Journal of WORLD CONFERENCE

Vol 4 No 1 (January 2022)

www.proceedings.worldconference.id/index.php/prd

ISSN 2019
2656-1174

VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

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JOURNAL OF WORLD CONFERENCE
VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

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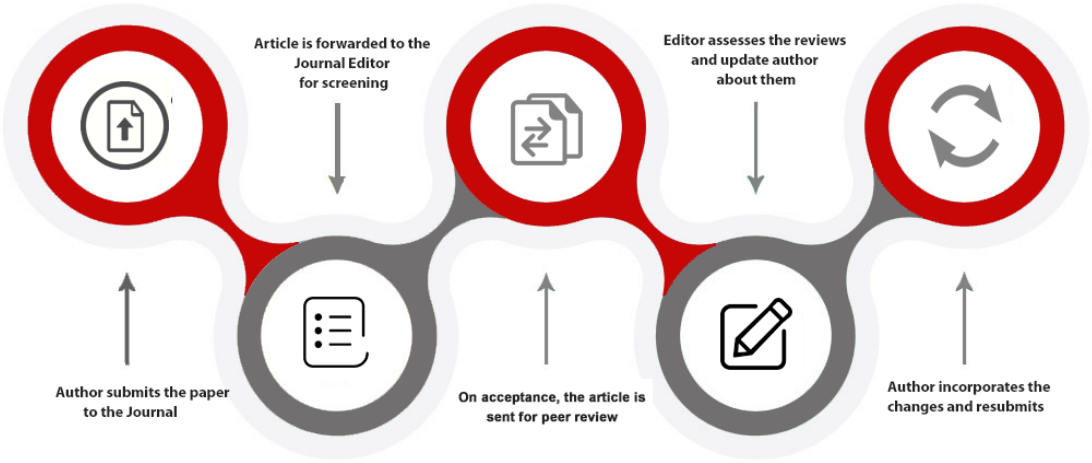

