JOURNAL OF APPLIED GEOSPATIAL INFORMATION

Vol 5 No 2 2021

http://jurnal.polibatam.ac.id/index.php/JAGI
ISSN Online: 2579-3608

Development of A Geographic Information System for The Distribution of Parks in Kediri City

Toga Aldila Cinderatama [1,*], Trisha Alfandi[2], Ashafidz Fauzan Dianta[3], Rinanza Zulmy Alhamri[4], Hamdani Arif[5], Yoppy Yunhasnawa[6]

[1,2,4] PSDKU Kediri, State Polytechnic of Malang, Mojoroto, Kota Kediri, Indonesia
[3] Dept of Creative Multimedia Technology, Electronic Engineering Polytechnic Institute of Surabaya, Sukolilo, Kota Surabaya, Indonesia
[5] Dept of Informatics Engineering, State Polytechnic of Batam, Kota Batam, Kepulauan Riau, Indonesia
[6] Dept of Information Technology, State Polytechnic of Malang, Lowokwaru, Kota Malang, Indonesia
*Corresponding author e-mail: toga.aldila@polinema.ac.id

Received: Sep 13, 2021
Accepted: November 18, 2021
Published: November 20, 2021

Abstract
The Department of Environment, Hygiene, and Parks is an agency that takes care of cleanliness and landscaping in Kediri. The distribution of parks in the Kediri City area is data and managed using a manual system using Microsoft Excel to get results in reports. For this reason, the Department of Environment, Cleanliness, and Parks requires an application that can be used to help manage data on the distribution of parks in the Kediri City area. The required system can manage park distribution data, display a park distribution map, and display the scale of conditions. The Geographic Information System for the Distribution of Parks in the City of Kediri was designed and built to meet the needs of the relevant agencies. Users of this system consist of visitors, admins, and heads of services. The system is designed and implemented using PHP, HTML, CSS, JavaScript, Mysql, and Laravel Framework, then integration with Google Maps API. The final result of this research is a Geographic Information System for the distribution of web-based parks in the City of Kediri using the Google map API as a provider of free maps that are integrated into the website. In addition, of course, it provides information about the distribution of the park and the scale of conditions.

Keywords: City Parks Distribution, Kediri City, Open Green Space, Maps, Geographic Information System

1. Introduction

The development of information technology today is progressing very rapidly. The development of this technology is marked by the existence of processing in the field of work which was initially managed using the manual method has now been managed using digital technology. Internet media users have a significant influence in the effort to present information.With the internet, the media information can be quickly and easily obtained and disseminated. City parks are green open spaces that have many benefits for the surrounding community. City parks can be used for vacation spots; there are many things we can do to spend free time in the middle of routines that make us bored, such as doing activities with the community, playing, exercising, taking pictures, relaxing. In addition, the park can also be used to hold events such as music events and socialization events. Currently, the city government of Kediri is intensively building city parks; each sub-district in the city of Kediri has several parks that can be used for tourism and other activities. The distribution of city parks is not so evenly distributed in the city of Kediri(Perda Kota Kediri, 2013), several urban villages have not built parks, but there are also urban villages with more than one city park. The development of city parks should be proportional to the sub-district area and the sub-district population. Before building a park, all factors should be considered in advance, from the right location to comparing the number of parks and the area. Therefore, a geographic information system is required to provide city park data in the Kediri City area. GIS (Geographic Information System) is expected to provide convenience in accessing, storing, changing data, and updating data. In addition, the existence of GIS is expected to provide instructions and convenience for visitors to obtain information related to the distribution of city parks, comparison of park area with the area, and

