

The Application Of Google Earth In The Arrangement Of Industry And Trade Agglomeration Areas In Pekalongan City

Agus Ilyas¹, Tri Agus Setiawan², Eny Jumiati³, Satriedi Wahyu Binabar⁴

¹Informatics Management Study Program, ^{2,3}Informatics Engineering
STMIK Widya Pratama

¹agusilyas@gmail.com, ²tri.triagus.setiawan45@gmail.com, ³enyjumiati003@gmail.com, ⁴binabars@gmail.com

Accepted on 31-12-2022

Abstract

Pekalongan City has a variety of potential areas that include the field of industry, services and trade or called agglomeration. The potential that exists is not only in the field of batik but also has beach tourism areas, culture, shopping, electronic trade, hotels, markets and so on. Based on the data from the Agency for Regional Development of Pekalongan City (Bappeda) in 2020 that in 2019 the investment growth was Rp. 3.29 trillion, the economic growth in the industrial sector was 4.84%, and the economic growth in the trade and services sector was 5.72%. Meanwhile, the economic income in 2019 in the Large Trade and Retail sector contributed the largest GDP of 21.79% while the smallest sector of the Water Supply, Waste Treatment, Waste and Recycling sector was 0.10%. With an area of 45.25 km² which has 4 sub-districts and 27 urban villages classified as a small area has limitation in choosing the ideal location, it is possible to have the emergence of centralization or concentration of industry in a certain area or on the other hand, there are several different types of centers and industries in one area because the area is very potential compared to other regions, this is in accordance with the spatial and regional planning (RTRW). For this reason, it is necessary to have a Geographic Information System (GIS) that is able to display the web-based agglomeration of industry and trade to ensure the quality and smooth flow of information about the existing potential. For this reason, the research that will be carried out uses the *Research and Development (R&D)* method, while the system development model used is Waterfall. In the creation and development of applications carried out with free and open-source software (Google Earth, global Mapper and others). The results of the research conducted can help the government in the context of making regional development policies based on the Geographic Information System of the Agglomeration of Industry and Trade so that between industry players there is no unfair competition but rather support and complement each other so as to increase the original income of the region, and investment for the achievement of the welfare of society

Keywords: *Geographic Information Systems, Agglomerations, Spatial and Regional Planning*

I. INTRODUCTION

Pekalongan known as the City of Batik has various regional potentials that include the field of industry, service, and trade. The potential that exists is not only in the field of batik but also has beach tourism areas, culture, shopping, electronic commerce, hotels, markets and so on. Based on the data from the Agency for Regional Development of Pekalongan City (Bappeda) in 2020 that in 2019 the investment growth was Rp. 3.29 trillion, the economic growth in the industrial sector was 4.84%, and the economic growth in the trade and services sector was 5.72% [1]. Meanwhile, the economic income in 2019 in the Large Trade and Retail sector contributed the largest GDP of 21.79% while the smallest sector of the Water Supply, Waste Treatment, Waste and Recycling sector was 0.10%. Based on the existing of Spatial and Regional Planning (RTRW) of Pekalongan City [2] has been compiled and drawn a map of the distribution of industrial estates, both trade and services or called agglomerations. Industrial agglomeration [3][4][5] is the concentration of industrial activities aimed at more optimal and efficient management. The existing agglomerations include batik and textile centers located in Buaran Alit, Kradenan, Jenggol, Banyuurip Alit, Banyuurip Ageng, Medono, Kauman, Kergon, Sampangan, Poncol, Pasir Sari and Pabean; Electronic Trade Centers on Hayam Wuruk and Gajahmada street; hotels located on Gajahmada street, Dr. Cipto Mangunkusumo street; Beach and Cultural Tourism on Jetayu street, Panjang Wetan, Slamaran; Shopping Center on Nusantara Street, Urip Sumoharjo street and other centers or areas. Pekalongan City which covers an area of 45.25 km² / 4525 hectares with 4 sub-districts and 27 urban villages those are classified as a small area has limitations in choosing an ideal location, so it is very possible that there will be a centralization or concentration of industry in a certain area or in the other hand, there are several different types of centers and industries in one area because the area is very potential compared to other regions. For this reason, it is necessary to have a Geographic Information System (GIS) that is able to display the web-based agglomeration of industry and trade [6][7][8][9] to ensure the quality and smooth flow of information about the existing of potential. Based on the existing conditions, research is needed to mitigate and find out the potential location in increasing economic activity as a step to equalize economic growth. For this reason, the research carried out using the *Research and Development (R&D)* method [10][11] which is the method used to produce certain products and test the effectiveness of the product, while the system development model used is Waterfall [12]. The creation and development of applications carried out with free and open-source software that provides data and information about the location and area of industry, services, and trade.

