GEOGRAPHIC INFORMATION SYSTEM DEVELOPMENT OF NATURAL TOURISM OBJECT IN GARUT DISTRICT AREA

Ali Isman1, Tati Harihayati Mardzuki 2
[1.2]Information Engineering - University Computer Indonesia
Jl. Dipatiukur 112-114 Bandung
E-mail: ismanali46@gmail.com1,tati.harihayati@email.unikom.ac.id[2]

ABSTRACT

Garut has an area of approximately 306 406 hectares or 6.94% of the area of West Java Province. Garut Regency is rich in objects and natural tourist attraction, in addition to the environment is still beautiful appeal could also spoil the visitor's eye. Based on data Disparbud Garut 2017 that there were 102 natural attractions, from travel 102 86 of which are still under government supervision for further development, while 16 are in the stage of development. Tourism development is an act that should be a manager, both government and society, with the development of a tourist then the tourists to visit the tourist sites will increase and economic growth in the region will be better. Based on the problems that exist today Disparbud Garut district has not had an information system that can help in planning the development of sustainable tourism resulting in the development and manufacture of new tourist can miss the mark of what is expected Disparbud Garut because it is not adjusted once the condition of the object and spatial planning travel which will is developed. Results of tests performed on the Geographic Information System is built it can be concluded that the system can help the head of tourism in the development of nature tourism, travel well being developed and planning of sustainable tourism development.

Keywords : The expansion of tourism, nature tourism, Garut Travel, Geographic Information Systems, Garut.

1. PRELIMINARY

Department of Tourism and Culture (Tourism and Culture) is a government agency that is located in Garut regency, West Java province, Garut has an area of approximately 306 406 hectares or 6.94% of the area of West Java Province. Garut regency is geographically located in the southern province of West Java with the coordinates of 6º 57 '34 - 7º 44' 57 "South latitude and 107 º 24 '3" - 108 º 24' 34 "East Longitude. Restrictions namely the western region bordering the Bandung District and Cianjur District, east of Tasikmalaya regency, north of Regency Bandung and Sumedang, while the south by the Indonesian Ocean. Garut Regency is rich in attractions and appeal of tourism, whether an object or cultural attractions, historical, artificial or natural, but of all the sights in Garut regency still many tourist areas are not yet developed by the manager, of the many travel in Garut, the most potential for development, namely nature because in addition to their environment which is still unexploited potential also has the appeal that could spoil the visitor's eye,

therefore Disparbud Garut, was eager to develop it by considering important aspects that can be seen in terms of geography among others that appeal, spacious location, accessibility, facilities, and management. With diperhatikanya aspects of the development of the tourist will travel better and pengunjungpun satisfaction can be increased. In addition to in terms of tourism development, Tourism and Culture Garut has the task of multiplying attractions to increase revenue and encourage economic growth in the region, in terms of geography there are only 8 tourist sites that could potentially be a new tour that is Cikondang, River Cipancong, River Cihideung, Gemblongan, Curug Luhur , Curug Ngaleng, and Nagara Dagha, to 8 locations will be a new travel way is to pay attention to important aspects that support whether or not the location. Things to note Disparbud Garut in the manufacture of new tourism that is spacious location, potential, and accessibility. With the location of these aspects it has been said to be a new tourist potential. Interviews have been conducted with Mr. Henry, S. Sos as Head Section of Tourism Destinations states that travel Garut district has great potential but in planning a sustainable Attraction pengembangkan still less precise because not adjusted first with objects and spatial conditions of the area attractions which will be developed,

Based on the problems, the use of geographic information systems are needed to assist in the planning of sustainable tourism development, with the geographic information system could simplify the Head of Tourism in monitoring and decision-making on the level of development of tourism that there is in the area of Garut.

2. BASIC THEORY

2.1 Siste Geographic Information

GIS is a decision support system that mampun mengintregrasikan spatial location using the specified characteristics of the phenomenon. Data contained in the SIG spasila or spatial location data on non spasila

earth and the data can be called a data or information that can be displayed as tables or objects that have nothing to do with spatial data [1].

2.1.1 Spatial Data

Spatial data is data that has a picture of the area located above the earth's surface that are represented in the form of graphs, maps, points, and picture with a digital format and stored in the form of coordinates x, y (vector [1].

2.1.2 Non-Spatial Data

Non-spatial data is the data in the form of a table, the table contained in the information held by the spatial data, the information contained in non-spatial data is the data that are interconnected with spatial data [1].