comparison of park area with population. Research related to the topic of Geographic Information Systems has been carried out by several researchers referring to previous research relevant to the current research. In 2019 Dwiki Rifara Khodri researched the Utilization of Geographic Information Systems for Mapping the Distribution of City Parks Based on Android. This study makes an android-based application for the distribution of city parks in Pasuruan City. According to the theme, this application hopes to introduce application users to parks in Pasuruan City and their facilities (Khodri, 2019). In 2017 Galuh Gumilang et al. researched the Implementation of Google Map Service for Mapping the Spread of Thematic Parks in the City of Bandung. This study resulted in a web-based geographic information system used by local governments and the general public to access information about thematic parks in the city of Bandung. In addition, this system can also provide information about the distribution of thematic parks in Bandung, which is expected to become a tourism promotion event in the city of Bandung(Galuh, 2017). In 2018 Hamdi et al. have researched the Design of a Web-Based Geographic Information System for Mapping Parks in Indragiri Hilir Regency. The web-based geographic information system for mapping parks in Indragiri Hilir district aims to promote recreational areas. It can make it easier for the public to search for parks and green open spaces by searching for precise and accurate coordinates and accurate information(Hamdi, 2018). From the previous implementation, the authors only show the distribution of the object of their case study based on coordinates. In this study, the geographical information system has been design and build to show the distribution of parks in the City of Kediri that equipped with additional feature to filter park distribution data based on area scale and population to help The Department of Environment, Hygiene, and Parks convey information about the distribution of parks in the City of Kediri.

2. Literature Study

2.1 Geographic Information System(GIS)

Geographic Information System is a computer system used to collect, examine, integrate, and analyze information related to the earth's surface. The term geographic information system combines three main elements: systems, information, and geography. Thus, understanding these three main elements will be constructive in understanding GIS. By looking at the main elements, it is clear that GIS is one of the information systems. GIS is a system that emphasizes elements of geographic information. The term "geographic" is part of the spatial (spatial). These two terms are often used interchangeably or interchangeably until a third term arises, geospatial. These three terms contain the same meaning in the context of GIS (Prahasta, 2002).

2.2 City Parks

City parks are green open spaces that have the primary function for beauty and social interaction. City parks, as one of the green open spaces, also have functions, namely, landscape functions, environmental conservation functions, educational values, activity spaces, and city facilities, aesthetic values, economic activities, social functions, ecological functions, hydrological functions, and health functions (Iswara, 2017).

Table 2.1 City Park in Kediri City

No	City Park Name	District	Address	m^2
1.	Taman Joyoboyo	Kota	Jl. Ahmad Yani, Banjaran	35.000
2.	Taman Ngronggo	Kota	Jl. Perintis Kemerdekaan No. 90	6.995
3.	Taman Memorial	Kota	Jl. PK Bangsa	2.375
4.	Taman Stasiun	Kota	Jl. Stasiun	366
5.	Taman Bantaran Sungai Brantas	Kota	Jl. Mayjend Sungkono	2.055
6.	Taman Tugu Adipura	Kota	Jl. Mayjend Sungkono	22
7.	Taman Monumen Pancasila	Kota	Jl. Basuki Rahmat	433
8.	Taman Air Terjun Jembatan Lama	Kota	Jl. Mayjend Sungkono	34
9.	Taman Kantor DKP	Kota	Jl. Mayor Bismo	601
10.	Taman Alun-Alun	Kota	Jl. Panglima Sudirman	
11.	Taman Pulau Jembatan Semampir Sisi Timur	Kota	Jl. Mayor Bismo	127
12.	Taman Sekartaji	Mojoroto	Jl. Veteran	6.255
13.	Taman Lingkaran Sekartaji	Mojoroto	Jl. Sudanco Supriyadi	345
14.	Taman Garuda	Mojoroto	Jl. Sudanco Supriyadi	102
15.	Taman Goa Sudanco	Mojoroto	Jl. Sudanco Supriyadi	996
16.	Taman Harmoni	Mojoroto	Jl. Sudanco Supriyadi	875
17.	Taman GOR	Mojoroto	Jl. Raung	1.631
18.	Taman Pulau Jembatan Sisi Barat	Mojoroto	Jl. KH. Ahmad Dahlan	133

19.	Taman Jl. Kawi	Mojoroto	Jl. Kawi	56
20.	Taman Herbal	Mojoroto	Jl. Totok Kerot No. 7000	16.747

2.3 Provision of green open space by area in urban areas

Green open space in urban areas consists of public green open space and private green open space. The proportion of green open space in urban areas is at least 30% which consists of:

of 20% public green open space and 10% consists of private green open space. If the area of green open space, both public and private, in the city concerned has a total area greater than the applicable regulations or laws, this proportion must be maintained. 30% proportion is the minimum measure to guarantee balance

urban ecosystems, both the balance of the hydrological system and microclimate balance, as well as other ecological systems that can increase the availability of clean air needed by the community, and at the same time increase the aesthetic value of the city(Permen PU, 2008). Table 2.2 is green open space data that shows the percentage of green open space in the area of Kediri City.