From the results of the research carried out, it can help the government in the context of making regional development policies in mitigating and managing the spatial and regional planning of Pekalongan City (RTRW) based on the Agglomeration Geographic Information System Industry so that between industry players there is no unfair competition but rather support and complement each other so as to increase the original income of the region, investment for the achievement of the welfare of society

II. LITERATURE REVIEW

Several studies are used as previous research that is used as a research reference. The previous researches were about the Agglomeration Geographic Information System [32][33][34] in table 1:

Table 1. Related Research The Agglomeration Geographic Information System

Author	Title	Problem	Result
Haryanto, et. al 2017	Spring Potential Analysis Using Geographic Information Systems	There are difficulties in classifying and displaying potential springs with the help	Produce mapping by generating four classes, namely rare (rare groundwater area), low (local productive aquifer), medium

		of a Geographic Information System (GIS).	(medium productive aquifer), and high (high productive aquifer).
Sadali, et.all 2020	Regional Potential Development in Samigaluh District, Kulon Progo Regency Through Participation-Based Tourism Potential Mapping	There is no mapping that can determine the location of tourism potential in Kulonprogo Regency	Able to display web-based tourism potential in Kulonprogo Regency so as to increase local revenue
Lie, et.all 2021	Analysis of urban agglomeration structure through spatial network and mobile phone data	Understanding the structure of urban agglomeration is therefore essential for policy-makers and planners	The results provide deeper insights into the urban agglomeration structures and spatial network collaboration

III. RESEARCH METHOD

Research conducted using *Research and Development (R&D)* [13][11], which is a method used to produce a particular product and test the effectiveness of the product as figure 2.1

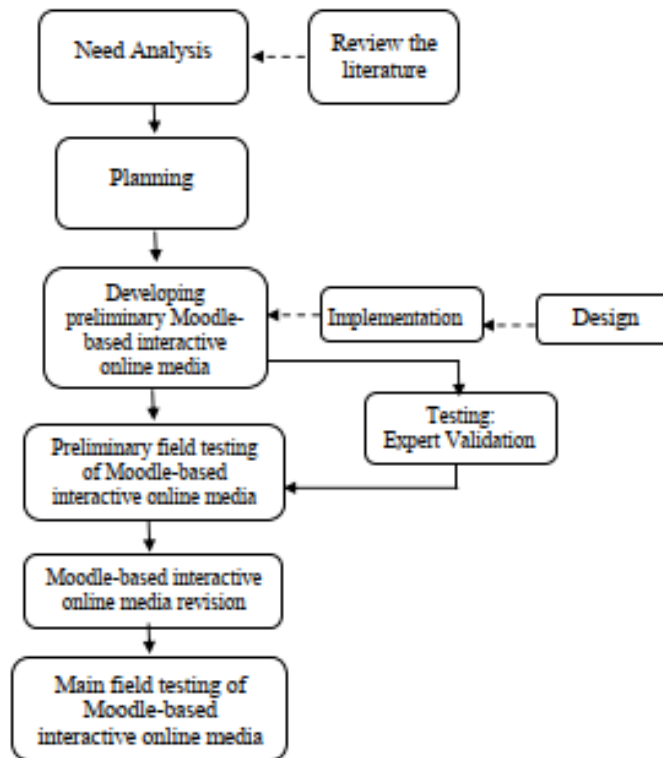


Figure 2. 1 R &D Research Methods

1. Collecting Data Method

Collecting data methods those are:

- a. Observation, direct observation on the object of the research in the form of data on the distribution of industrial areas of trade, tourism and culture, services, and markets.
- b. Interviews, conducted with relevant agencies and businessmen
- c. Sampling, data collection in the form of businessmen, examples of electronic businessmen, hotel managers, and others

2. Stages of Research

Stages in the research namely:

- a. Survey and Data Collection.
Collection of the data on the distribution of trade, tourism and cultural industrial estates, services, markets, spatial data and regional attributes in the form of *Latitude-Longitude* coordinates. The data is taken from the Agency for Regional Development of Pekalongan City (Bappeda) website, BPS, Department of Industry and Trade of Pekalongan City

- b. Data Processing

The stages data processing are carried out as follows:

Data in the form of the distribution and number of trade, tourism and cultural industries, services, markets, articles, images, videos, documents are processed in the form of tables and stored in databases using Xampp and MySQL. The agglomeration distribution map is obtained from the Spatial and Regional Planning (RTRW) of Pekalongan City as shown in Figure 2.2.