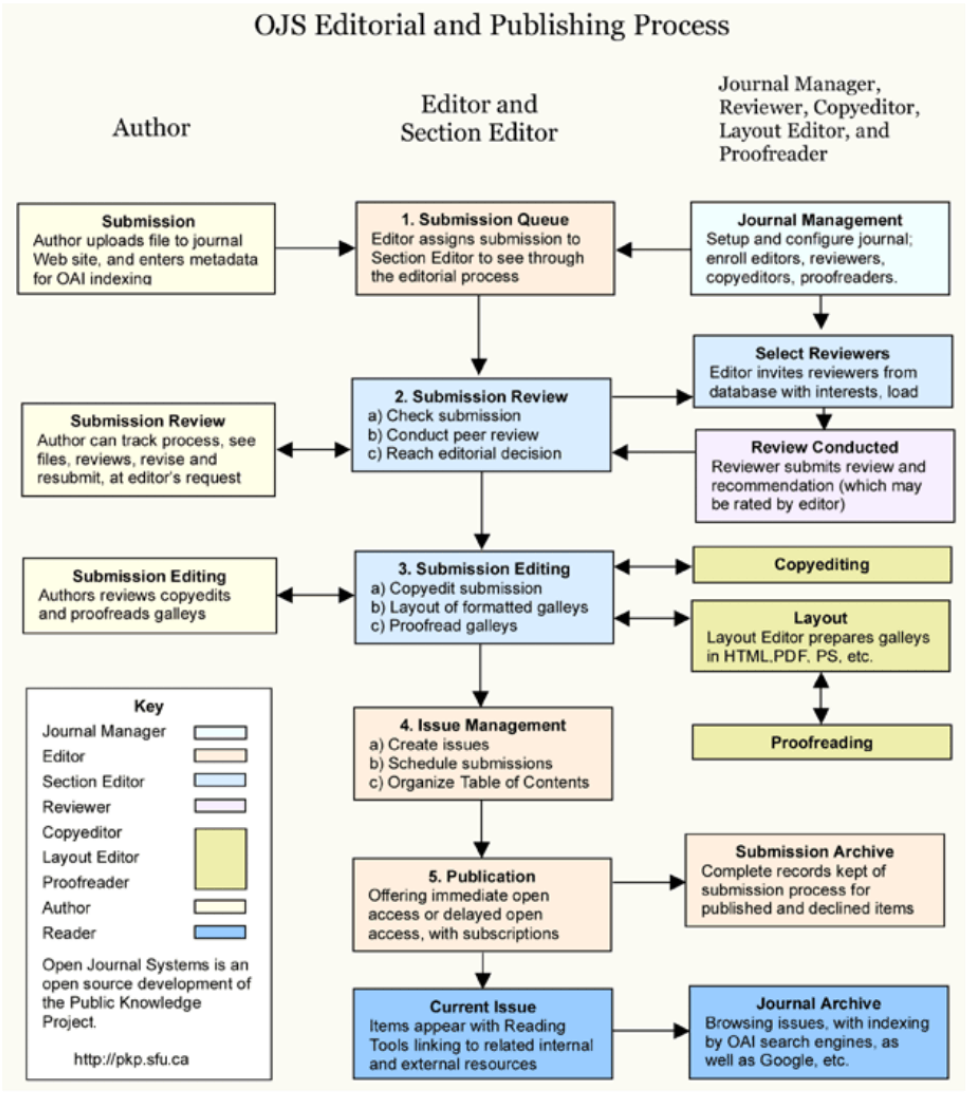

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VOLUME 4 | NUMBER 1 | JANUARY 2022
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JWC JOURNAL OF WORLD CONFERENCE
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Traffic Performance Analysis and Road Safety Facilities in Bojonegoro District 2021-2026 (Case Study: S. Panglima Sudirman – S. Teuku Umar)

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Abstract

Bojonegoro is one of the regencies in East Java with a population of 1 million more. This makes Bojonegoro Regency as a center of trade, business, and education in east Java, therefore many people who make some of its areas into crowded centers by accident, one of which is what happened to Jl. Teuku Umar- Jl. Panglima Sudirman (Treaffic). Based on these conditions, studies need to be conducted in the analysis of traffic performance and road accident facilities in the next 5 years precisely in 2026. The methods used are surveys of morning, afternoon, afternoon rush hours conducted 3 days, namely 2 normal days and 1 holiday (Tuesday, Wednesday and Saturday), geometric data analysis using the 1997 MKJI method and Road Safety Facilities using Road Equipment Planning (Ministry of PUPR Human Resources Development Agency). In this study, traffic flow in Jl. Panglima Sudirman in 2026 amounted to 1224.99 smp / hour, LOS B. While the traffic flow on Jl. Teuku Umar in 2026 amounted to 1518.04 smp / hour, LOS B. The results of the calculation of traffic in 2026 had a traffic flow of 679.05 smp / h, LOS C, and traffic flow delays of 77.70 det / smp. From the results of calculations that have been done and existing observations with the acquisition of LOS C at the intersection, it is necessary to widen the road by 2 meters, for the proposed road safety facilities in 2026 there needs to be the addition of signs, signs, and APILL at a certain point.

Keywords
LOS, MKJI 1997, Road Safety Facility, Traffic Performance

1. Introduction

Roads play an important role in transportation activities and population mobility. The population growth rate and economic growth rate greatly affect traffic growth and the increasing need for transportation facilities and infrastructure in the city of Bojonegoro, especially in several sections of Jl. Teuku Umar is considered very important because it is the center of the city and there are several related agencies, schools and offices including: the Department of Tourism and Culture, the National Land Agency of Bojonegoro Regency, the Bojonegoro Regency Primary Tax Service Office, SDN Kadipaten 1 and PLN Bojonegoro and several clothing shops. On Jl. Panglima Sudirman is also considered very important because there are areas of economic activity, related service offices and schools such as: Bojonegoro District Health Office, Bojonegoro District Social Service, SMAN 1 Bojonegoro.(PUSDIKLAT Roads, Housing, Settlements, 2017)

Road safety facilities are needed for the functioning of roads to meet certain safety standards or safety, road use safety includes, among others, guard rails, glare absorbers, rest areas, road islands, and road user information equipment, including directional signs, delineators, guide fence etc. Road safety facilities are needed so that users are more relaxed, not tired and bored during the trip.

1.1 Research Objectives

This research related to the analysis of traffic performance and road safety facilities has the following objectives:

a. Knowing the traffic conditions on Jl. Teuku Umar, Jl. Panglima Sudirman and the intersection between the 2 roads at peak hours in the morning, afternoon and evening in June 2021.
b. Knowing the performance and level of service on the 2 roads and intersections in the next 5 years.
c. Knowing the existing condition of road safety facilities on these 2 roads and intersections, so that they can find out what needs to be improved in the next 5 years.

