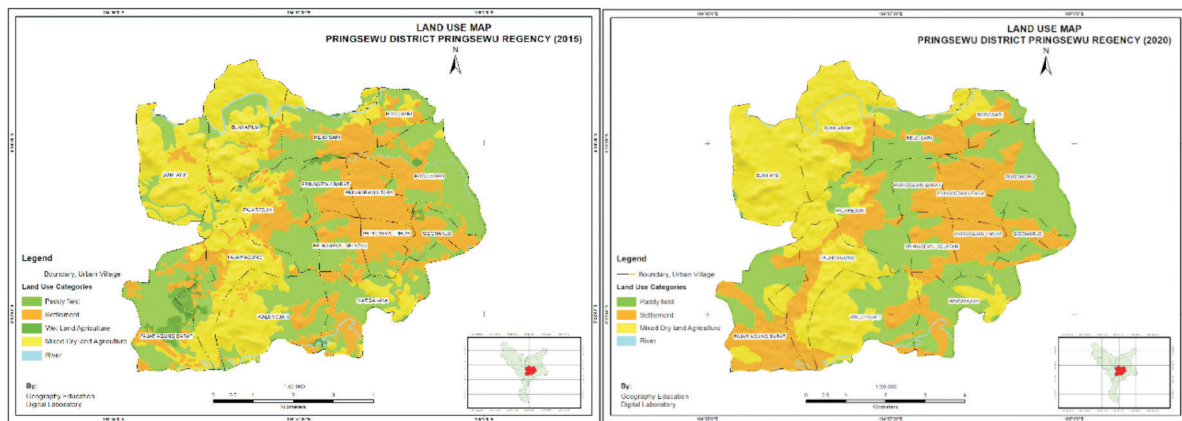


Fig. 2. Land Use Map 2015 and 2020

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 pekan can be seen in the following Table 4.

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

| No. | Villages          | Paddy Field Area<br>(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  | Waluyoajati       | 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             |
|     | <b>Total</b>      | <b>1.677,08</b>                | <b>1.603,92</b> |

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, Waluyoajati, 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 pekan 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<br>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                              | Waluyoajati       | -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.

### 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

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

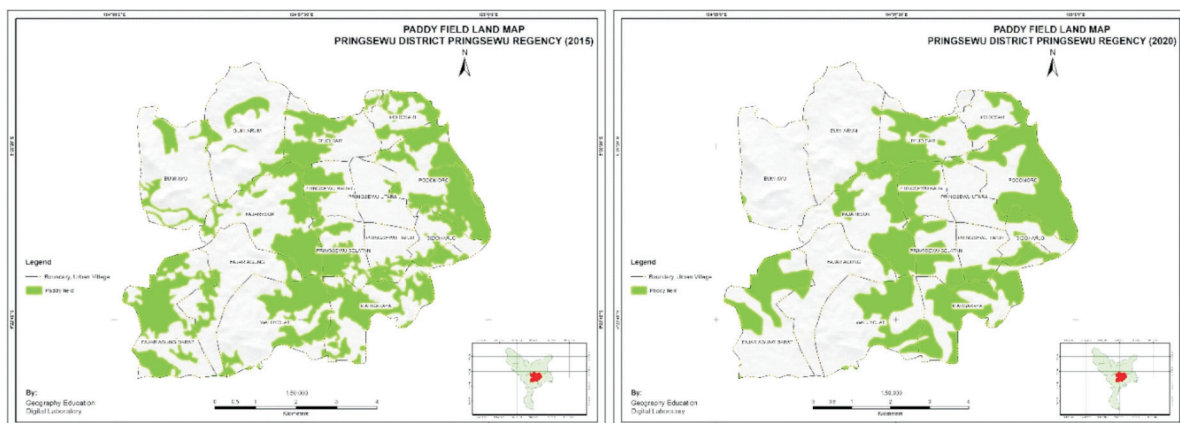
| No. | Villages          | Total Area (ha) | (%)          |
|-----|-------------------|-----------------|--------------|
| 1   | Pringsewu Timur   | 4,60            | 0,27         |
| 2   | Pringsewu Selatan | 13,31           | 0,79         |
| 3   | Pringsewu Barat   | 1,26            | 0,08         |
| 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  | Waluyoajati       | 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         |
|     | <b>Total</b>      | <b>205,53</b>   | <b>12,05</b> |