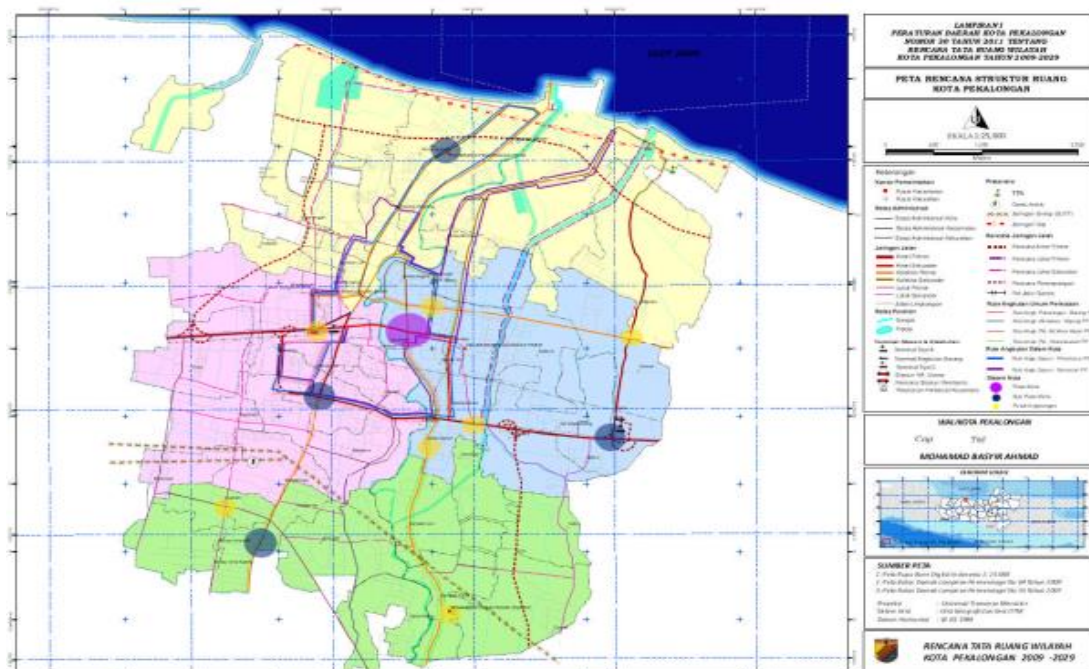


Figure 2. 2 Spatial and Regional Planning (RTRW) of Pekalongan City

Planning and development are very closely related in realizing an ideal city. Regional development must be based on land needs and planned economic needs [4][30]. Globalization that is growing is one of the significant causes in influencing the development in Indonesia, both city and regency governments to carry out physical development [3]. The development activities are so significant that they require the Government in Indonesia to issue policies that regulate development.

Industrial agglomeration [31] is the centralization of industrial activities aimed at more optimal and efficient management. The factors causing the occurrence of agglomeration those are a. The existence of an area or area of production growth center that is designed according to the spatial layout and function of the region. b.

Similarity of business locations based on one of the production factors. c. The existence of a similarity in the need for complete infrastructure and service facilities. d. The existence of cooperation and mutual need in producing a production.

The benefits of agglomeration in some regions produce something positive for the region and industry, including a. Reducing environmental pollution, because with such concentration it is easier to prevent it b. Facilitate supervision and monitoring by relevant institutes on industries that do not follow the rules. c. It can promote the region easily. d. It can reduce transportation costs and production costs to a minimum.