Table 2.2 Data Recapitulation of Kediri City Green Open Space

No	District	Green Open Space Area (m^2)	District Area (Km^2)
1	Mojoroto	4,270,505	24,6
2	Kota	3,557,547	14,9
3	Pesantren	5,393,680	23,9

The ratio of public green open space is used to determine the adequacy of public green open space to the needs of public green open space. The following equation is used To determine the level of public green open space adequacy ratio:

$$\textbf{Green Open Space Ratio} = \frac{\text{Green Open Space Area}}{\text{District Area}} \textbf{ x 100\%}$$

Where with the ratio value:
< 10% : Very Less
10% – 20% : Less
> 20% : OK> 20%

3. Research Method

3.1 System Development Method

The Geographic Information System For The Distribution Of Parks In Kediri City uses the waterfall system development method. Waterfall Model suggests a systematic and sequential approach to software development, starting from the specification of customer requirements and planning, modeling, construction, and maintenance(Pressman, 2010). An overview of the waterfall method, according to Pressman can be seen as in Figure 3.1.

Figure 3.1 Waterfall method according to Pressman

Information:

A. System / Information Engineering and Modeling

Starting with looking for the needs of the entire system that will be applied in software. Considering the software must be able to interact with other elements. This geographic information system requires hardware, databases.

B. Analysis

In this step is an analysis of system requirements. Collecting data at this stage can be carried out by conducting a study, interview or literature study. An analysis system person will extract as much information as possible from the user so that a computer system can be created to perform the tasks that the user wants. At this stage, the authors in data collection conducted interviews with staff at the Department of Environment, Hygiene, and Parks to find out the system requirements required by the department, made observations to determine the running of the system that was taking place, and used literary studies in gathering information needed by the system through journals, and the internet as a reference.

C. Design System (Design)

The design process will translate the requirements into a software design that can be estimated before coding is started. This process focuses on: data structures, software architecture, interface representations, and procedural details (algorithms). This stage will produce a document called a software requirement. This document will be used by programmers to carry out system creation activities. The author has design use cases, activity diagrams, relationships between tables, system architecture, and system interfaces.

D. Coding & Testing (writing program / implemention syncodes)

Coding is the translation of designs in a language that can be recognized by computers—performed by the programmer who will translate the user's transactions. This stage is the real stage of working on a system. At this stage, the author will do the coding of the system design using sublime software that runs on the browser.

E. Implementation / Program Testing (Integration & Testing)

This stage can be said to be final in making a system. After analyzing, designing, and coding, the user will use the finished system. The goal of testing is to find errors in the system and then fix them. After the coding stage in working on this geographic system is complete, the author will test with the user to determine the deficiencies or errors of the geographic information system.

F. Maintenance (Operation & Maintenance)

At this stage, if in testing Geographic Information System For The Distribution Of Parks In Kediri City, there are deficiencies or errors found by the user, then the author will correct these deficiencies or errors.

3.2 Use Case Diagram

Figure 3.2 is a use case diagram (Booch, 2010) of Geographic Information System For The Distribution Of Parks In Kediri City.

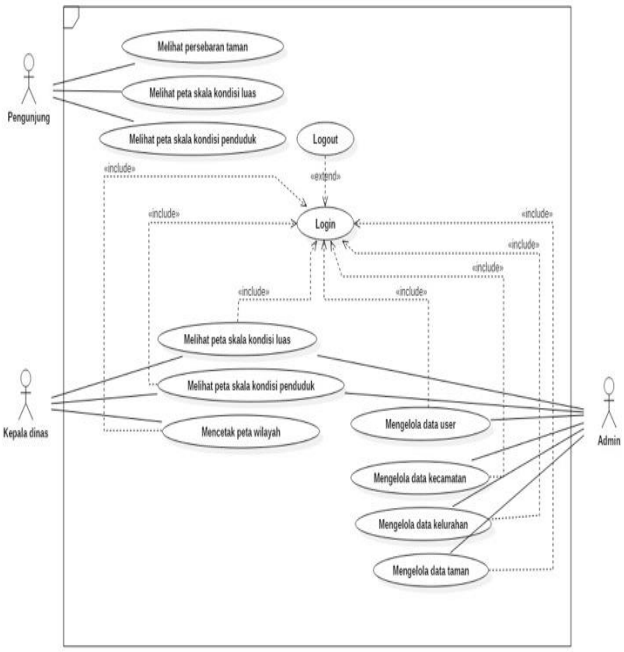

Figure 3.2 Use case diagram

In this Use Case there are 3 actors. Each actor has access rights and will discuss in Table 3.1.