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

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  | Waluyoajati       | 3                               | -                          | -                          |
| 12  | Fajar Agung       | 2                               | 1                          | 1                          |
| 13  | Fajar Agung Barat | 1                               | 1                          | 1                          |
| 14  | Bumiayu           | 1                               | 0                          | 0                          |
| 15  | Margakaya         | 4                               | 0                          | 0                          |
|     | <b>Total</b>      | <b>44</b>                       | <b>16</b>                  | <b>17</b>                  |

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           | Waluyoajati       | -                           | 1                    | 1                 |
| 12           | Fajar Agung       | -                           | -                    | -                 |
| 13           | Fajar Agung Barat | -                           | -                    | 1                 |
| 14           | Bumiayu           | -                           | -                    | 1                 |
| 15           | Margakaya         | -                           | -                    | 1                 |
| <b>Total</b> |                   | <b>2</b>                    | <b>4</b>             | <b>13</b>         |

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       | Waluyoajati       | 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

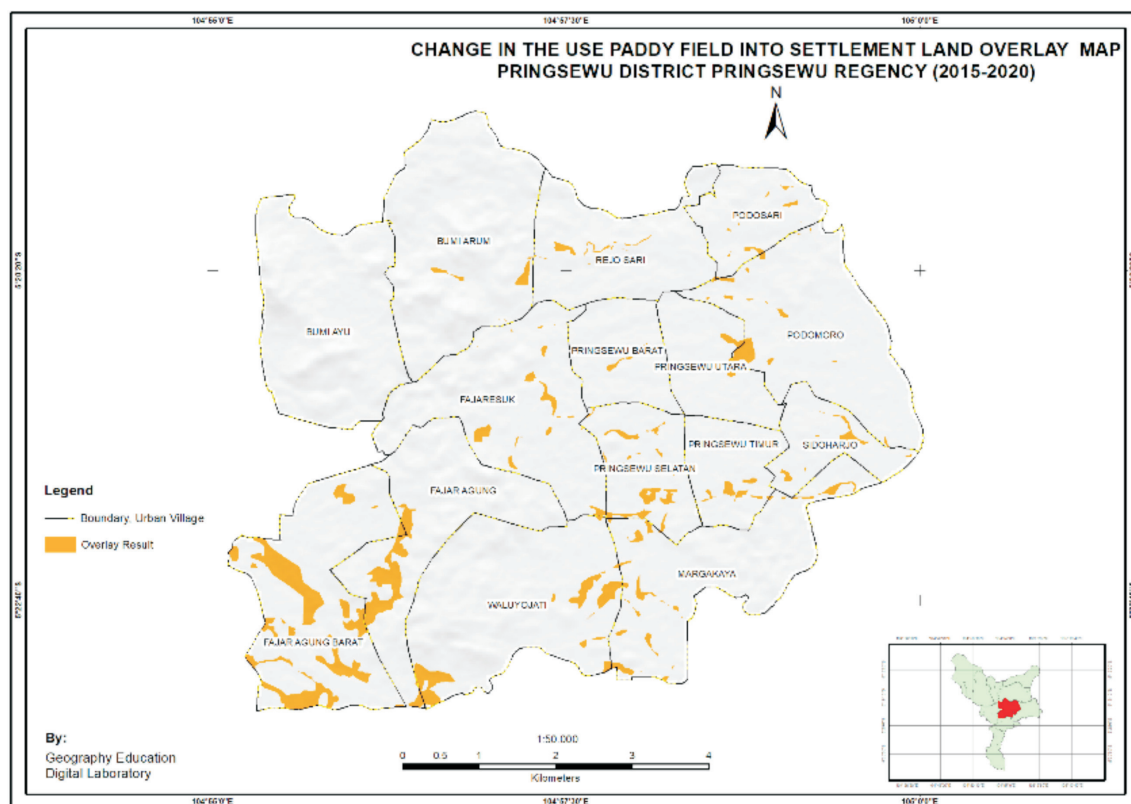


Fig. 4. Overlay Map of Changes in the Use of Paddy Fields to Residential in Pringsewu District, 2015-2020

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 residential pattern 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.

## Acknowledgments

Thank you to the Institute for Research and Community Service (LP2M), University of Lampung, the Regional Government of Pringsewu Regency, and all the stakeholders involved in this research.