2.2 Tourism

Tourism is a human activity that is conscious and get services rotated among people within a country itself or abroad to seek satisfaction of diverse and different from what happened where he obtained a permanent job.

2.2.1 Planning and Tourism Development

Planning and development of tourism is a dynamic process and continuing towards ketataran a higher value by way of adjustment and correction is based on the results of monitoring and evaluation results and feedback implementation of the previous plan, tourism development is needed to improve the quality of travel and increase local revenue ,

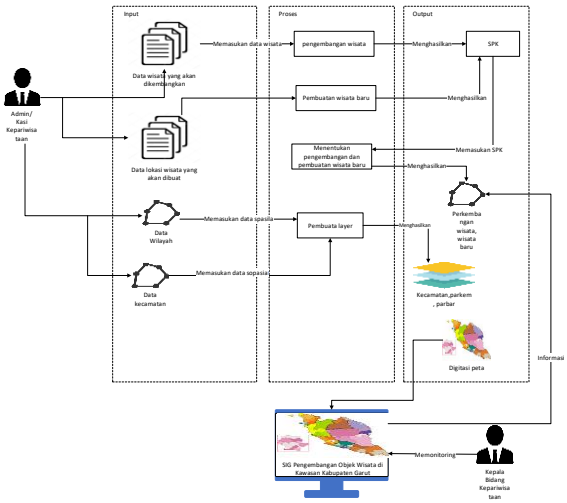
2.3 Simple Additive weighting method (SAW)

Simple Additive weighting method (SAW) often or can be called a weighted summation method. The basic concept SAW method is to look for a weighted summation of the rating performance of each alternative on all attributes. SAW method requires a process of normalizing the decision matrix (X) to a scale that can be compared with all the ratings of existing alternatives. SAW method is very efficient because of the time required in a shorter calculation. [3].

3. ISI RESEARCH

3.1 Analysis of Geographic Information Systems

Analysis of geographic information system which is a stage where we know what kind of a geographic information system to be built. The following analysis of geographic information systems can be seen in Figure 1



Picture 1, Analysis of Geographic Information Systems

3.2 Analysis of Spatial Data

Spatial data in applications to be built covering districts, development, and location of tourist sites. The following analysis of spatial data in applications to be built can be seen in Table 1

Table 1. Analysis of Spatial Data

No.	Indicator	Description	spatial data	Example
1	sub-district	Area of the districts. The green color is clear that almost all the districts dominated by forests and perkebuna compared with the density of houses		
2	Development	Travel with development value <40	Polygon	
		Travel with a development value of 40-60	Polygon	
		Travel with a development value of 60-75	Polygon	

		Travel with a development value of 75-90	Polygon	
		Travel with development value> 90	Polygon	
3		Point Tourist sites	Point	

3.3Non-Spatial Data Analysis

Non-spatial data in a geographic information system making the development of natural attractions in the region Garut Regency can be seen in Table 2.

Table 2. Non-Spatial Data Analysis

No.	Name	Description	Attribute
1	sub-district	Contains information on the sub-district where tourist attractions are located	sub-district
2	Development	Contains information on developments attractions in Garut	Tourism name, address, attractiveness, accessibility, facilities, management, area tourist sites.
3	manufacture	Contains information about creating a new travel in Garut	Tourism name, address, day after location, potential, accessibility
4	Tourism	Contains information on behalf of tourism and travel amenitas	Tourism name, area name, address, name of the village, sub-district names. The distance from the capital, attraction, activity, area, accessibility, amenitas

3.4 Analysis of Development of Attractions

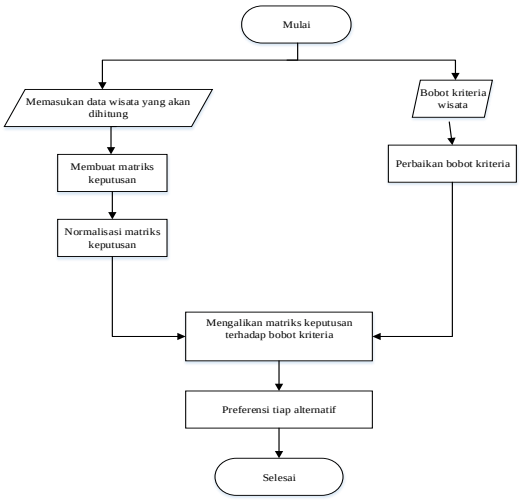
The analysis used in determining the tourism development that is using Simple Additive weighting method.

a. Analysis of needs input
   1. Attractiveness
   2. accessibility
   3. Amenities
   4. Management
   5. Comprehensive travel site

b. Analysis output needs
   The output resulting from this research is an alternative that is in it has the lowest value compared to other alternatives.