From the research conducted obtained data on the place of trade based on the type of trading facilities based on the source: <https://pekalongankota.bps.go.id/> as in table 2.1:

Table 2.1 Types of Trading Facilities

Types of Trading Facilities	2018	2019	2020	2021
Market	10	10	10	10
Shop	74	74	74	74
Stall	466	503	555	555
Los	1300	1417	1404	1419
Retail	1228	1237	1135	1120
Total	3078	3241	3178	3178

There is a distribution of areas based on Regional Regulation No.30 of 2011 concerning the Regional Spatial Plan of Pekalongan City [18] as in table 2.2:

Table 2.2 Pekalongan City Spatial Area

Area Type	Street/Village/Sub-district
Modern Shopping Area	Tirto Street, Gajah Mada Street, Hayam Wuruk Street, Dr. Cipto Street, Dr. Wahidin Street, KH. Mas Mansyur Street, Jenderal Sudirman Street, Dr. Setiabudi Street, Dr Sutomo Street, Urip Sumoharjo Street, Gatot Subroto Street, Hos Cokroaminoto Street, Kartini Street, KH. Wahid Hasyim Street, Hasanudin Street, Sultan Agung Street, WR. Supratman Street
Shopping Center Area	Alun-alun Area, Monumen Area, Urip Sumoharjo Street, Sultan Agung Street and Dr. Soetomo Street
Traditional Market Area	Banyurip Alit, Landungsari and Sampangan Village
Government Office Area	Mataram Village Podosugih Village, Sriwijaya Street, Bendan Street, WR. Supratman Street, Kusuma Bangsa Street and Jetayu Panjang Wetan, Village, Tirto Street
Private Office Area	Pemuda Street Bendan Village, Area Imam Bonjol Street Kraton Lor Village, Diponegoro Street Dukuh Village, Jend. Soedirman Street, Podosugih Village
Small and Micro Industrial Estate (Batik and Textile Industry)	Buaran Village, Kradenan Village, Jenggol Village, Banyuurip Alit Village, Banyuurip Ageng Village, Tegalrejo Village, Pringlangu Village, Medono Village, Tirto Village, Kauman Village, Kergon Village, Sampangan Village, Poncol Village, Pasir Sari Village and Pabean Village
Small and Micro Industrial Estate (Food and Beverage Industry)	Banyurip Alit Village and Banyurip Ageng Village
Cultural Tourism Area	Krapyak Kidul Village, Krapyak Lor Village and Sapuro Village
Beach Tourism Area	Krapyak Lor Village and Panjang Wetan Village
River Tourism Area	Panjang Wetan Village, Krapyak Kidul and Krapyak Lor Village

For coding activities in creating a website using codeigniter framework, bootstrap, CSS to make it look attractive and responsive.

This testing phase will test the app's system before it is published. Testing on the system uses the Black Box method. This test aims to find out which systems is running according to the analysis and design at the time of the development. Testing with black Box method has the aim to test every function that runs (functional) in the software. Indicators of success for each section tested by testing each section and the functions of menus, submenus, forms and buttons on the system. System testing and success indicators are created using tables for easy reading. Testing starts from the functional needs of the system. The system functional needs testing table is shown in Table 2.3.

Table 2.3. Functional Testing

No	Functional Testing	Information
1	There are Front-end and Back-end as the main page and Admin	Available
2	There is a form for providing criticism and suggestions	Available
3	There is Admin page to manage data and information	Available
4	There are pages to display photo and video galleries	Available
5	There is a page for changing data	Available
6	There is a page that displays a visualization map of the agglomeration map of Pekalongan City	Available

IV. RESULTS AND DISCUSSION

The design and manufacturing process of the Regional Agglomeration GIS in Pekalongan City is as follows:

1. Preparation and Application

Spatial data collection is carried out using the help of the Android GPS application. The GPS application used is Polaris Navigator, which is one of the GPS applications with excellent accuracy capabilities for latitude and longitude locations besides that there are some quite interesting features. Download Polaris Navigator App And Install It.