## References

- Abdurachman, A., Dariah, A. and Mulyani, A. 2008. Strategi dan teknologi pengelolaan lahan kering mendukung pengadaan pangan nasional. *Jurnal Litbang Pertanian*. 27(2) : 43-49. <http://203.190.37.42/publikasi/p3272081.pdf>
- Affan, F.M. 2014. Analisis perubahan penggunaan lahan untuk permukiman dan industri dengan menggunakan Sistem Informasi Geografis (SIG). *Jurnal Ilmiah Pendidikan Geografi*. 1(2): 49-60. <http://blog.ub.ac.id/ismayanti/files/2016/02/330-1171-1-PB.pdf>
- Akbar, T. 2018. Kampung tematik sebagai bentuk partisipasi masyarakat dalam permasalahan permukiman kumuh di Kota Malang. *Wahana: Tridharma Perguruan Tinggi*. 70(2) : 37-48. <https://doi.org/10.36456/wahana.v70i2.1741>
- Al-shalabi, M., Billa, L., Pradhan, B., Mansor, S. and Al-Sharif, A. A. 2013. Modeling urban growth evolution and land-use changes using GIS based cellular automata and SLEUTH models: the case of Sana'a metropolitan city, Yemen. *Environmental Earth Sciences*. 70(1) : 425-437. <https://doi.org/10.1007/s12665-012-2137-6>
- Anggita, A.T. 2018. Pemanfaatan Sistem Informasi Geografis (Sig) Untuk Pemetaan Perubahan Penggunaan Lahan Pertanian Sawah Menjadi Non-Sawah Di Kabupaten Klaten Tahun 2007–2018 (Doctoral dissertation, Universitas Widya Dharma). <http://repository.unwidha.ac.id/id/eprint/1182>
- Arikunto, Suharsimi. 2006. Prosedur Penelitian: Suatu Pendekatan Praktek. Rineka Cipta. Jakarta. <https://scholar.google.com/citations?user=ZYhYmFcAAAJ&hl=en&oi=sra>
- Arviante, E. Y., Masyhuri, M., Waluyati, L. R. and Darwanto, D. H. 2019. Gambaran Krisis Petani Muda Indonesia. *Agriekonomika* 8(2) : 168-180. DOI: <https://doi.org/10.21107/agriekonomika.v8i2.5429>
- Arsyad, D.M. 2015. Pengembangan inovasi pertanian di lahan rawa pasang surut mendukung kedaulatan pangan. *Pengembangan Inovasi Pertanian*, 7(4), 169-176. DOI: <https://doi.org/10.21107/agriekonomika.v8i2.5429>
- Atta, M. 2017. Kajian Penataan Kawasan Pasar Tradisional Di Tepian Sungai Mempawah. *Jurnal Teknik Sipil*. 17(1). DOI: <http://dx.doi.org/10.26418/jtsft.v17i1.23907>
- Aulia, K. I., Subiyanto, S. and Sudarsono, B. 2019. Analisis Arah Perkembangan Fisik Wilayah Kabupaten Kendal Menggunakan Sistem Informasi Geografis. *Jurnal Geodesi Undip*. 8(1) : 486-495. <https://ejournal3.undip.ac.id/index.php/geodesi/article/view/22779>
- Ayu, I. K. and Heriawanto, B.K. 2018. Perlindungan Hukum Terhadap Lahan Pertanian Akibat Terjadinya Alih Fungsi Lahan di Indonesia. *JU-ke (Jurnal Ketahanan Pangan)*. 2(2) : 122-130. <http://riset.unisma.ac.id/index.php/JU-ke/article/view/1607>
- Benu, N. M. and Moniaga, V.R. 2016. Dampak Ekonomi dan Sosial Alih Fungsi Lahan Pertanian Hortikultura Menjadi Kawasan Wisata Bukit Rurukan di Kecamatan Tomohon Timur, Kota Tomohon. *Agri-Sosioekonomi*. 12(3) : 113-124. DOI: <https://doi.org/10.35791/agrsosek.12.3.2016.14058>
- Bintarto. 1976. Pengantar Geografi Pembangunan. PT. P.B. Kedaulatan Rakyat. Yogyakarta.
- Birdsall, N., Kelley, A. C., Sinding, S. W. and Sinding, S. (Eds.). 2001. *Population matters: demographic change, economic growth, and poverty in the developing world*. Oxford University Press. <https://doi.org/10.2307/1534753>
- Blaikie, P. and Brookfield, H. (Eds.). (2015). *Land degradation and society*. Routledge. <https://books.google.co.id/books?hl=en&lr=&id=HZpGCgAAQBAJ&oi=fnd&pg=PP1&dq=Blaikie>
- Bonham-Carter, G. F. 2014. *Geographic information systems for geoscientists: modelling with GIS* (Vol. 13). Elsevier. [http://www.miramonte.uab.cat/geofocus\\_ojs/index.php/geofocus/article/view/36/203](http://www.miramonte.uab.cat/geofocus_ojs/index.php/geofocus/article/view/36/203)
- Budi Heri Pirngadie, D. P. 2015. Dampak kegiatan tambang timah konvensional terhadap perubahan guna lahan di Kabupaten Belitung. *Jurnal Planologi Unpas*. 2(3) : 177-194. <http://repository.unpas.ac.id/id/eprint/30449>
- Burrough, P. A., McDonnell, R., McDonnell, R. A. and Lloyd, C. D. 2015. *Principles of Geographical Information systems*. Oxford university press. <https://books.google.co.id/books?hl=en&lr=&id=kvOJCAAAQBAJ&oi=fnd&pg=PP1&dq=Burrough,+P.+A.,>
- Cohen, N. and Reynolds, K. 2015. Resource needs for a socially just and sustainable urban agriculture system: Lessons from New York City. *Renewable Agriculture and Food Systems*. 30(1) : 103-114. <https://www.jstor.org/stable/26341783>
- Danial, E. and Wasriah, N. 2009. Metode Penulisan Karya Ilmiah. Bandung: Laboratorium Pendidikan Kewarganegaraan.
- Desianingtyas, M. 2015. *Dampak Pertumbuhan Penduduk Terhadap Alih Fungsi Lahan di Kabupaten Sukoharjo Tahun 2000 dengan 2013* (Doctoral dissertation, Universitas Muhammadiyah Surakarta). <http://eprints.ums.ac.id/id/eprint/33759>
- Dewan, A. M., Yamaguchi, Y. and Rahman, M. Z. 2012. Dynamics of land use/cover changes and the analysis of landscape fragmentation in Dhaka Metropolitan, Bangladesh. *GeoJournal*. 77(3) : 315-330. <https://doi.org/10.1007/s10708-010-9399-x>
- Kecamatan Denpasar Selatan). *Jurnal Manajemen*