3.4.1 Development Chronology Attractions

Flow application method of SAW (Simple Additive weighting) in the development of natural attractions as follows:



a. Determining criteria
   Based on the data obtained from a Travel book Garut, THAT in developing natural tourist attraction that is glued to the criteria listed in the book. The criteria used for decision making, namely:
   1. Attractiveness
      The appeal of an attribute of the cost so that if the minimum value of the appeal of the appeal which prioritized to be developed.
   2. accessibility

Criteria	Attractiveness	accessibility	Amenities	Management	Comprehensive travel site
Attribute	*cost*	*cost*	*cost*	*cost*	*cost*
Value	25%	20%	20 %	20%	15%

Accessibility is an attribute of cost so that if the value of the minimum accessibility of such accessibility are prioritized for development.

3. Amenities
   Facility is an attribute of cost so that if the value of the minimum amenities such facilities are prioritized to be developed.
4. Management
   An attribute management costs so that if the value of the minimum management is the management of the prioritized to be developed.
5. Comprehensive travel site
   Size Location is an attribute comprehensive cost so that if the value of the minimum area location of these sites are prioritized for development.

Table 3. Selection Criteria

Results of an interview with Mr. Henry, S. Sos as Head Section of Tourism Destinations stated that there were 16 tourism will be developed and be an alternative in the decision are:

1. Situtu / Temple Cangkuang (A1)
2. situ bagendit (A2)
3. Affection beach Heulang (A3)
4. Coral beach Paranje (A4)
5. Turkish Rancabuaya (A5)
6. Turkish cidora (A6
7. Turkish manalusu (A7)
8. Gardens strobery (A8)
9. Pine forest interrupted awi (A9)
10. situ salawe (A10)
11. GSC (A11)
12. Tourist village malombong (A12)
13. Semarang travel village (A13)
14. Levi Tonjong (A14)
15. BTL (A15)
16. Arrowroot pine forest city (A16)

b. Determine the weight of each criterion
Weighting process carried out by the Department of Tourism and Culture Garut represented directly by the Section Head of Tourism Destinations, here is the weight value of each criterion:

Table 4. Weight Value Criteria

c. Providing compatibility rating value
Based on predetermined criteria, will now be given an example of the calculation in a case. Of these cases will be made to match the value based on the criteria of each alternative. There are 16 tours that will be developed in Garut and would be an alternative, as follows:
Of all the criteria will be determined weight value, namely:

1. Very Less (SK) = 1
2. Less (K) = 2
3. Enough (C) = 3
4. Good (B) = 4
5. Very Good (SB) = 5

The following is a table of criteria of attractiveness criteria (C1) with a weight of its value as follows:

Table 5. Fascination

No.	Attractiveness	Value
1	Very less	1
2	Less	2
3	Pretty good	3
4	Well	4
5	Very good	5

The following is a table of criteria of accessibility criteria (C2) with a weight of its value as follows:

Criteria	Information	Attribute
C1	Attractiveness	*cost*
C2	accessibility	*cost*
C3	Amenities	*cost*
C4	Management	*cost*
C5	Comprehensive travel site	*cost*

Table 6. Accessibility

No.	accessibility	Value
1	Very difficult	1
5	Difficult	2
3	moderate	3
4	Easy	4
5	Very easy	5

The following is a table of criteria for facilities criteria (C3) with a weight of its value as follows;

Table 7. Facilities

No.	Amenities	Value
1	Very difficult	1
2	Less	2
3	Pretty good	3
4	Well	4
5	Very good	5

The following is a table of criteria management criteria (C4) with a weight of its value as follows:

Table 8. Management

No.	Management	Value
1	Very less	1
2	Less	2
3	Pretty good	3
4	Well	4
5	Very good	5

The following is a table of criteria of broad criteria of tourist sites (C5) with the weight of its value as follows:

Table 9. Size Travel Locations

No.	Comprehensive travel site	Value
1	<2 H	1
2	2-4 Ha	2
3	4-6 Ha	3
4	6-8 Ha	4
5	> 8 Ha	5

Once the criteria and the weighting of each criterion has been determined, then the following steps to resolve it:

Table 10. Compatibility Rating On Any Criteria

Alternative	Criteria				
	C1	C2	C3	C4	C5
Situtu / Temple Cangkuang	3	4	3	3	5
situ bagendit	3	4	3	3	5
Affection beach Heulang	3	4	3	3	5
Coral beach Paranje	2	4	2	2	5
Turkish Rancabuaya	3	4	3	3	5
Turkish cidora	3	3	2	2	3
Turkish manalusu	3	3	2	2	5
Gardens strobery	3	3	3	3	2
Pine forest interrupted awi	3	2	3	3	4
situ salawe	3	3	2	3	4
GSC	3	3	3	2	4
Tourist village malombong	3	3	3	3	5
Semarang travel village	3	3	3	3	4
Levi Tonjong	3	3	2	2	2
BTL	3	3	2	3	3
Arrowroot pine forest city	3	3	3	3	5

Each of the criteria in the table above using cost because the sought attribute is the smallest value. To obtain the normalization used the following formula:

$$rij = \frac{Min\ Xij}{Xij}$$

The calculation of normalized X matrix for each criterion are as follows:

The appeal of (C1) cost

$$R\ 1 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 12 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 13 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 14 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{2} = \frac{2}{2} = 1$$

$$R\ 15 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 16 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 17 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 18 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 19 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 110 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 111 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 112 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 113 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 114 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 115 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

$$R\ 116 = \frac{\min(3,3,3,2,3,3,3,3,3,3,3,3,3,3,3)}{3} = \frac{2}{3} = 0{,}67$$

After everything was calculated then obtained values normalized performance rating (Rij) form a matrix normalized (R), namely:

$$R = \begin{pmatrix} 0.67 & 0.67 & 0.67 & 1 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 \\ 0.5 & 0.5 & 0.5 & 0.5 & 0.5 & 0.67 & 0.67 & 0.67 & 1 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 & 0.67 \\ 0.67 & 0.67 & 0.67 & 1 & 0.67 & 1 & 1 & 0.67 & 0.67 & 1 & 0.67 & 0.67 & 0.67 & 1 & 1 & 0.67 \\ 0.67 & 0.67 & 0.67 & 1 & 0.67 & 1 & 1 & 0.67 & 0.67 & 0.67 & 1 & 0.67 & 0.67 & 1 & 0.67 & 0.67 \\ 0.4 & 0.4 & 0.4 & 0.4 & 0.4 & 0.67 & 0.4 & 1 & 0.5 & 0.5 & 0.5 & 0.4 & 0.5 & 1 & 0.67 & 0.4 \end{pmatrix}$$

d. Calculation of the final value

After the results were normalized known as the matrix above, the subsequent awarding of the decision process, in this case tourism development can provide weight values as shown in Table 3.4, in order to obtain:

W = [25; 20; 20; 20; 15]

$$Vi = \sum_{j=1}^{n} Wj\ rij$$

Vi = ranking for each alternative
Wj = weight value of each criterion
Rij = value normalized performance rating
So:

$$V\ 11 = (25)(0{,}67) + (20)(0{,}5) + (20)(0{,}67) + (20)(0{,}67) + (15)(0{,}4) = (16{,}75) + (10) + (13{,}4) + (13{,}4) + (6) = 59{,}55$$

For the calculation of V2 - V1 V16 is as rich calculation. After calculating the preference value of each alternative tour then travel preference values obtained with the development of tourist attraction that is still minimal Rancabuaya coast, Situ bagendit, dear Turkish Heulang, and Situ / temple Cangkuang. The fourth of these alternatives have the same development value is 59.55 as shown in Table 11,

Table 11. Results of Each Alternative Calculation

No.	Travel name	The calculation results
1	Turkish Rancabuaya	59.55
2	situ bagendit	59.55
3	Affection beach Heulang	59.55
4	Situtu / Temple Cangkuang	59.55
5	Arrowroot pine forest city	62.95
6	Tourist village malombong	62.95
7	Semarang travel village	64.45
8	Pine forest interrupted awi	71.05
9	situ salawe	71.05
10	GSC	71.05
11	Gardens strobery	71.95
12	BTL	73.6
13	Turkish manalusu	76.15
14	Turkish cidora	80.2
15	Coral beach Paranje	81
16	Levi Tonjong	85.15