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2. Methodology

The method used in this study is a quantitative method, planning is used for traffic analysis is planned based on (General Bina Marga, 1997) and planning is used for road safety facilities based on road equipment planning of the Ministry of Public Works and Public Housing.

The data obtained, both primary and secondary data, were analyzed to look for geometric conditions, traffic volume and road safety facility conditions. The stages of data analysis are as follows:

a. Geometric condition Jl. Panglima Sudirman - Jl. Teuku Umar and the intersection
b. Average daily traffic volume to determine speed and LOS
c. The existing condition of road safety facilities on Jl. Panglima Sudirman - Jl. Teuku Umar and the intersection

2.1. Workflow

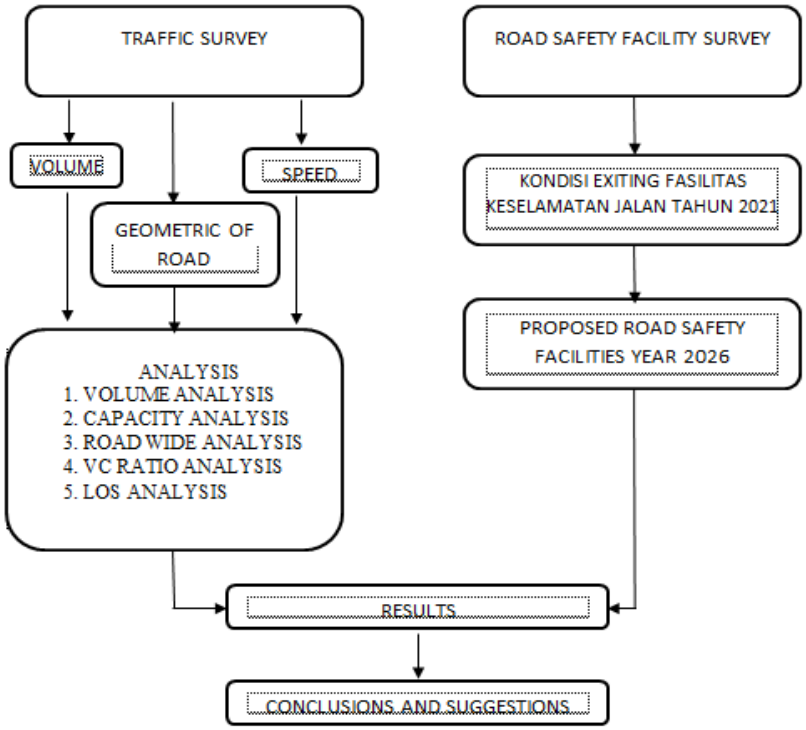

Figure 1.

3. Result and Discussion

3.1. Volume Lalu lintas Tahun 2021

Traffic volume is the number of vehicles that pass a certain point or line on a cross section of the road. Traffic volume enumeration data is information needed for the planning, design, management and road operation phases (Sukirman, 1999).

Table 1. Description of Urban Street Middle School Values

Transportation Type	Passenger Car Unit Value (smo/h)
Heavy Vehicle (HV)	1,20
Light Vehicle (LV)	1,00
Motorcycle (Mc)	0,25

Table 2. Description of the EMP Value of Urban Roads

Transportation Type	Emp	
	Shielded Approach	Opposite Approach
LV	1,00	1,0
HV	1,30	1,3
MC	0,20	0,4

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Table 3. Adjustment factors for side resistance and shoulder width FC_{SF}

Road Type	Class Resistance Side	Adjustment factor for resistance side and shoulder width FCSF Shoulder Width Ws			
		≤ 0,5	1,0	1,5	≥2,0
4/2D	VL	0,95	0,97	0,99	1,01
	L	0,94	0,96	0,98	1.0
	M	0,91	0,93	0,95	0,98
	H	0,86	089	0,92	0,95
	VH	0,81	0,85	0,88	0,92
4/2 UD	VL	0,95	0,97	0,99	1,01
	L	0,93	0,95	0,97	1,0
	M	0,9	0,92	0,95	1,97
	H	0,84	0,87	0,9	0,93
	VH	0,77	0,81	0,85	0,9
2/2 UD	VL	0,93	0,96	0,97	0,99
Or walk	L	0,9	0,92	0,95	0,97
One way	M	0,86	0,88	0,91	0,94
	H	0,78	0,81	0,84	0,88
	VH	0,68	0,72	0,77	0,82