- Agribisnis (Journal of Agribusiness Management)*.  
DOI: <https://doi.org/10.20527/frontbiz.v2i3.649>
- Dewi, N. K. and Rudiarto, I. 2013. Identifikasi Alih Fungsi Lahan Pertanian dan Kondisi Sosial Ekonomi Masyarakat Daerah Pinggiran di Kecamatan Gunungpati Kota Semarang. *Jurnal Wilayah dan Lingkungan*. 1(2) : 175-188.  
<https://core.ac.uk/download/pdf/234033194.pdf>
- Esch, T., Marconcini, M., Marmanis, D., Zeidler, J., Elsayed, S., Metz, A. and Dech, S. 2014. Dimensioning urbanization—An advanced procedure for characterizing human settlement properties and patterns using spatial network analysis. *Applied Geography*. 55: 212-228.  
<https://doi.org/10.1016/j.apgeog.2014.09.009>
- Esch, T., Heldens, W., Hirner, A., Keil, M., Marconcini, M., Roth, A. and Strano, E. 2017. Breaking new ground in mapping human settlements from space—The Global Urban Footprint. *ISPRS Journal of Photogrammetry and Remote Sensing*. 134 : 30-42.  
<https://doi.org/10.1016/j.isprsjprs.2017.10.012>
- Ehrlich, P. R. and Holdren, J. P. 1971. Impact of population growth. *Science*. 171(3977) : 1212-1217.  
<https://www.jstor.org/stable/1731166>
- Fadilla, L., Subiyanto, S. and Suprayogi, A. 2017. Analisis arah dan prediksi persebaran fisik wilayah kota semarang tahun 2029 menggunakan sistem informasi geografis dan CA Markov model. *Jurnal Geodesi Undip*. 6(4) : 517-525.  
<https://ejournal3.undip.ac.id/index.php/geodesi/article/view/18184>
- Fajriany, N. I. 2017. *Analisis Faktor-Faktor Yang Memengaruhi Alih Fungsi Lahan Pertanian Di Kabupaten Pangkep* (Doctoral dissertation, Universitas Islam Negeri Alauddin Makassar).  
<http://repositori.uin-alauddin.ac.id/id/eprint/7635>
- Fauzi, Y., Susilo, B. and Mayasari, Z. M. 2009. December). Analisis Kesesuaian Lahan Wilayah Pesisir Kota Bengkulu Melalui Perancangan Model Spasial dan Sistem Informasi Geografis (SIG). In *Forum Geografi* (Vol. 23, No. 2, pp. 101-111).  
DOI: <https://doi.org/10.23917/forgeo.v23i2.5002>
- Fei, L., Shuwen, Z., Jiuchun, Y., Liping, C., Haijuan, Y. and Kun, B. 2018. Effects of land use change on ecosystem services value in West Jilin since the reform and opening of China. *Ecosystem Services*. 31 : 12-20.  
<https://doi.org/10.1016/j.ecoser.2018.03.009>
- Filatova, T., Verburg, P. H., Parker, D. C. and Stannard, C. A. 2013. Spatial agent-based models for socio-ecological systems: Challenges and prospects. *Environmental Modelling & Software*. 45: 1-7.  
<https://doi.org/10.1016/j.envsoft.2013.03.017>
- Guo, Q., Taper, M., Schoenberger, M. and Brandt, J. 2005. Spatial-temporal population dynamics across species range: from centre to margin. *Oikos*. 108(1) : 47-57.  
<https://doi.org/10.1111/j.0030-1299.2005.13149.x>
- Hanushek, E. A. 2013. Economic growth in developing countries: The role of human capital. *Economics of Education Review*. 37: 204-212. <https://doi.org/10.1016/j.econedurev.2013.04.005>
- Haq, A. M. 2020. *Dampak Pemanfaatan Lahan Pertanian menjadi Kawasan Perkotaan Pinrang di Kecamatan Watang Sawitto* (Doctoral dissertation, Universitas Islam Negeri Alauddin Makassar). <http://repositori.uin-alauddin.ac.id/17998/>
- Harahap, F. R. 2013. Dampak urbanisasi bagi perkembangan kota di Indonesia. *Society*. 1(1) : 35-45.
- Harjanti, A., Suwandono, D. and Wijaya, H. B. 2002. *Identifikasi Faktor-Faktor Penyebab Perubahan Penggunaan Lahan Permukiman Menjadi Komersial Di Kawasan Kemang Jakarta Selatan* (Doctoral dissertation, Universitas Diponegoro).
- Haumahu, J. P. 2018. Analisis Perubahan Penggunaan Lahan Di Jazirah Leitimur Pulau Ambon. *Agrologia*. 3(2).
- Herlindawati, A., Trimo, L. and Noor, T. I. 2018. Analisis Tekanan Penduduk Terhadap Petani Padi Sawah. *Mimbar Agribisnis: Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis*. 4(1) : 12-24.
- Hidayati, D. 2017. Memudarnya nilai kearifan lokal masyarakat dalam pengelolaan sumber daya air. *Jurnal Kependudukan Indonesia*. 11(1) : 39-48.
- Husain, I. H. A. 2019. *Ketahanan Dasar Lingkungan: Basic Environment* (Vol. 1). SAH MEDIA.
- Idjudin, A. A. 2011. Peranan konservasi lahan dalam pengelolaan perkebunan. *Jurnal Sumberdaya Lahan*. 5(2).
- Indonesia, M. U., Prabowo, H. S., Tobing, I. S., Abbas, A. S., Saleh, C., Huda, M. and Mangunjaya, F. M. 2017. *Pelestarian Satwa Langka untuk Keseimbangan Ekosistem: Penuntun Sosialisasi Fatwa MUI No 4, 2014, tentang Fatwa Pelestarian Satwa Langka untuk Menjaga Keseimbangan Ekosistem* (Vol. 1). LPLH-SDA MUI.
- Jamaludin, A. N. 2015. Sosiologi perkotaan: memahami masyarakat kota dan problematikanya. Penerbit CV Pustaka Setia. Bandung.
- Jayadi, I. M. Y., Christiawan, P. I. and Sarmita, I. M. 2017. Dampak Pertumbuhan Penduduk Terhadap Daya Dukung Lahan Pertanian Di Desa Sambangan. *Jurnal Pendidikan Geografi Undiksha*. 5(2).
- Jihan, J. C. 2015. *Analisa Zona Perubahan Penggunaan Lahan Di Kecamatan Sukolilo Surabaya Timur Berbasis SIG* (Doctoral dissertation, Institut Teknologi Sepuluh Nopember).
- Kato, Y. 2013. Not just the price of food: Challenges of an urban agriculture organization in engaging local residents. *Sociological Inquiry*. 83(3) : 369-391.
- Kodoatie, R. J. 2007. Peran Hutan dalam Pengendalian Bencana Banjir-Kekeringan-Tanah Longsor: Identifikasi Masalah dan Teknik Pengendalian. In



