ISBN 978-602-14917-7-5
The First International Conference of Food and Agriculture

Development of Geographic Information System (GIS) Spread of The Dangerous Diseases in Jember District

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Abstract. Jember has an area of 3,293.34 km2 with an altitude between 0 - 3.330 masl. Climate Jember Regency is tropical with temperature range between 23oC - 32oC. Such a climate Jember is susceptible to tropical diseases such as Tuberculosis, Diphtheria, Pertussis, Tetanus neonatorum, Leprosy, Dengue Haemorrhagic Fever (DHF), Measles, HIV-AIDS, Malaria and Filariasis. Potential diseases that may arise in an area to be a challenge for the parties concerned to prevent and to overcome, this is related to the readiness of personnel and medical materials, as well as coverage prevention or coverage of prevention. That conditions resulted in many GIS (Geographic Information System) researches to resolve the issue. GIS is used because it has the ability to properly visualize the spread, have good visual presentation of data that more easily analyzed, interpreted and arrange a prevention strategy or handling. This study aims to develop GIS spread of disease in Jember District. So with the GIS developed research hopes to be widely used either for the general public or the government to prepare a plan for prevention or treatment of disease in Jember District.

Keywords— ***GIS, Jember, disease' spread***

1. Introduction

Jember has an area of 3,293.34 km2 with a height between 0-330 mdpl. Jember is a tropical climate with a temperature range between 23oC - 32oC. The Jember climate is vulnerable to tropical diseases such as Tuberculosis, Diphtheria, Pertussis, Tetanus neonatorum, Leprosy, Dengue Haemorrhagic Fever (DHF), Measles, HIV-AIDS, Malaria and Filariasis [1]

The potential for diseases that may arise in an area is a challenge for the related parties to take precautionary measures to prevent them, this is related to the readiness of personnel and medical materials, as well as the scope of prevention or coverage of countermeasures. Such conditions have resulted in a lot of research emerging to try to solve these problems, research [1][2][3][4][5][6][7][8][9][10][11][12][13][14] try to map the spread of the disease using a Geographic

Information System (GIS) approach. GIS is the most widely used choice because it has the ability to visualize the distribution well, compared to using data tables. With the form of visual data presentation, it is easier to be analyzed and interpreted, so that it is easier for related parties to formulate prevention or handling strategies.

This study aims to develop GIS in the distribution of diseases in Jember Regency. So that with the GIS developed the research hopes that it can be used widely both for the general public or the government to plan a prevention or treatment of diseases in Jember Regency.

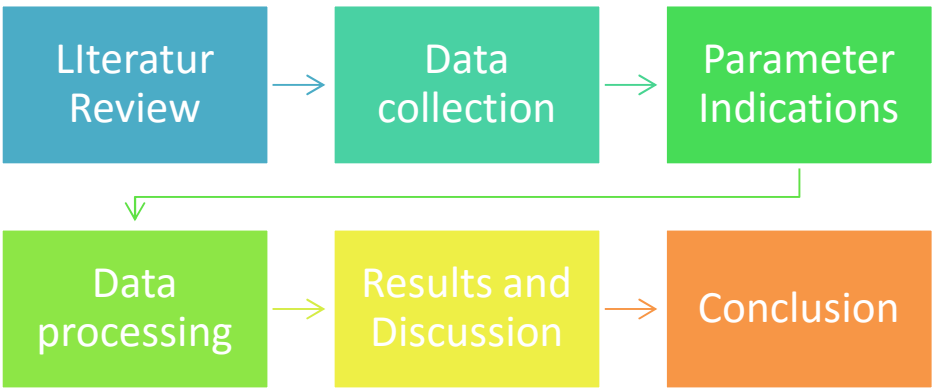
2. Related Work

Geographic Information System (GIS) is the most widely used option for handling disease distribution because it has the ability to visualize the distribution well, compared to using data tables. But GIS research for health also has challenges, Research [8] find out to what extent the public health system is helped by real-time mapping of distribution, conditions and efficacy of treatment, the results found that there are deficiencies in GIS that are inaccurate will have an adverse effect on the treatment of the disease.

Research [2] do modeling of the spread of disease, this study tries to understand the pattern of disease distribution. Research [3] see the environmental impact of Hand-Foot-Mouth disease in Shenzhen China using hospitals and GIS. Research [4] using the Fuzzy Weight of Evidence (FWoFE) method implemented in GIS, this method is used to predict disease distribution, by monitoring water and planning. Research [5] mapping the distribution of dengue fever using the Spatial Statistic, Spastial Interpolation and Buffer Analysis methods, then the results of the processing are visualized in the GIS. Research [6] [7] use Geometric Descriptors to find / follow the distribution of diseases. Research [9] visualize dengue fever incidents using the Expectation Maximization (EM) Algorithm. Research [10] visualizing the spread of infectious diseases with GIS, this study is shown for prevention.

From the explanation of the research above, it can be seen that GIS for mapping the distribution of diseases has a good future as well as challenges. This challenge arises because the GIS is not representative, to answer these problems research developing GIS that is relevant to limited regional needs. Limited regional selection in this study aims to spread the data displayed by the system to represent conditions in the field.