Table 4. Basic Free Flow Rate (F_{V0})

Transportation Type	Current Speed Vehicle Light LV	Vehicle Weight HV	Bicycle Motorcycle MC	All Vehicle (average)
Six – lane Divided (6/2D)	62	52	48	57
Four – lane Divided (4/2D)	57	50	47	55
Four – lane – tak Divided (4/2D)	53	46	43	51
Four – lane – not Divided (2/2UD)	44	40	40	42

Table 5. Side Barrier Classes for urban roads

Kelas Hambatan Samping (SFC)	Kode	Weighted amount event per 200 m Hour (Two Side)	Special Conditions
Very Low	VL	< 100	Evacuation : Side Road Availabe
Low	L	100 - 299	Evacuation : Some Transportation etc
Medium	M	300 – 499	Industry : Several Street Side Shope
High	H	500 – 899	Commercial : High Street Side Activity
Very High	VH	> 900	Commercial : Activity of Market Two Side

1) Calculation Analysis
   a. Street of Panglima Sudirman = Peak hours Tuesday at 11.00 – 12.00 WIB, which is 873.70 smp/hour
   b. Street of Teuku Umar = Peak hours Tuesday at 16.00 – 17.00 WIB 1092.1 smp/hour
   c. intersection = Peak hours Tuesday 16.00 – 17.00 WIB, namely:
      1. Protected U = 410.9 pcu/hour, Countered U = 579.7 pcu/hour
      2. S Protected = 493.7 pcu/hour, S Against = 673.7 pcu/hour
      3. T Protected = 408 pcu/hour, T Against = 583.2 pcu/hour
      4. B Protected = 542.3 pcu/hour, B Against = 744.9 pcu/hour

Table 6. Capacity adjustment factor for Jalan Panglima Sudirman 2021

About/ Direction	Traffic Flow Q	Level Saturation	Speed VLv	Segmen Length Street	Traveling Time TT
	Formulir UR-2	DS	Gbr.D-2:1 or 2	L	(24)/(23)
	Smp/h	(21)/(16)	Km/h	km	Hour
(20)	(21)	(22)	(23)	(24)	(25)
	785,50	0,210	35,0	0,985	0,028

Table 7.Factors for adjusting the capacity of street Teuku Umar 2021

About/ Direction	Traffic Flow Q	Level Saturation	Speed VLv	Segmen Length Street	Traveling Time TT
	Formulir UR-2	DS	Gbr.D-2:1 or 2	L	(24)/(23)
	Smp/h	(21)/(16)	Km/h	km	Hour
(20)	(21)	(22)	(23)	(24)	(25)
	1089,70	0,291	29,0	0,758	0,026

Table 8. Adjustment factor for signalized intersection 2021

Code Approach	Traffic Flow	Capacity Smp/jam	Level Saturation	Green Ratio
			DS	GR
	Smp/h		=	=
	Q	C	Q/C	g/c
(1)	(2)	(3)	(4)	(5)
Utara	410,9	582,04	0,71	0,21
Selatan	493,7	582,04	0,85	0,21
Timur	408	674,37	0,61	0,20
Barat	542,3	722,54	0,75	0,21

3.2. Traffic Volume in 2026

Table 9. Data on Increase in Growth in Bojonegoro Regency

No	Transportation Type	2017	2018	2019	2020	Average Percentage Increase
1	LV	5971	7431	8891	7431	4%
2	HV	2958	3688	4418	3688	5%
3	MC	14954	22254	29554	22254	13%

Table 10. Capacity adjustment factor for Jalan Panglima Sudirman 2026

About/ Direction	Traffic Flow Q	Level Saturation	Speed VLv	Segmen Length Street	Traveling Time TT
	Formulir UR-2	DS	Gbr.D-2:1 or 2	L	(24)/(23)
	Smp/h	(21)/(16)	Km/h	km	Hour
(20)	(21)	(22)	(23)	(24)	(25)
	1224,99	0,327	35,0	0,985	0,028

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Table 11. Capacity adjustment factor for Jalan Panglima Sudirman 2026

About/ Direction	Traffic Flow Q	Level Saturation	Speed VLv	Segmen Length Street	Traveling Time TT
	Formulir UR-2	DS	Gbr.D-2:1 or 2	L	(24)/(23)
	Smp/h	(21)/(16)	Km/h	km	Hour
(20)	(21)	(22)	(23)	(24)	(25)
	1518,04	0,406	29,0	0,758	0,026