- Prosiding Workshop Peran Hutan dan Kehutanan dalam Meningkatkan Daya Dukung DAS.*
- Kristianto, E. 2015. Kajian Konversi Sawah Menjadi Non Sawah Di Kabupaten Pati Tahun 2003-2013 (Doctoral dissertation, Universitas Negeri Semarang).
- Kulsum, U., Arifin, B. and Abidin, Z. 2015. Determinan Keputusan Petani terhadap Konversi Lahan Sawah Menjadi Permukiman. *Jurnal Ilmu Ilmu Agribisnis: Journal of Agribusiness Science*. 3(2).
- Kustianingrum, D., Embunpagi, B., Azizah, R. N. and Indraswari, D. 2015. Pola Spasial Permukiman Kampoeng Batik Laweyan, Surakarta. *Reka Karsa*. 3(1).
- Lailia, A. N. 2014. *Gerakan masyarakat dalam pelestarian lingkungan hidup* (Doctoral dissertation, Universitas Airlangga).
- Laka, B. M., Sideng, U. and Amal, A. 2017. Perubahan Penggunaan Lahan di Kecamatan Sirimau Kota Ambon. *Jurnal Geoelebes*. 1(2): 43-52.
- Lambin, E. F., Rounsevell, M. D. and Geist, H. J. 2000. Are agricultural land-use models able to predict changes in land-use intensity?. *Agriculture, Ecosystems & Environment*. 82(1-3): 321-331.
- Lestari, V. N. S. 2017. Pertumbuhan Penduduk Dan Keluarga Berencana. <https://doi.org/10.31227/osf.io/ut4rz>
- Liu, W., Zhan, J., Zhao, F., Yan, H., Zhang, F. and Wei, X. 2019. Impacts of urbanization-induced land-use changes on ecosystem services: A case study of the Pearl River Delta Metropolitan Region, China. *Ecological Indicators*. 98: 228-238.
- Lusy, Irma, Nani Suwarni, Dedy Miswar, and M. Thoha BS Jaya. 2020. Pemodelan Bencana Longsor Berbasis Spasial. *LaGeografia*. 19(1) : 16-27.
- Machault, V., Vignolles, C., Borchi, F., Vounatsou, P., Pages, F., Briolant, S. and Rogier, C. 2011. The use of remotely sensed environmental data in the study of malaria. *Geospatial Health*. 151-168.
- Mahi, I. A. K. 2016. *Pengembangan Wilayah: Terori & Aplikasi*. Kencana.
- Malingreau, J. P. and Cristiani, 1982. *A Land Cover/Land Use Classification For Indonesia*. Puspics-Bakosurtanal UGM. Yogyakarta.
- Mantra, Ida Bagoes. 2000. *Metodelogi Penelitian Survei*, Pustaka Pelajar Offset, Yogyakarta.
- Mas, J. F., Kolb, M., Paegelow, M., Olmedo, M. T. C. and Houet, T. 2014. Inductive pattern-based land use/cover change models: A comparison of four software packages. *Environmental Modelling & Software*, 51 : 94-111.
- Miswar, D., Sugiyanta, I. G. and Yasta, R. D. 2020. Analisis Geospasial Perubahan Penggunaan Lahan Sawah Berbasis LP2B Kecamatan Pagelaran Utara. *Media Komunikasi Geografi*. 21(2).
