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Geographic information systems of fire vulnerability area in West Jakarta

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Geographic information systems of fire vulnerability area in West Jakarta

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Abstract. The purpose of making this application is to find out the area that is a fire-prone point in West Jakarta. The parameters used are fire incidents in each district in West Jakarta from data obtained from SUDIN West Jakarta Fire Department. The fire-prone map made with interpolation using the Inverse Distance Weighted (IDW) method. The process of making maps using the geographic information applications (GIS) application, namely ArcGIS version 10.5, this software is used to digitize, classify and process data. Data processing on this research produced West Jakarta fire vulnerability map for 2015 to 2018 which have 4 layers in each year.

1. Introduction

DKI Jakarta province has various parts of the region, one of region is West Jakarta. West Jakarta is a strategic place, and have high density and high population activity. Based on Central Bureau of Statistics data, West Jakarta's population reached 2.4 million in 2015[1]. The density of occupation can be one of the factor causing the high risk of fire in West Jakarta. The highest fire cases occured in 2015 with 356 cases and caused losses of up to Rp. 90,695,400,000. [2], [3], [4], [5]. This research aims to develop Geographical Information Systems that can be provide information about the spread of fire-prone areas in West Jakarta.

2. Method and Materials

2.1. Sample Preparation
The data used in this research are data of fire events in West Jakarta from 2015 to 2018 obtained from the West Jakarta Fire Department.

2.2. Method
Map making is doing by digitizing, classifying and processing of data that has been obtained from the West Jakarta Fire Department to produce fire-prone maps using interpolation the Inverse Distance

Weighted method in ArcGIS. IDW interpolar is an automatic and relatively easy technique, as it requires very few parameters from the operator, such as search neighborhood parameters, exponent and eventually smoothing factor, from the operators [6]. The method of Inverse Distance Weighting is an interpolation technique where the estimation of interpolation is made based on the values in the nearest location that are only measured by the distance from the interpolation location [7], [8]. This technique determines the point of fire vulnerability using parameters from a series of sample points.

3. Results and Discussion

Comparison and calculation of fire incidents in 8 sub-districts in West Jakarta were carried out using data obtained from the Fire Department, data used from 2015 to 2018. The first step to make a map is to do a fire data classification. Data classification was carried out by writing subdistrict names, coordinates that became vulnerable points in each district and the number the incidence of fire in each district in West Jakarta. Classification result shown in Table 1.

Table 1. Table of Classification Result the fire events in West Jakarta

Sub-Distric	X	Y	Years	Fire Events
GROGOL PETAMBURAN	106,787078	-6,148906	2015	52
PALMERAH	106,789418	-6,201051	2015	15
TAMBORA	106,809433	-6,136368	2015	35
TAMAN SARI	106,815642	-6,137099	2015	26
KEBON JERUK	106,772193	-6,195285	2015	49
KEMBANGAN	106,739854	-6,186202	2015	58
CENGKARENG	106,724260	-6,138078	2015	73
KALIDERES	106,703160	-6,133595	2015	48
Sub-Distric	X	Y	Years	Fire Events
GROGOL PETAMBURAN	106,775793	-6,154866	2016	42
PALMERAH	106,791356	-6,189910	2016	17
TAMBORA	106,795688	-6,145553	2016	28
TAMAN SARI	106,815642	-6,137099	2016	28
KEBON JERUK	106,761128	-6,168333	2016	35
KEMBANGAN	106,738608	-6,219101	2016	33
CENGKARENG	106,72426	-6,138078	2016	47
KALIDERES	106,715434	-6,116459	2016	36
Sub-Distric	X	Y	Years	Fire Events
GROGOL PETAMBURAN	106,788393	-6,179478	2017	33
PALMERAH	106,791356	-6,189910	2017	25
TAMBORA	106,803993	-6,137368	2017	45
TAMAN SARI	106,818232	-6,144785	2017	18
KEBON JERUK	106,761128	-6,168333	2017	43
KEMBANGAN	106,742520	-6,172313	2017	36
CENGKARENG	106,724260	-6,138078	2017	68
KALIDERES	106,703160	-6,133595	2017	43