1) Geometric Change of signalized intersection 2026

Table 12. Changes in Field Conditions at the signalized intersection 2026

Approach WA	Enter W ENTER	Turn Left Directky W LTROR	Exit W EXIT
(8)	(9)	(10)	(11)
7,5	7,5	0	7,5
7,5	7,5	0	7,5
8	8	0	8
8	8	0	8

Table 13. Adjustment factor for signalized intersection 2026

Code Approach	Traffic Flow	Capacity Smp/jam	Level Saturation	Green Ratio
			DS	GR
	Smp/h		=	=
	Q	C	Q/C	g/c
(1)	(2)	(3)	(4)	(5)
Utara	606,87	863,03	0,70	0,21
Selatan	714,78	983,45	0,73	0,21
Timur	606,50	992,82	0,61	0,20
Barat	788,05	1063,73	0,74	0,21

4. Conclussion and Suggestions

4.1 Conclusion

Based on the results of research and analysis of the results of field data collection at the location of the Jl. Panglima Sudirman, Jl Teuku Umar and signaled intersections, the following conclusions can be drawn:

a. Traffic flow on the Jl. Panglima Sudirman in 2021 is 785.5 pcu/hour, the degree of saturation is 0.21, the average speed is 35 km/hour and has a capacity of 3741 pcu/hour. Meanwhile, the traffic flow on the Jl. Teuku Umar in 2021 is 1089.70 pcu/hour, the degree of saturation is 0.291, the average speed is 29 km/hour and has a capacity of 3741 pcu/hour. The signaled signal in 2021 has an average traffic flow of 463.72 pcu/hour, an average capacity of 640.25 pcu/hour, has an average saturation degree of 0.73, and an average traffic delay of 77, 70 sec/pcu.(Mehun Regulation 2018 concerning Roads, 2018)
b. Traffic flow on the Jl. Panglima Sudirman in 2026 is 1224.99 pcu/hour, the degree of saturation is 0.327, and has a capacity of 3741 pcu/hour. Meanwhile, the traffic flow on the Jl. Teuku Umar in 2026 is 1518.04 pcu/hour, the degree of saturation is 0.406, and has a capacity of 3741 pcu/hour. Signaled signals in 2026 have an average traffic flow of 679.05 pcu/hour, an average capacity of 975.76 pcu/hour, an average saturation degree of 0.70, and an average traffic delay of 77. 70 sec/pcu, with the addition of the U, S, T, B approaches of 2 meters.
c. Road safety facilities on Jl Panglima Sudirman and Jl Teuku Umar based on exiting conditions on Signs, Marka, APILL, and Public Street Lighting are good but there are some points that need to be added and also need maintenance.

4.2 Suggestions

a. It is necessary to provide and maintain public transportation facilities so that people in Bojonegoro Regency prefer public transportation to private vehicles so that in the next 10 years traffic jams at intersections can be avoided without having to widen the road.
b. It is necessary to add W in the approach U=7.5 S=7.5 T=8 B=8 which will have an impact on the basic value of green junior high school/hour (So), so that the degree of saturation changes to U=0.7 S=0 .73 T=0.61 B=0.74 and all approaches belong to LOS C and D.

c. Add road safety facilities, namely Signs, Marka and APILL at certain points that are considered important.
d. Clarify the existence of existing signs, because there are several other obstacles that cover the signs.
e. It is necessary to conduct further research on the condition of the intersection in the next 10 years

References

General Bina Marga, D. (1997, February 25). *Highway Capacity Manual Project (HCM)." Indonesian Road Capacity Manual (MKJI)*. PT Bina Karya. https://www.slideshare.net/MiraPemayun/mkji-manual-kapasitas-jalan-indonesia

Mehun Regulation 2018 concerning Roads, J. (2018). *Jakntri, 2018, PM No. 82 Tatars*.

PUSDIKLAT Roads, Housing, Settlements, and R. I. D. (2017). *Module 6 Road Equipment Planning*.

Sukirman, S. (1999). *Fundamentals of Road Geometric Planning*.

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VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Construction of a Road Network in Central Surabaya and Traffic Conditions in The Girilaya Road Surabaya City Based on Geographic Information Systems

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Abstract

The purpose of this study was to create a road network in the form of a geographic information system and to find out the traffic conditions that occurred on the Girilaya road, Surabaya City in 2021. This traffic condition research used a method that refers to the calculation of congestion figures. In accordance with field observations, the road with the type of road 2/2 UD is two lanes – two-way undivided, with a road width of 6 meters for a total of 2 directions with a shoulder of 1 meter each on the right and left sections.