- Miswar, D., Halengkara, L., Sugiyanta, I. G., & Al Azhari, A. S. 2021. Study of Changes in Geospatial Based Land Use in Ambarawa District, Pringsewu Regency. *International Journal of Multicultural and Multireligious Understanding*. 8(2) : 94-107.
- Modara, M., Ait Belaid, M. and Aljenaid, S. 2014. Assessment of land-use/land-cover change in Muharraq Island using multi-temporal and multi-source geospatial data. *International Journal of Image and Data Fusion*. 5(3) : 210-225.
- Mohit, M. A., Ibrahim, M. and Rashid, Y. R. 2010. Assessment of residential satisfaction in newly designed public low-cost housing in Kuala Lumpur, Malaysia. *Habitat International*. 34(1) : 18-27.
- Moniaga, V. R. 2011. Analisis daya dukung lahan pertanian. *Agri-Sosioekonomi*. 7(2) : 61-68.
- Mu'adi, S., Maksum, A., Hakim, M. L. and Umanailo, M. C. B. (2020). Transfer of function agricultural land. In *Proc. Int. Conf. Ind. Eng. Oper. Manag.* 0 (pp. 2568-2574).
- Nasional, K. N. P. P. 2007. *Evaluasi pemekaran daerah*. Bappenas: UNDP.
- Nasution, Z. 2014. Pertumbuhan Ekonomi dan Kemiskinan. *ECOBISMA (Jurnal Ekonomi, Bisnis dan Manajemen)*. 1(2) : 1-10.
- Nugroho, S. P. 2011. Minimalisasi lahan kritis melalui pengelolaan sumberdaya lahan dan konservasi tanah dan air secara terpadu. *Jurnal Teknologi Lingkungan*. 1(1).
- Nursetianingrum, F. 2018. *Pengaruh Jumlah Penduduk, Tenaga Kerja, dan Dana Alokasi Bantuan Pembangunan Terhadap Ketimpangan Pembangunan Ekonomi Provinsi Lampung dalam Perspektif Ekonomi Islam Tahun 2012-2016* (Doctoral dissertation, UIN Raden Intan Lampung).
- Nyoman, S. I. 2013. Faktor-Faktor Yang Mempengaruhi Tingginya Laju Pertumbuhan dan Implementasi Kebijakan Penduduk di Provinsi Bali. *Piramida*. 12(1).
- Peterson, E. W. F. 2017. The role of population in economic growth. *Sage Open*. 7(4) : 2158244017736094.
- Prahasta, Eddy, 2005. *Konsep-konsep Dasar Sistem Informasi Geografis*. CV. Informatika, Bandung.
- Prasada, I. M. Y. and Rosa, T. A. 2018. Dampak alih fungsi lahan sawah terhadap ketahanan pangan di Daerah Istimewa Yogyakarta. *Jurnal Sosial Ekonomi Pertanian*. 14(3) : 210.
- Pribadi, D. O. 2006. Model perubahan tutupan lahan dan faktor-faktor yang mempengaruhinya. *Jurnal Teknologi Lingkungan*. 7(1).
- Raharja, R. T. 2012. *Analisis Perubahan Penggunaan Lahan Dengan Menggunakan Aplikasi Penginderaan Jauh Dan Sistem Informasi Geografis Di Pesisir Kecamatan Sluke Kabupaten Rembang Tahun 2004-2012* (Doctoral dissertation, Universitas Muhammadiyah Surakarta).
- Rasyid, F. 2014. Permasalahan dan dampak kebakaran hutan. *Jurnal Lingkar Widayaiswara*, 1(4), 47-59.
- Ridho, A. K. F. and Taryono, I. 2018. *Analisis Perubahan*