2. Spatial data collection

Activate then select on the Main menu will be displayed Latitude and Longitue, the existing data is recorded written in document Excel and stored in the form of cvs as in table 2.4:

Table 2. 4 Latitude and Longitue Area in Pekalongan City

1	109.676155	-6.8895800	17	109.679203	-6.8902509
2	109.676501	-6.8896066	18	109.679225	-6.8900072
3	109.677049	-6.8896990	19	109.679225	-6.8897820
4	109.677035	-6.8899398	20	109.679254	-6.8896193
5	109.677001	-6.8902759	21	109.679308	-6.8894042
6	109.676938	-6.8906874	22	109.679378	-6.8891514
7	109.677100	-6.8907601	23	109.679050	-6.88906838
8	109.677306	-6.8907993	24	109.678789	-6.88902034
9	109.677690	-6.8908519	25	109.678261	-6.8889065
10	109.678066	-6.8909296	26	109.677641	-6.8888299
11	109.678348	-6.8910009	27	109.677086	-6.8887197
12	109.678762	6.89103980	28	109.67637	-6.8886032
13	109.678999	-6.8910139	29	109.676326	-6.8888941
14	109.679173	-6.8909037	30	109.676290	-6.8894196
15	109.679173	-6.8906813	31	109.676169	-6.8894075
16	109.679211	-6.8904837	32	109.676155	-6.8895800

3. Enter data into Google Earth

Excel data that has been saved in the form of a csv file is then entered using the import command into Google Earth. Data will be displayed in the form of dots with labels 1 to 32, then using the polygon tool it is drawn by connecting one point with another. The starting point will meet the end point so that it is closed, hence the name closed polygon. Blend the appropriate colors to make them look more attractive

4. Save polygon image data in the form of KML then uploaded into cloude / hosting, then called via the program usually invocation is made via View on the Front-end if using CodeIgniter. With the command

```
var variable-name= new google.maps.KmlLayer({  
    url: 'https://nama-doain.com/file-kml.kml',  
    map: peta  
});
```

The results of the exit are as follows

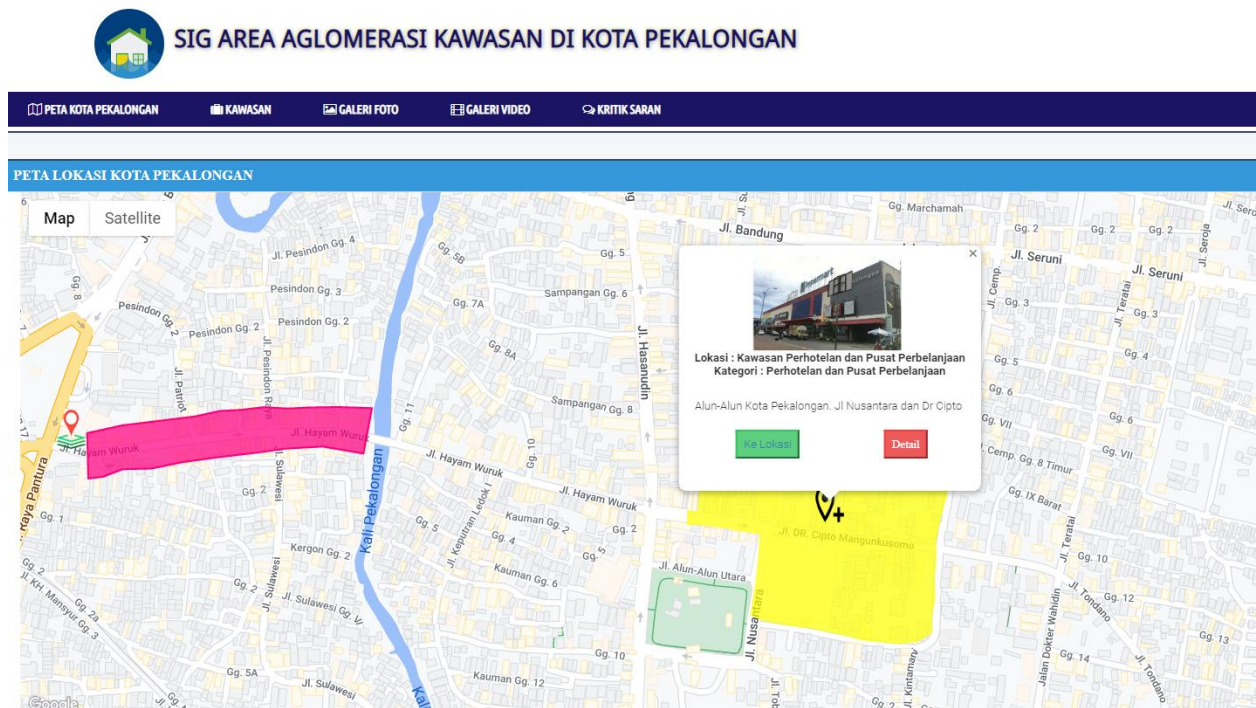


Figure 2.3 Agglomeration Area

The yellow picture shows the Hotel area which includes the Sidji Hotel, Pesona and Namira Hotel which is 4-star. For shopping centers, among others, there are Matahari and Jogya. The area is a modern area in the city of Pekalongan