3. Research Method



Figures 3.1 Research Methods

3.1 Literature Review

Literature study was conducted with the aim of collecting information from several references related to the issues to be discussed. Theories related to the problems that will become research are used as a

basis for processing data. At this stage the State of the Art will be obtained where the research position serves to identify problems.

3.2 *Data Collections*

Literature study was conducted with the aim of collecting information from several references related to the issues to be discussed. Theories related to the problems that will become research are used as a basis for processing data. At this stage the State of the Art will be obtained where the research position serves to identify problems.

3.3 *Parameter Identification*

This stage is carried out to identify the parameters or variables that will be used in the research. Parameter determination is done by observing the actual conditions to determine what parameters are needed. This identification phase is carried out in consultation with the Expert.

3.4 Data Processsing

Data processing is done to change the raw data obtained in the field so that it can be displayed in the GIS. The processing stage starts from the classification and then arranges the data structure, so that it is suitable for display in the form of a visual map.

3.5 Pengembangan Aplikasi

The stages of developing this application are the stages of coding GIS, at this stage the results will be entered into the results of consultation with experts, then entered the observation data in it, so that GIS display will be obtained which represents the distribution of diseases in Jember Regency.

3.6 Rsult and Discussion

At this stage, an analysis of the display of GIS will be carried out on the raw data, then it will be discussed the suitability and non-conformities that arise in the development process. If there are parts that are not appropriate, it will be repaired, if there is no discrepancy, the application is considered successful.

3.7 Conclusions and Recomendations

At this stage is the final stage of the research that draws conclusions from the results of the analysis of the discussion and provides suggestions for further research. In this section a review of related technology / research is also conducted, this is done to ensure the research has a clear / novel contribution to the research world. In addition, by continuing to review research developments, research will benefit if there are similar studies that might find results that could improve the reading / modeling of the system..

4. Result and Discussion

This study uses three layers consisting of the location of health facilities, the distribution of disease represented by data obtained from the list of disease patients in each health facility, then the third layer is the distribution layer of the disease.

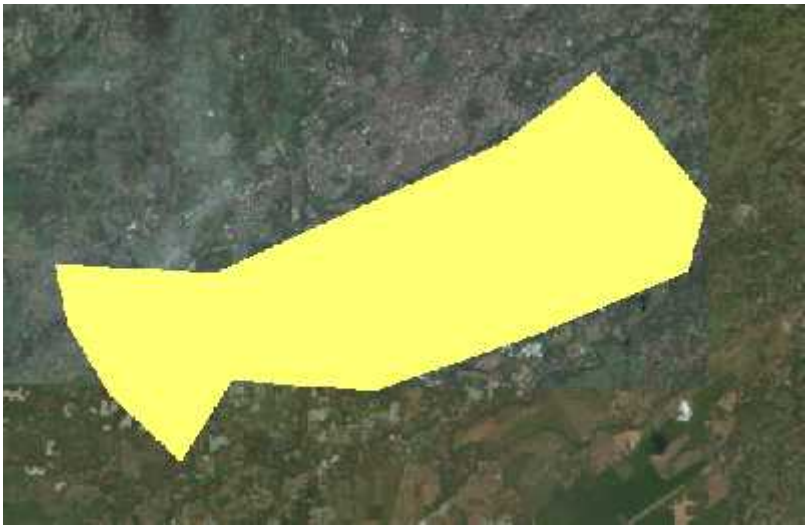
The use of the three layers in this study aims to provide a complete picture of the complete distribution of the disease in Jember Regency, the existence of health facilities and the spread of disease distribution used as government variables to take a policy of handling or preventing a disease.

This study aims to develop GIS in the distribution of diseases in Jember Regency. So that with the GIS developed the research hopes that it can be used widely both for the general public or the

government to plan a prevention or treatment of diseases in Jember Regency. The developed system is shown by Figure 1.

Picture 1. Jember

The analysis used in the research is in the form of visual, spatial and modeling analysis. Modeling is done because the distribution of the disease does not have a fixed form, such as the example of the distribution of disease Dengue on Jalan Java, so the distribution can only follow the shape of the road. The application used in this study is to combine the distribution points and then form polygons that describe the distribution of disease. The results of the tests carried out by the research show that the application can provide a complete picture of the conditions of disease distribution in Jember Regency.



Picture 2. Affected Area

5. Conclusion

The results of research conducted have succeeded in developing a GIS that describes the distribution of diseases in Jember Regency. Spread results can be displayed accurately according to the data collected in the research process. This study will further develop the capabilities of the application by completing the application with the ability to input from health facilities in the form of information on the type of disease suffered and the number of patients suffering.

This research is expected to provide an overview that can be used by the government to determine strategies for handling or preventing a disease. So that the distribution of a disease can be recognized and controlled properly, and finally the impact or victim can be minimized.

Acknowledgment
The authors would like to acknowledge the financial support of this work by grants from PNBP, Politeknik Negeri Jember. The author also thanked the P3M and Jurusan Teknologi Informasi, Politeknik Negeri Jember, which has provided support and assistance in completing this research.

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