Table results of these calculations is the condition of the attractions that will be developed in accordance with the data of Garut regency tourism book. There are 16 tours that will be developed and each tourist has a value of properties are available, it is already sorted ditabel ranging from the smallest to the largest, the smaller the value held then the tour of the most prioritized to be developed. On the table there are 4 Attraction 3:11 having a minimum value of 59.55 which Rancabuaya coast, Situ bagendit, dear Turkish Heulang, and Situ / temple Cangkuang. Of the four such travel will be developed first is Racabuaya beach because the beach has a great potential to attract many visitors, besides supported by good access to the site,

Table 12. Levels of Value Development

No.	Depth Value Development	Information
1	Very less	<40
1	Less	40-60
2	Enough	60-75
3	Well	75-90
4	Very good	> 90

Based on the interview with Mr. Henry, S.Sos As Section Head of Tourism Destinations states that the value of the level of development in each of the attractions at each location of the tour can be seen in Table 12

3.5 Analysis Database

Here is an Entity Relationship Diagram of the geographic information system development of natural attractions in the region Garut district that can be seen in Figure 2

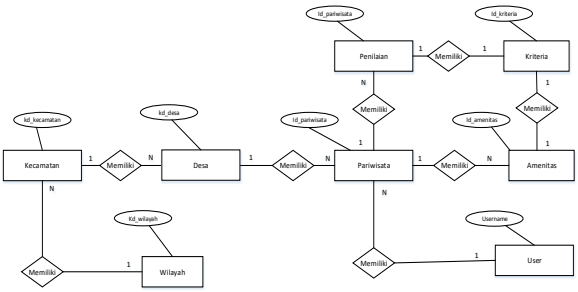


Figure 2. Entity Relationship Diagram

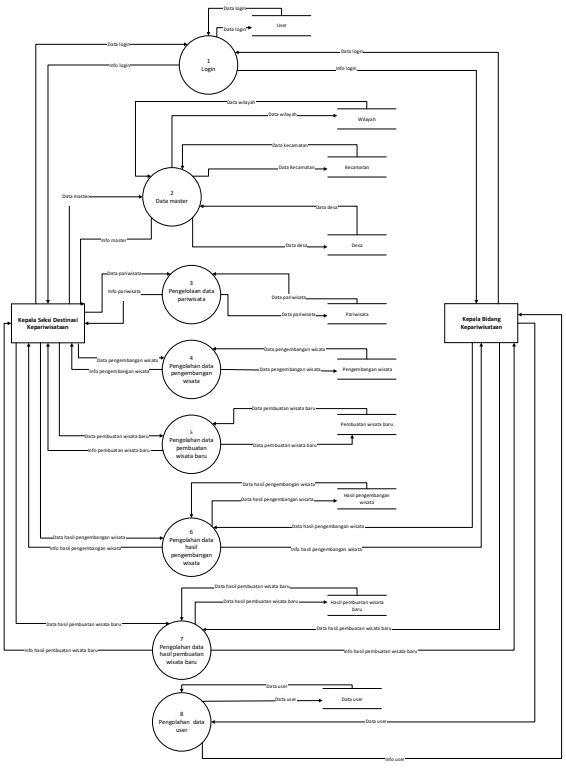
3.6 Diagram Context

Diagram context of a Geographic Information System that will be built are as in Figure 3

Figure 3.diagram Context

3.6 DFD Level 1 Geographical Information Systems

DFD level 1 Geographical Information Systems Development Natural Attractions in the region Garut regency in Gamabr 4



GABAR 4.DFD Level 1

3.7 Relationship Diagram

Geographic information system relationship diagram is shown in Figure 5

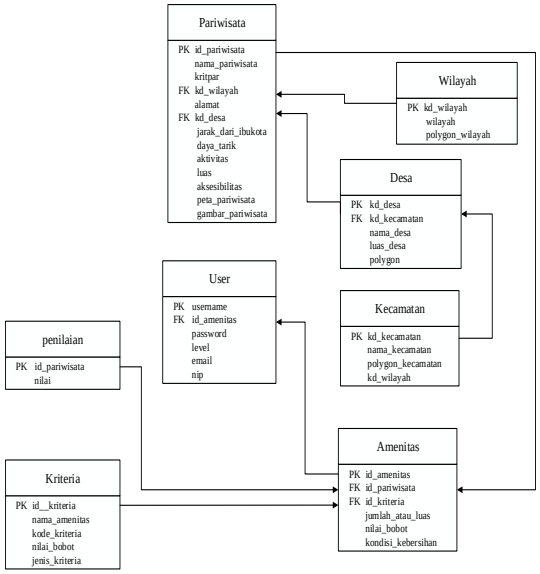


Figure 5. Relationship diagram

3.8 Interface Design

The design of the interface is a description of a sketch of the display system to be built. It is intended to simplify the display interface implementing a geographic information system to be built

3.8.1 Interface Design Login

Login interface design on a geographic information system development of natural attractions in kawansan Garut can be seen in Figure 6.