Tabel 3.1 Actor Definition

Num	Actor	Deskripsi
1.	Head of Department	Head of Department is an actor who has access rights to see the scale of conditions based on area, see the scale of conditions based on population, and print areas.
2.	Admin	Admin is an actor who has the authority to manage park data, sub-district data, and geographic data, including adding, changing, and deleting data. Admin can see the scale of conditions based on area and view the conditions based on the number of residents.
3.	Visitors	Visitors can see the distribution of the park, the scale of conditions based on area, and see the scale of conditions based on the number of residents.

3.3 The Relationship Between Tables

The relationship between tables is a diagram for modeling data structures and relationships between data. Table relations are also used to design databases to describe related data in a database. Figure 3.3 displays the relationship between tables of the geographic information system that will be created.

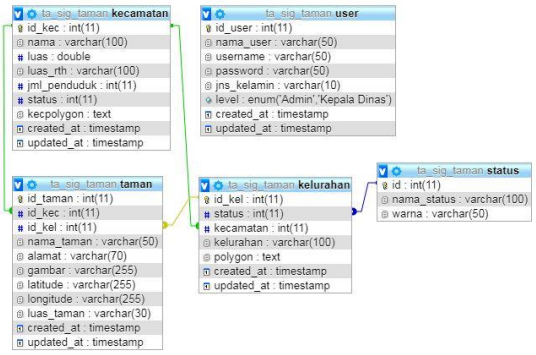

Figure 3.3 The relationship between tables

3.4 Diagram Architecture

In developing a geographic information system for the distribution of parks in Kediri City, it is necessary to have a clear system architecture to run coherently and correctly(Hidayat, 2018). As shown in the system architecture(Burd, 2012) visitors can see the distribution of the park, the system displays the location and data from the database server, the admin can manage the data to be displayed by the system, the head of the department can see the distribution of the park based on the broad scale, and the number of residents. The following is a picture of the architecture diagram of a geographic information system:

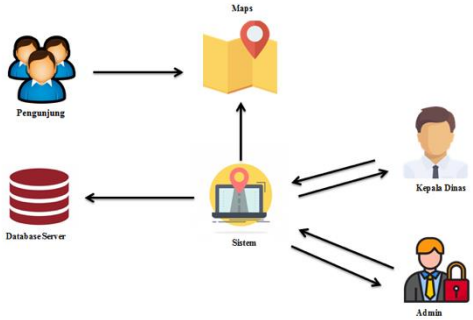

Figure 3.3 Diagram Architecture

4. Result and Discussions

4.1 Login Page

Testing the login menu is done by the admin and the head of the service entering the username and password in the login form. If the data is correct, it will go to the respective page, but a notification of failed login will appear if it is wrong.

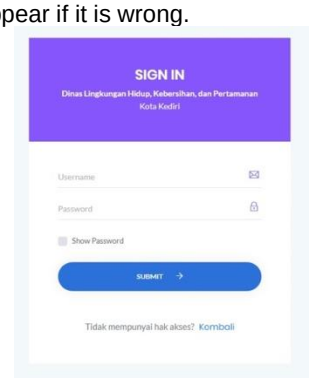

Figure 4.1 Login Page

For example, if Admin successfully logged in, will enter the Head of Service page, and notification of successful login will appear. The display of successfully entering the Admin page is shown in Figure 5.2.

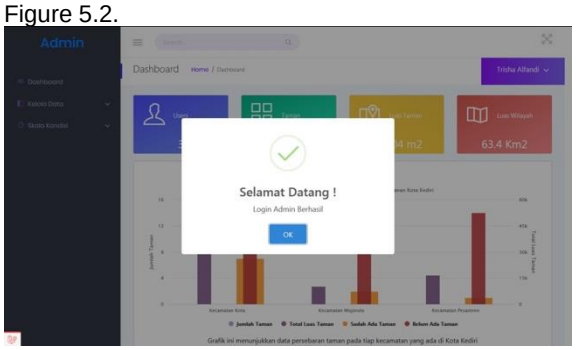

Figure 4.2 Administrator Dashboard Page

4.2 District Page

In this menu, testing is done by the admin by logging in first to enter the admin page. The sub-district data management page displays all sub-district data in the Kediri city area stored in the database. The data displayed is the district, the location of the park. On the sub-district data management page, click the add icon. The sub-district data management menu can be shown in Figure 4.3.