Sub-Distric	X	Y	Years	Fire Events
GROGOL PETAMBURAN	106,775793	-6,154866	2018	20
PALMERAH	106,791356	-6,189910	2018	13
TAMBORA	106,797698	-6,151891	2018	22
TAMAN SARI	106,823059	-6,146211	2018	13
KEBON JERUK	106,760089	-6,181913	2018	22
KEMBANGAN	106,738608	-6,219101	2018	28
CENGKARENG	106,734639	-6,141237	2018	36
KALIDERES	106,700093	-6,107175	2018	26

Based on the data table of the fire events that have been classified, the data will be processed using ArcGIS software to produce sub-district shapefiles as the first layer and village shapefiles as the second layer on the map as shown in Figure 1.
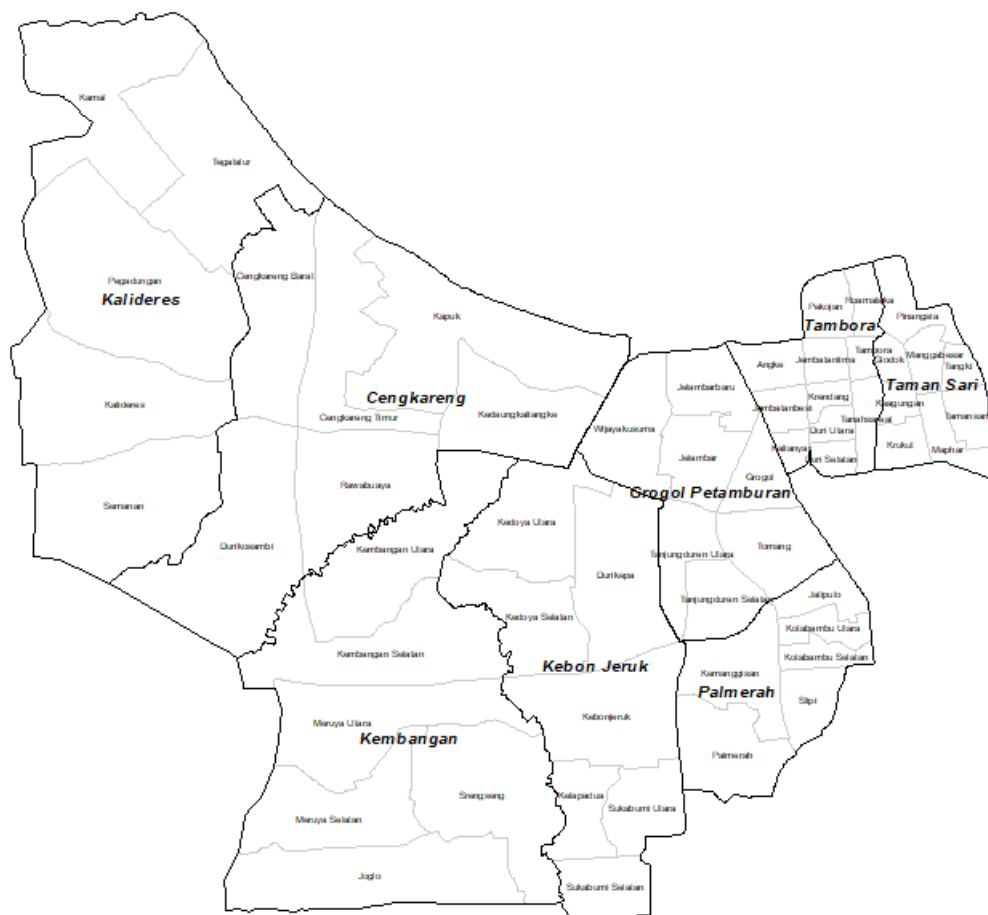