The facilities on these roads are not equipped with traffic signs such as (no stopping, no parking, speed limit). The highest average daily traffic volume on this road segment is from 07.00 – 18.00 as many as 1725.8 vehicles/hour. Motorcycles are the most dominant type of vehicles passing through these roads. From the analysis of the level of congestion carried out, the results showed that the side barriers on the road segment were categorized as moderate (M) at 378.6 events/hour.

Congestion occurs because of the density of activities and vehicles reduce speed and stop on the side of the road. This results in the value of service on the road section being D indicating that the flow of vehicles is obstructed, the speed is low and the volume of vehicles is above capacity. Therefore, the role of the government is very important to reduce the level of congestion that occurs and drivers are more orderly in carrying out activities on these roads.

Keywords
Geographic Information Systems, Traffic Congestion, Volume.

1. Introduction

Today's information technology can be applied to all fields of work. Information technology can be used as a means of information to create a road network in the form of a geographic information system. Making it easier for users of the system to find information from the road network.

The advantage of Web GIS is that it can be used by anyone with access to the internet. So it is very good if the use of Web GIS as a medium to present something. Actually there is already information about the road network made by the relevant agencies in the form of manual maps and digital maps. how to get it is also still limited and difficult. For this reason, this research must display or provide a web-based Geographic Information System (GIS) that can be useful and can be accessed by everyone without being limited by time and place, namely via the internet. Based on the above background, this research as a final project intends to take the title "Making a Road Network in Central Surabaya and Traffic Conditions in the Girilaya Road, Surabaya City Based on Geographic Information Systems.

1.1 Map

A map is a picture of the earth's surface drawn on a flat plane with a certain scale. Describe several functions and types of maps, namely as follows:

The main function of the map is perhaps for orientation or navigation. In each case, most maps available to the general public, with the exception of weather charts, are produced to assist with orientation and navigation. People use orientation maps to be able to get from one place to another on a pre-selected/determined route, and want to be able to check the map/chart whether they are still on the right path during their journey.

1.2 Geographic Information System (GIS)

Geographic Information System (GIS) is a computer system used to manipulate geographic data. This system is implemented with computer hardware and software that functions for data acquisition and verification, data compilation, data storage, data change and updating, data management and exchange, manipulation, retrieval, presentation and data analysis. In general, there are two types of data that can be used to present or model the phenomena that occur in the actual field. This type of data such as position data, coordinates, space, and spatial. While the second is the type of data that represents the descriptive aspects of the modeling of the phenomenon which includes the items or properties concerned to the time dimension. This data is usually referred to as attribute data or non-spatial data. Attribute or non-spatial data types are used by database management systems (DBMS). This system can be used in the scope of business, education, engineering, management, academia, trade, offices, and matters related to the description of spatial data attributes. The limitation in DBMS is that it can only answer non-spatial questions (Prahasta, 2009).

Information systems can be broken down into several subsystems which are illustrated in the diagram below.

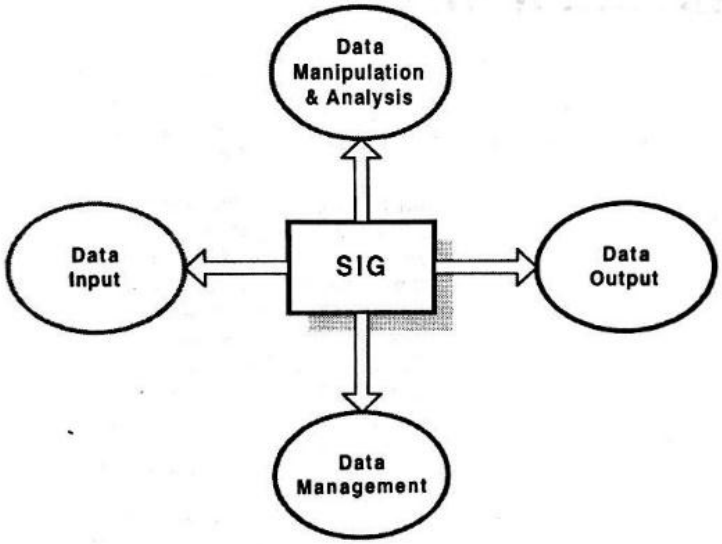

Figure 1. Geographic Information System Subsystem (Source: (Prahasta, 2009)