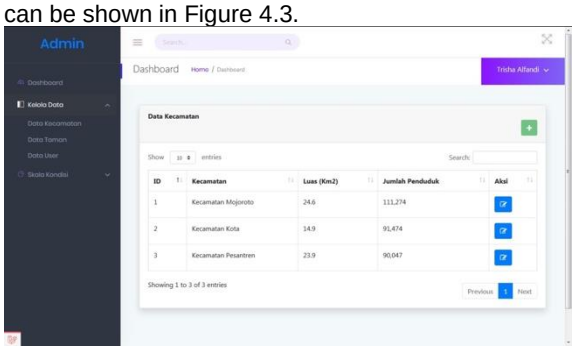

Figure 4.3 District Page

4.3 Sub-District Page

In this menu, testing is done by the admin by logging in first to enter the admin page. The sub-district data management page displays all sub-district data in the Kediri city area stored in the database. The data displayed is the district's name, sub-district, and the status of the park's existence. On the village data management page, additional data can be done by clicking the add icon. The data management menu can be shown in Figure 4.4.

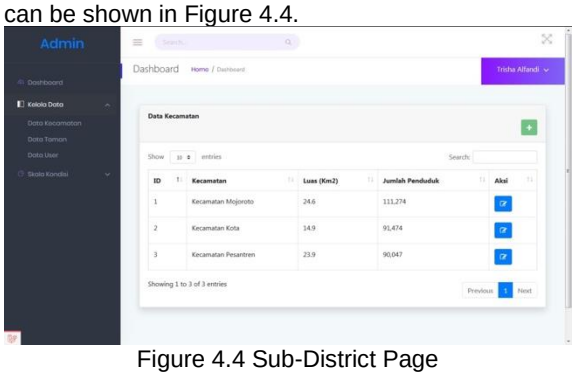

Figure 4.4 Sub-District Page

Add Sub-district data page, admin can add Sub-district on the page manually consisting of Sub-district name, map, and park status. After completing the form, click the save button, and the additional data will be entered into the database and displayed by the system. The Add sub-district data menu is shown in Figure 4.5.

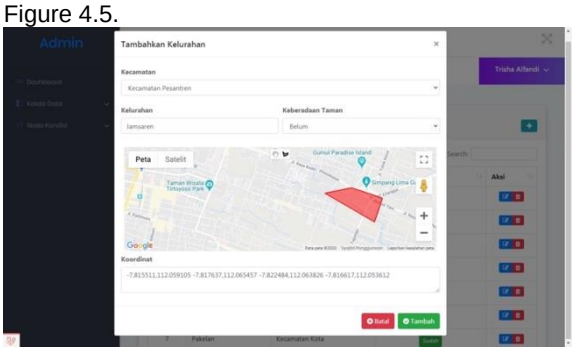

Figure 4.5 Add Sub-District Data Page

4.4 City Parks Page

In this menu, testing is done by the admin by logging in first to enter the admin page. The park data management page displays all park data in the Kediri city area stored in the database. The data displayed is the park's name, the location of the park, the area of the park, and the park's facilities. On the manage data page, by clicking the add icon. The data management menu can be shown in Figure 4.6.

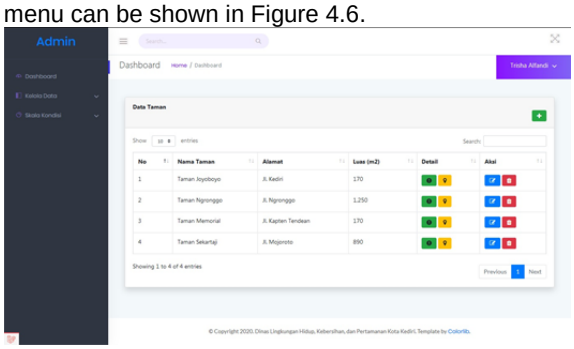

Figure 4.6 City Parks Page

Pages add park location data, the admin can add parks on the page manually, which consists of the park's name, the park's location, the area of the park, and garden facilities. After completing the form, click the save button, and the new data will be entered into the database and displayed by the system. The Add park data menu is shown in Figure 4.7