- Penggunaan Lahan di Kecamatan Laweyan Kota Surakarta Tahun 2013 dan Tahun 2017* (Doctoral dissertation, Universitas Muhammadiyah Surakarta).
- Rozenstein, O. and Karnieli, A. 2011. Comparison of methods for land-use classification incorporating remote sensing and GIS inputs. *Applied Geography*. 31(2), 533-544.
- Rupini, A. A. D., Dewi, N. K. A. and Sueca, N. P. 2017. Implikasi alih fungsi lahan pertanian pada perkembangan spasial daerah pinggiran kota (studi kasus: Desa Batubulan, Gianyar). *Undagi: Jurnal Ilmiah Jurusan Arsitektur Universitas Warmadewa*. 5(2): 9-18.
- Rustiadi, E. 2001. Alih Fungsi Lahan dalam Perspektif Lingkungan Perdesaan. *Lokakarya Penyusunan Kebijakan dan Strategi Pengelolaan Lingkungan Kawasan Perdesaan*. 10-11.
- Saraswati, D. A., Subiyanto, S. and Wijaya, A. P. 2016. Analisis Perubahan Luas Dan Pola Persebaran Permukiman (Studi Kasus: Kecamatan Tembalang, Kecamatan Banyumanik, Kecamatan Gunungpati, Kecamatan Mijen Kota Semarang Jawa Tengah). *Jurnal Geodesi Undip*. 5(1) : 155-163.
- Sari, M., Fatma, F., Purba, T., Bachtiar, E., NNPS, R. I. N., Simarmata, M. M. and Nurdin, N. 2021. *Pengetahuan Lingkungan*. Yayasan Kita Menulis.
- Serang, T. D. N. 2018. Alih Fungsi Lahan Pertanian Menjadi Kawasan Pariwisata Berbasis Good Governance Dalam Mewujudkan Tertib Tata Ruang. *Jurnal Media Hukum Dan Peradilan*. 5(1) : 123-140.
- Setiawan, I. 2016. Peran Sistem Informasi Geografis (SIG) dalam Meningkatkan Kemampuan Berpikir Spasial (Spatial Thinking). *Jurnal Geografi Gea*. 15(1).
- Sitorus, S. R. 2018. *Perencanaan Penggunaan Lahan*. PT Penerbit IPB Press. Bogor.
- Soleh, A. 2017. Strategi pengembangan potensi desa. *Jurnal Sungkai*. 5(1) : 32-52.
- Solihat, A. 2018. *Pengaruh Kekuatan Ekonomi Cina Dan India (Cindia) Terhadap Pertumbuhan Ekonomi Di Kawasan Asia Pasifik* (Doctoral dissertation, Perpustakaan).
- Suratha, I. K. 2017. Dampak Alih Fungsi Lahan Pertanian Terhadap Ketahanan Pangan. *Media Komunikasi Geografi*. 15(2).
- Susilo, E. and Sudarmanto, B. 2012. Kajian Hidrologi Terhadap Perubahan Penggunaan Lahan Pertanian Dan Lahan Hijau Menjadi Pemukiman Di Kota Semarang.
- Swetnam, R. D., Fisher, B., Mbilinyi, B. P., Munishi, P. K., Willcock, S., Ricketts, T. and Lewis, S. L. 2011. Mapping socio-economic scenarios of land cover change: A GIS method to enable ecosystem service modelling. *Journal of Environmental Management*. 92(3): 563-574.