V. CONCLUSION

Summarize sentences the primary outcomes of the study in a paragraph. Explain if the claims in this section supported by the results, and if they seem reasonable. Also, describe whether the result support or contradict previous theories, and explain how the research has moved the body of scientific knowledge forward.

REFERENCES

- [1]P. K. Pekalongan, *Preliminary Draft of the Local Government Performance Plan (RKPD) of Pekalongan City in 2022*, vol. 7. 2020.
- [2]S. D. K. Pekalongan, *Pekalongan City Regional Regulation Number 9 of 2011 concerning Parking Tax.pdf*. 2011.
- [3]V. M. Zahara, S. Adha, D. Adiwinata, and M. Nurhikmat, "Agglomeration of Regional Development Disparities of Banten Province," *JIIIP - J. Ilm. Science Educator.* , vol. 4, no. 4, pp. 228–236, 2021.
- [4]B. Novirin, "Analysis of the Effect of Industrial Agglomeration on Economic Growth in Its Implementation in Several Regions of Indonesia," *Oikon. J. Kaji. Ekon. and Keuang. Sharia*, vol. 2, no. 1, pp. 60–69, 2021.
- [5]Pekalongan City Government, *Pekalongan Mayor Regulation Number 10 of 2021 About the Roadmap for the Development of the Creative Economy of Pekalongan City for 2020-2024*. 2021.
- [6]I. Yuliadi, "A survey of agglomeration determinants in Indonesia," *Acad. J. Interdiscip. Stud.* , vol. 10, no. 1, pp. 304–312, 2021.
- [7]M. M. Ridhwan, "Spatial wage differentials and agglomeration externalities: Evidence from Indonesian microdata," *Econ. Anal. Policy*, vol. 71, pp. 573–591, 2021.
- [8]J. Zhang, J. Li, C. Dong, X. Zhang, A. Rentizelas, and D. Shen, "Comprehensive assessment of sustainable potential of agricultural residues for bioenergy based on geographical information system: A case study of China," *Renew. Energy*, vol. 173, pp. 466–478, 2021.
- [9]J. Langer, A. A. Cahyaningwidi, C. Chalkiadakis, J. Quist, O. Hoes, and K. Blok, "Plant siting and economic potential of ocean thermal energy conversion in Indonesia a novel GIS-based methodology," *Energy*, vol. 224, p. 120121, 2021.
- [10]Sugiyono, *Qualitative Quantitative Research Methods R&D*. Alfabeta, 2011.
- [11]M. D. Gall, W. R. Borg, and J. P. Gall, *Educational Research*. University of Akron, 2002.
- [12]R. S. Pressman, *Software Engineering A Practitioner's Approach*, Eight Edit. Mc Graw Hill, 2015.
- [13]Sugiyono, *Qualitative Quantitative Research Methods and R&D*, 2nd ed. Alfabeta, 2019.
- [14]T. A. Setiawan, H. W. Hapsoro, and A. Ilyas, "Mitigation of Drug Distribution Through Geographic Information Systems in Pekalongan City with The Integration of Global Mapper and Google Earth," *Diigtal Zo.* , vol. 11, no. x, pp. 324–334, 2020.
- [15]L. Safanelli *et al.* , "Terrain Analysis in Google Earth Engine : A Method Adapted for High-Performance Global-Scale Analysis," *Int. J. Geo-Information*, pp. 1–13, 2020.
- [16]A. Dennis, B. Haley Wixom, and R. M. Roth, *System Analysis and Design*, Fifth. John Wiley & Sons, Inc, 2012.
- [17]A. Susanty, S. Hartini, D. Puspitasri, W. Budiawan, and P. Hidayatullah, "Design the geographical information system for supplier selection in batik industry," *Lect. Notes Eng. Comput. Sci.* , vol. 2217, pp. 221–226, 2015.
- [18]P. K. Pekalongan, *Regional Regulation No.30 of 2011 concerning the Spatial Plan of Pekalongan City Area*. 2011.
- [19]N. E. Christian, Y. D. Y. Rindengan, and P. D. K. Manembu, "Designing Web Services-Based Public Facility Applications," *J. Tek. Inform.* , vol. 8, no. 1, 2016.
- [20]Y. A. Susetyo, P. O. N. Saian, and R. Somya, "Construction of an HMVC-Based Marine Resource Potential Zone Information System in Gunungkidul Regency Using Google Maps API and JSON," *Indones. J. Model. Comput.* , vol. 2, pp. 101–107, 2018.
- [21] A. Ilyas, T. A. Setiawan, and S. W. Binabar, "GEOGRAPHIC INFORMATION SYSTEM FOR EDUCATION AND FLOOD DISASTER MITIGATION FOR DISASTER PREPAREDNESS IN PEKALONGAN CITY," *J. R&D of Pekalongan City*, vol. 19, pp. 55–63, 2020.
- [22]T. H. Prasetyo, "Designing Webgis-Based Land Inventory Systems for the Government," in *National Seminar on Information and Multimedia Technology*, 2016, pp. 6–7.
- [23]A. B. Webie Ni Maja, "Designing a Web-Based Land Value Zone Geographic Information System Using a Javascript Library Leaflet," *J. Tek. ITS*, vol. 5, no. 2, pp. A809–A816, 2016.
- [24]I. Setiawan, "The Role of Geographic Information Systems (GIS) in Improving Spatial Thinking Skills," *J. Educator. Geogr.* , pp. 733–744, 2014.
- [25]I. R. Setiawan and G. P. Hartawan, "Computer-Based Mapping as a Means of Describing the Potential of