1.3 Web-based Geographic Information System (Web-GIS)

Web-GIS is basically a development of a GIS application based on the internet. This is because the development of applications in the network environment has shown great potential in relation to geo-information. Web-GIS is a web-based geographic information system consisting of several interrelated components. Web-GIS is a combination of graphic mapping design, digital maps with geographic analysis, computer programming, and a database that is interconnected into one web design and web mapping. For example, there is an online map for a city where users can easily access and use it to search for a location to be searched. (Esri, 1990)

1.4 Portal for ArcGIS

Some content obtained from various sources, both desktop-based, browser-based, and applications from the device in question needs to be stored on an internal computer. Internal start use and processing to be carried out. Restricted by a computer network security system which is no other use to protect data within its access rights. As the reason for using an internal database system, only internal users are allowed to access the content. Portal for ArcGIS is used to publish maps or content related to spatial analysis to ArcGIS Server (Esri, 1990).

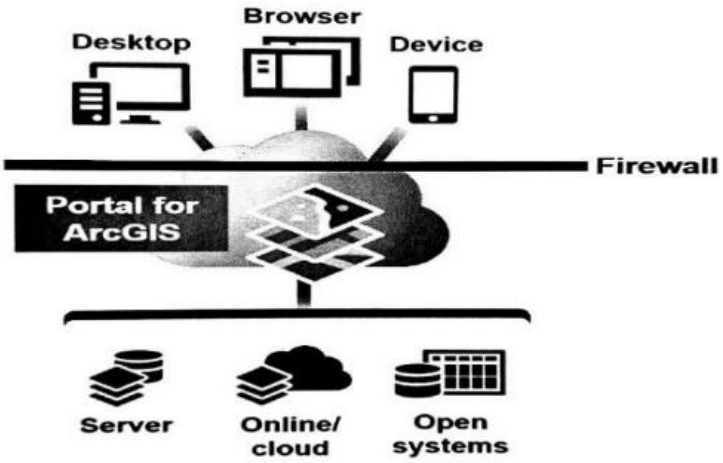

Figure 2. Portal Schematic for ArcGIS (Source: (Prahasta, 2009)

1.5 ArcGIS Server

ArcGIS for web-based server has functions as geocoding, geographic analysis, conversion, network analysis, and geo-geodatabase management. ArcGIS Server is used for geographic analysis because Portal for ArcGIS cannot use this feature. Thus, they both become a single entity where the output is web-based content that can be used within a single scope of user needs. ArcGIS server also has a function for users who are connected to the internet to publish server-based maps (Esri, 1990).

1.6 Database System Components

As a system, the database system has many integrated components including hardware, users, operating systems, database management systems (DBMS), other application programs, and databases (Prahasta, 2009). Hardware components include CPU (processor), memory (RAM), storage (hard disk, CD, etc.), keyboard, monitor, mouse, network (cable and internet network).

1.7 Geodatabase

An ArcGIS geo-database is a collection of geographic datasets of various types retrieved in a file folder system, Microsoft Access database, or multiuser DBMS (such as Oracle, Microsoft SQL Server, Postgre SQL, Informix, or IBM DB2). Geo-databases come in many forms, have a variety of users and can range from small, single-user databases building files to larger workgroups, departments, and enterprises. Geo-databases can be accessed by many users (Esri, 1990). However, a geo-database is more than just a collection of datasets. In ArcGIS Geo-database can mean many things, among others (Esri, 1990)

1.8 Road

The classification of road functions according to the Surabaya City Regional Regulation Number 12 of 2014 concerning the Surabaya City Regional Spatial Plan 2014-2034 is:

5. Freeway is a public road for continuous traffic with full control of the entrance and without any level crossing and is equipped with a road-owned fence.
6. Toll road is a public road which is part of the road network system and as a national road whose users are required to pay tolls.

1.9 Web

WWW, better known as the web, was originally a service for presenting information on the internet using HTML. Web is synonymous with the internet, because of its current popularity, the web has become an application interface for conducting transactions and presenting complete information from all over the world

1.10 HTML

HTML stands for Hyper Text Markup Language. HTML documents are pure text files that can be created with any text editor. This document is known as a web page. An HTML document is a document that is presented in the surfer's web browser. This document generally contains information or application interfaces on the internet.