- Syafitri, R. A. W. D. and Susetyo, C. 2019. Pemodelan pertumbuhan lahan terbangun sebagai upaya prediksi perubahan lahan pertanian di Kabupaten Karanganyar. *Jurnal Teknik ITS*. 7(2): C255-C262.
- Syahpin, R. 2012. *Persepsi Masyarakat Terhadap Ruang Terbuka Hijau Di Kecamatan Medan Maimun* (Doctoral dissertation, UNIMED).
- Tanaya, D. R. and Rudiarto, I. 2014. Potensi pengembangan ekowisata berbasis masyarakat di kawasan Rawa Pening, Kabupaten Semarang. *Teknik PWK (Perencanaan Wilayah Kota)*. 3(1): 71-81.
- Taryana, D. 2009. Pendekatan Keruangan dalam Ilmu Geografi. *Jurnal Pendidikan Geografi*. 3(1).
- Toscano, P., Castrignanò, A., Di Gennaro, S. F., Vonella, A. V., Ventrella, D. and Matese, A. 2019. A precision agriculture approach for durum wheat yield assessment using remote sensing data and yield mapping. *Agronomy*. 9(8) : 437.
- Trisno Hidayat, R. M. and Amin, C. 2021. *Kajian Arah Perkembangan Permukiman Dan Kesesuaian Lahan Permukiman Eksisting Tahun 2019 Dengan Rtrw Di Kota Madiun Tahun 2010 Dan 2019* (Doctoral dissertation, Universitas Muhammadiyah Surakarta).
- Utami, D. and Afriliana, N. 2018. Determinan Pertumbuhan Ekonomi Daerah Otonomi Baru Di Provinsi Lampung. *Adminika*. 4(2) : 1-9.
- Verburg, P. H., Neumann, K. and Nol, L. 2011. Challenges in using land use and land cover data for global change studies. *Global Change Biology*. 17(2): 974-989.
- Wahyudi, E. B. 2009. *Analisis Perubahan Penggunaan Lahan di Kecamatan Sokaraja Kabupaten Banyumas Tahun 1994 dan 2004* (Doctoral dissertation, Universitas Muhammadiyah Surakarta).
- Wahyuningsih, T. 2012. Dampak Investasi Pemerintah Terhadap Investasi Swasta dan Kesejahteraan Masyarakat Setelah Pemekaran Daerah Kabupaten Kota di Provinsi Maluku. *Jurusan Ekonomi Pembangunan*. 4(2) : 243.
- Wicaksono, A. S. and Widiyastuti, D. 2019. Perubahan penggunaan lahan dan kondisi sosial ekonomi masyarakat di sekitar hartono mall. *Jurnal Bumi Indonesia*. 8(2).
- Widodo, B. and Winarti, W. 2020. Manajemen Pembangunan Desa Daerah Perbatasan Kota. *Public Administration Journal of Research*. 2(1).
- Wijayanti, V. E. P. 2020. Keseimbangan Penduduk. <https://doi.org/10.31219/osf.io/862f4>
- Wulandari, N. D. and Setyowati, D. L. 2020. Analisis Pola Persebaran Permukiman Tahun 1998, 2006 Dan 2019 di Kecamatan Gunungpati Kota Semarang. *Geo-Image*. 9(1): 65-71.
- Yempormas, E. 2019. Pemanfaatan Sumber Daya Alam Pada Kawasan Rawan Bencana Untuk Kegiatan Pariwisata Di Desa Umbulharjo Dan Desa Kepuharjo. *Jurnal Wilayah Dan Lingkungan* P-ISSN: 2338-1604 dan E-ISSN: 2407-8751 Volume 5 Nomor 2, Agustus 2017, 71-82