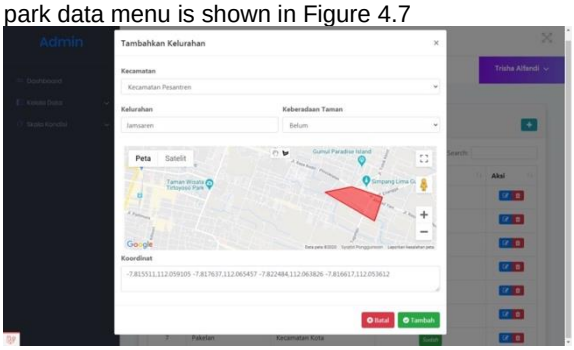

Figure 4.7 Add Park Data Page

4.5 Park Distribution Map

In this menu, the test is carried out by entering the visitor page, or the head of the department, the head of the department must first log in to the system while the visitors are not required to log in. After entering the page, the system will display a map of the distribution of parks in Kediri. Through this map, visitors and department head can see the location of several parks in the city of Kediri as shown in Figure 4.8.

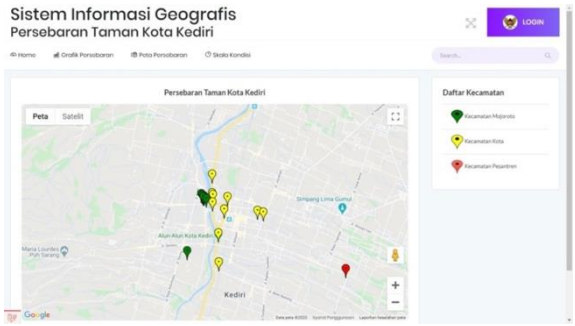

Figure 4.8 Parks Distribution Map

4.6 The distribution of the park in each Sub District

In this menu, the test is carried out by entering the visitor page, or the head of the department, the head of the department must first log in to the system while the visitors are not required to log in. After entering the page, the system will display a map of the distribution of parks in each sub district. Through this map, visitors and department head can see the location of several parks in each Sub District as shown in Figure 4.9.

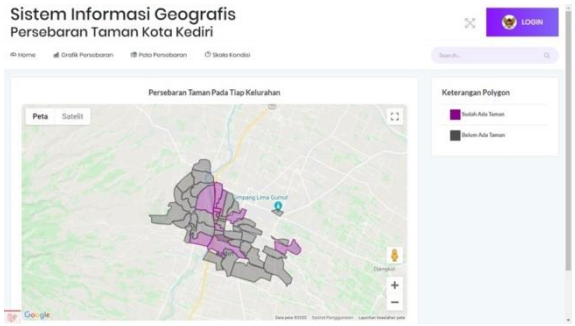

Figure 4.9 The distribution of the park in each Sub District

4.7 Green Open Space Ratio Based on Area

Analysis of research results is used to determine whether system testing has been successful or not. Black box testing (Rossa, 2011) is conducted to see whether the application features that are being developed already work well or not as shown in the table 5.1

In this menu, the test is carried out by entering the visitor page or department head. Select the scale menu; if successful, the system will display a scale based on Area. This page will show the Green Open space Ratio based on Area in three criteria: Very less, Less, or OK. From the data, it is shown in Figure 4.10. that Kota and Pesantren District has a good ratio of green open space, while in Mojoroto District is less.

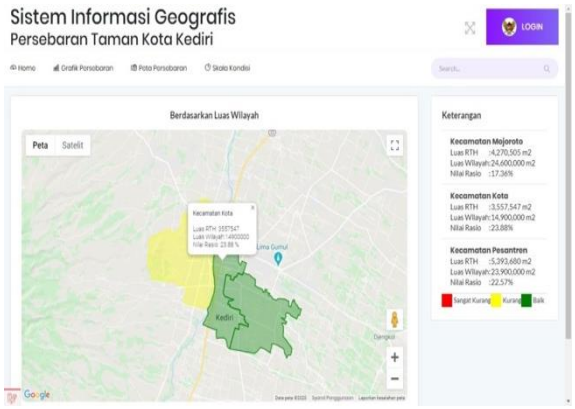

Figure 4.10 Green Open Space Ratio Based on Area

4.8 Green Open Space Ratio Based on Population

In this menu, the test is carried out by entering the visitor page or department head. Select the scale menu; if successful, the system will display a scale based on population. This page will show the Green Open space Ratio based on population. It is shown in Figure 4.11. that only Kota District has a good ratio of green open space.