Figure 1. The layer of Sub-district and Village in West Jakarta

After the first layer and the second layer are formed, the next step is to process the data to produce a fire-prone point as the third layer on the map., as shown on Figure 2.
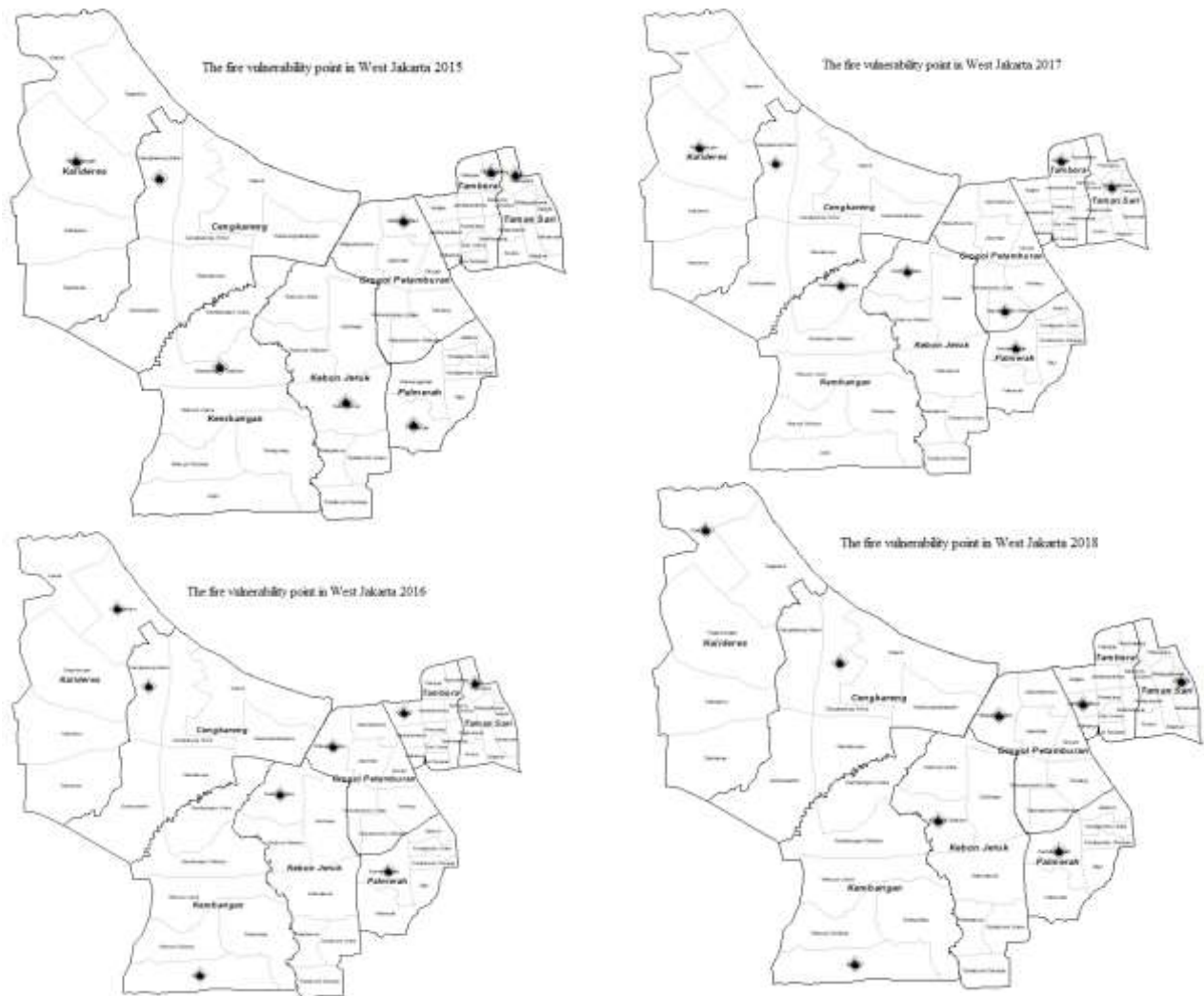
Figure 2. The layer of the fire-prone point in West Jakarta in 2015-2018