- the Waluran District, Sukabumi Regency," *J. Teknol. Engineering*, vol. 3, no. 2, pp. 303–310, 2018.
- [26]J. C. Wibawa and R. Zulfikar, "GIS-Based Regional Potential Analysis and Mapping Using the Growth Ratio Model (MRP)," *J. Tek. Inform. and Sist. Inf.*, vol. 3, pp. 524–538, 2017.
- [27]I. Geografis and S. I. G. Sig, "WebGIS-Based Mapping of Settlements and Potential Village Areas," *METIK*, vol. 4, no. 2, pp. 35–41, 2020.
- [28]A. Khusnawati and A. P. Kusuma, "GEOGRAPHIC INFORMATION SYSTEM MAPPING THE POTENTIAL OF LIVESTOCK AREAS USING WEIGHTED OVERLAY," *J. Mnemon.*, vol. 3, no. 2, pp. 21–29, 2020.
- [29]J. Coreit *et al.*, "Geographic Information Systems for Mapping the Business Potential of Creative Industries," *J. CoreIT*, vol. 2, no. 1, pp. 1–7, 2016.
- [30]M. D. Windasari, S. Ningsih, and Y. A. Pravasanti, "The Effect of Industrial Agglomeration, Labor Force, and Human Capital Investment on The Economic Growth of Regencies/Cities in Central Java Province in 2017-2019," *J. Akunt. and taxes*, 2019.
- [31]F. M. Eriandy, "AGGLOMERATION ANALYSIS ON ECONOMIC CORRIDORS IN INDONESIA,"
- [32]X. Liu, J. Huang, J. Lai, J. Zhang, A. M. Senousi, and P. Zhao, "Analysis of urban agglomeration structure through spatial network and mobile phone data," *Trans. GIS*, vol. 25, no. 4, pp. 1949–1969, 2021.
- [33]et al., "Pengembangan potensi wilayah di Kecamatan Samigaluh, Kabupaten Kulon Progo melalui pemetaan potensi wisata berbasis partisipasi," *J. Pendidik. Geogr.*, vol. 25, no. 1, pp. 1–16, 2020.
- [34]T. Hariyanto, S. A. Ekaprathama, and A. Kurniawan, "Analisis Potensi Mata Air Menggunakan Sistem Informasi Geografis (Studi Kasus : Wilayah Perbatasan Kabupaten Lumajang Dan Kabupaten Probolinggo)," *Geoid*, vol. 12, no. 2, pp. 158–162, 2018.