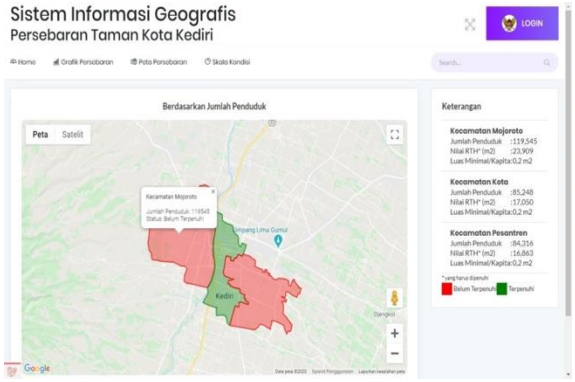

Figure 4.11 Green Open Space Ratio Based on Population

Table 5.1 Blackbox Testing Result

Num	Scenario	Expected Result	Description
1	Database connection	Application appear in browser	Valid
2	Display district data	CRUD district data	Valid

3	Display sub-district Data	CRUD sub-district data	Valid
4	Display Parks Data	CRUD Parks Data	Valid
5	Display Map Data	The distribution of parks data is displayed	Valid
6	Display Ratio of Green Open Space	Green open space is displayed	Valid

5. Conclusion

This research concludes that the geographic information system for the distribution of parks in Kediri City has been successfully designed and built. Hence the data parks collection can be done through a web browser. The application can display park distribution data in the form of markers on Google Maps maps and with additional feature to filter park distribution data based on area scale and population.

References

Dwiki Rifara Khodri. 2019. Pemanfaatan Sistem Informasi Geografis Untuk Pemetaan Persebaran Taman Kota Berbasis Android. Jurnal Geodesi. ITN Malang.

Galuh Gumilang and Rangga Sidik. 2017 Implementasi Google Map Service untuk Pemetaan Penyebaran Taman Tematik di Kota Bandung. Jurnal SI. Unikom Indonesia.

Hamdi, Usman, and Samsudin. 2018. Perancangan Sistem Informasi Geografis Pemetaan Taman Di Kabupaten Indragiri Hilir Berbasis Web. Jurnal SISTEMASI. Universitas Islam Indragiri.

Eddy Prahasta. 2002. Sistem Informasi Geografis: Konsep-Konsep Dasar Informasi Geografis. Bandung: Informatika Bandung.

Resi Iswara, Winny Astuti, and Rufia Andisetyana Putri. 2017. Kesesuaian Fungsi Taman Kota Dalam Mendukung Konsep. Jurnal Arsitektura. Universitas Sebelas Maret.

Peraturan Menteri Pekerjaan Umum Nomor 05/PRT/M/2008. 2008). Pedoman Penyediaan Dan Pemanfaatan Ruang Terbuka Hijau Di Kawasan Perkotaan.

Pressman, S, Roger, Ph.D. 2010. Rekayasa Perangkat Lunak Pendekatan Praktisi Edisi 7 (Buku 1), Yogyakarta: Andi.

Grady Booch et al. 2010. Object Oriented Analysis and Design with Applications.: Addison Wesley Profesional.

Peratuan Daerah Kota Kediri Nomor 11 tahun 2013. 2013. Peraturan Daerah Kota Kediri Tentang Rencana Pembangunan Jangka Panjang Daerah 2005-2025.

Delia Mediana and Andi Iwan Nurhidayat. 2018. Rancang Bangun Aplikasi Helpdesk (A-Desk) Berbasis WEB Menggunakan Framework Larave (Studi Kasus di PDAM Surya Sembada Kota Surabaya). Jurnal Manajemen Informatika. Universitas Negeri Surabaya.

Satzinger, Jackson, and Burd. 2012 System Analysis and Design in a Changing World Seventh Edition.: ISBN 978-1-305-11720-4.

Shalahuddin and Rossa. 2011. Modul Pembelajaran Rekayasa Perangkat Lunak. Bandung.