Furthermore, the interpolation process is carried out using the IDW method with the most fire event parameters from each existing sub-district. The IDW process is doing in stages, using the ArcToolbox in ArcGIS and then selecting Raster Interpolation > IDW, after that the IDW window will open. The feature input points in IDW will be filled with fire-prone shapefile data, the Z value field will be filled in with the existing parameter data, that is fire incident in each sub-district in West Jakarta. After the IDW process is complete, it will produce a fire vulnerability map in West Jakarta, as shown in Figure 3.
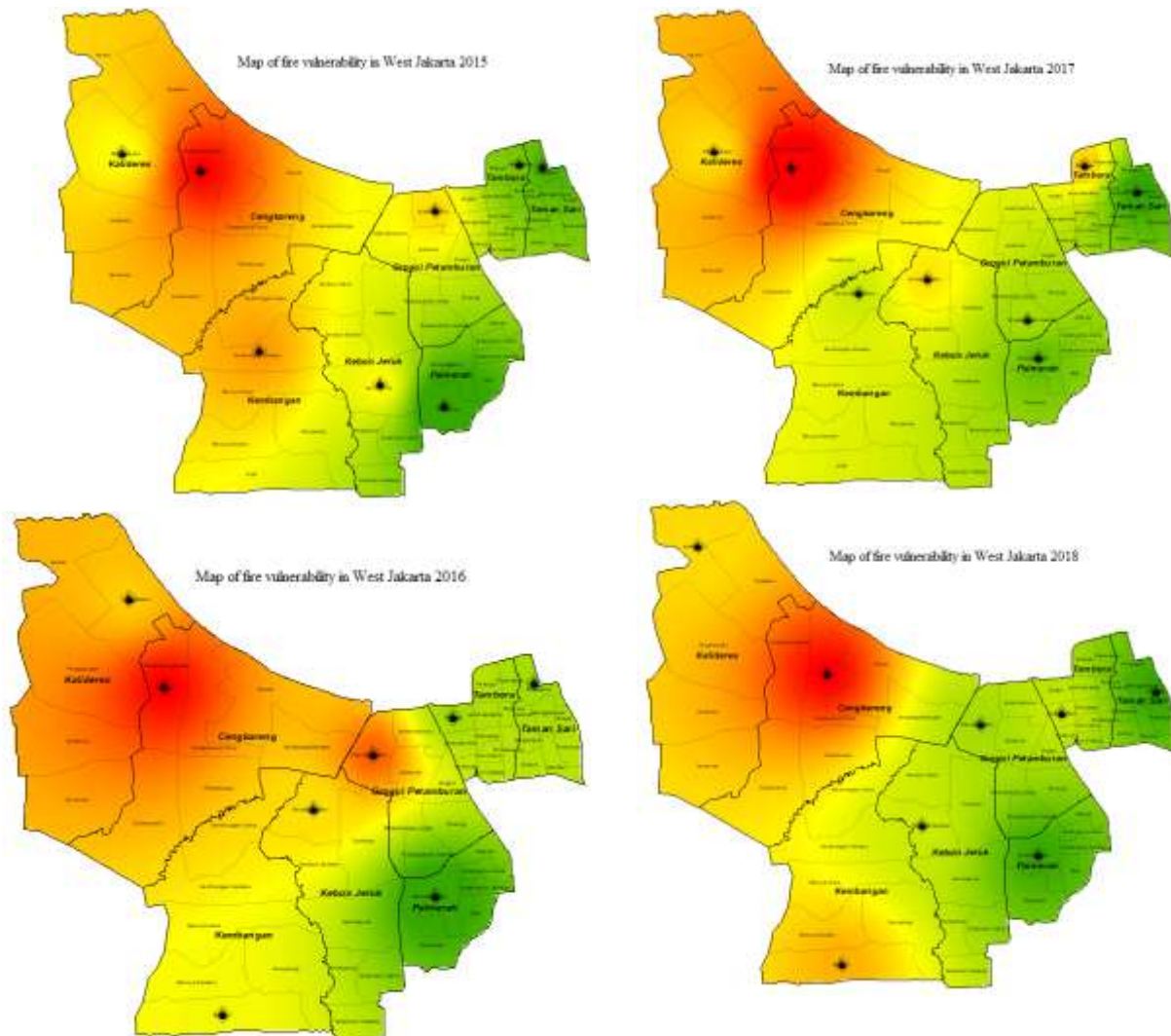
Figure 3. Map of fire vulnerability in West Jakarta in 2015-2018

4. Conclusion

Based on the results of research conducted in 2015 - 2018, the are with low level of fire vulnerability were Palmerah and Tamansari sub-district, while the high level of fire vulnerability is in the Cengkareng sub-district. Availability of information about West Jakarta fire vulnerability areas using GIS causes information to be more accessible by public, especially for the West Jakarta population.

5. References

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