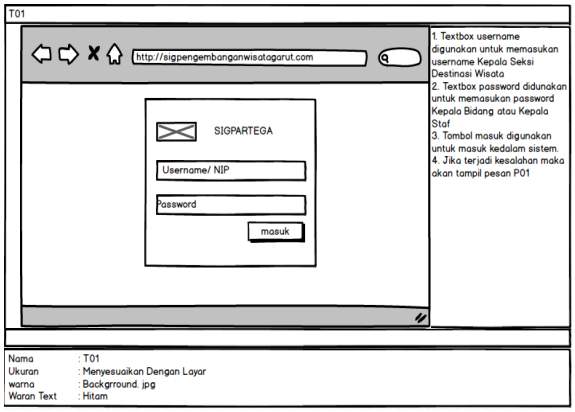


Figure 6. Interface Design Log In Geographic Information Systems Development Zone Nature in Garut

3.8.2 Interface Design Home

Homepage interface design on geographic information system development of natural attractions in kawansan Garut can be seen in Figure 7.

Figure 7. Interface Design Home On Geographic Information System Development Zone Nature in Garut

3.9 Testing System

Testing the system aims to find errors or deficiencies in the software being tested. Tests conducted to determine whether the system is built fit for use or not. Testing was conducted on the pages of Tourism Destinations Section Chief and Head of Tourism using UAT testing strategy.

3.9.1 Conclusion UAT Testing

Based on the results of testing *Users acceptence Test* (UAT), which has dilakukkan geographic information system development of natural attractions in the area of Garut district, it can be concluded that the system can proceed to the final user acceptance testing phase.

3.9.2Conclusion User Acceptance

Based on test results, it is concluded that the geographic information system development of natural attractions in the region Garut Regency is in accordance with the expected goals are to assist the Head of Tourism to develop tourism in Garut both current and in the next period.

4. CONCLUSION

4.1 Conclusion

Based on the results obtained in the preparation of this thesis it is concluded that the presence of geographic information system built to help the Head of Tourism in developing the natural attractions that exist Garut region both more developed now and in the development in the next period.

4.2 Recommendations

Based on the results that have been achieved in building a geographic information system development of natural attractions in the region Garut regency still has shortcomings, therefore it is advisable to add things that can equip the future, including:

1. Geographic Information System that is built for the future should be more widely cakupanya not rely on nature alone but can be used to develop other types of tourism such as special interest tours, artificial tourism and cultural tourism.
2. Tourism development in the data, any information that another criterion may be attached photograph development stage starting from the beginning until the final stages of development development
   Similarly, the advice can be given,

BIBLIOGRAPHY

[1] E. Prahasta, Geographic Information Systems Basic Concepts (Perspective Geodesy and Geomatics), Bandung: Bandung Informatics, 2014.

[2] S, Rosa A. and M. Salahuddin, Software Engineering and Object-Oriented Structured. Informatics. 2016

[3] A. Yani Ranius, Decision Support System Determining Travel Destinations Featured In Palembang, Bandung: Informatics, 2015

[4] S. Malik, Enterprise Dashboard Design and Best Practice for IT, New Jersey: John Wiley & Sons, Inc., 2005.

[5] D. Parmenter, Key Performance Indicators: Developing, Implementing, and Using Winning KPIs, New Jersey: John Wiley & Sons, Inc., 2007

[6] L. B. A, Software Engineering, Yogyakarta: Graha Ilmu, 2006.

[7] Hidayat, Adi and Utami Dewi Widianti. 2015. "Geographic Information System for Determining Freshwater Fish Cultivation Areas in the Department of Marine and Fisheries of Subang Regency in the Scientific Journal of Computers and Information Technology (KOMPUTA). Vol. 1 2015., 45-46

[8] AM Bachtiar, Geographic Information System for Mapping Public Facilities in Web-Based Sumedaang District, 2012

[9] Setiawan, Eko Budi. 2016, "Geographic Information System for Mapping the Potential of Creative Industry Businesses" in the journal CoreIT. Vo1 2 No.1 2016. 1-2

[10] M. Ir. M. Farid Azisl, Object Oriented Programming with PHP5, Jakarta: PT. Elex Media Komputindo, 2005.

,