There are two ways to create a web page: with an HTML editor or with a plain text editor (eg notepad). For practice or trying out the material in this paper, you should use notepad, after that near the end you can use

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Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

an HTML editor, this is intended so that you understand and get used to primitively creating web documents. Choose a name, any name, then add an extension of ".htm" or ".html" (double quotes do not need to be written as they are used for description only).

1.11 Transportation

Transportation explains that a system consisting of certain facilities along with a flow and control system that allows people or goods to move from one place to another efficiently at any time to support human activities. In this case, transportation has three elements, namely: there is a load that can be transported, there is a vehicle used as a means of transportation and there is a road that can be accessed. There are several types of land transportation, ranging from non-motorized such as bicycles, wagons, horse carts, tricycles, and so on, as well as motorized vehicles such as motorcycles and cars. People usually use private transportation such as private cars, rentals, or motorbikes to meet their transportation needs. Road users who do not use private vehicles can use mass transportation such as buses, public transportation, base or online motorcycle taxis and so on

1.12 Definition of Traffic Congestion

Congestion is an indication where the demand and use of the road crossing approaches or exceeds the design capacity of the transport infrastructure. The number of vehicles crossing a road approaches the physical capacity of existing road facilities and makes traffic speed slower so that the overall ability of traffic crossings decreases, where traffic is hampered but is still running.

Traffic jams often occur in areas that have a very high intensity of activity, land use and population. Traffic jams often occur due to high traffic volume, which is caused by a continuous mix of traffic (through traffic). The nature of traffic jams is a routine occurrence, which usually affects the use of resources, besides that traffic jams can also disrupt activities in the surrounding environment. The broad impact is that it affects the smooth running of socio-economic and cultural activities in an area .

2. Methodology

Against this background, roads in Surabaya function as a medium of socialization and accessibility for the community, so it is necessary to monitor and manage these roads in an integrated manner, and be able to provid the desired information in a short time. The results of this study are expected to be able to find out several things as follows:

1. Creating road network information in Simokerto District, Genteng District, Tegalsari District, Sawahan District and Gubeng District, Surabaya City interactively using a web-based Geographic Information System (GIS).
2. Provide information and make it easier to process road network data in the Surabaya City area online.
3. Knowing the traffic conditions of the Girilaya road in Surabaya

2.1 Research Sites

Research locations in this study are all arterial, collector and local road networks located in Simokerto District, Genteng District, Tegalsari District, Sawahan District and Gubeng District, Surabaya City.

Primary Data Collection. Primary data was obtained from the results of a direct survey at the research site, by measuring the dimensions of the channel directly and taking documentation at the research location. Data

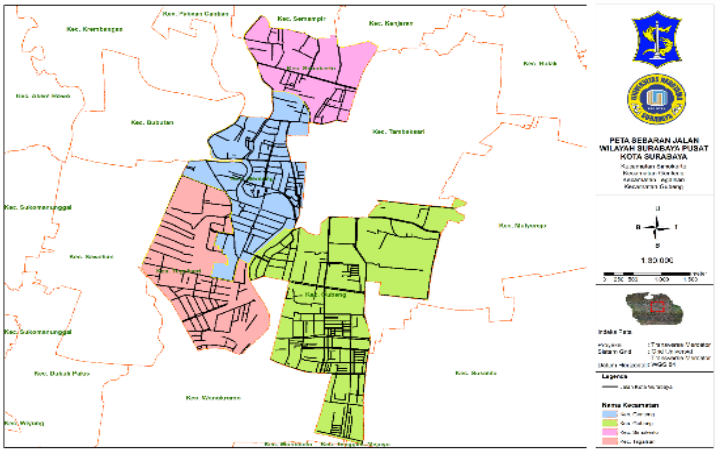

Figure 3. Research Locations

2.2 Data Used

The data used in this study are:

2) Traffic Volume Data

The method used to collect traffic volume data is done manually. To obtain this data, 2 observation posts were placed which were occupied by 2 officers for the recording section accompanied by the type of form for the number and type of vehicle. The postal point was chosen to make it easy to count the passing vehicles. Classification of types of vehicles that pass on the road:

f. Light Vehicles (LV): Passenger cars and small trucks (pick ups)
g. Heavy Vehicle (HV): Big truck
h. Motorcycles (MC): Motorcycles and three-wheeled vehicles
i. Non-motorized vehicles: bicycles and trishaws

3) Road Geometry Data

The method of collecting road geometry data is carried out by direct measurements in the field. The purpose of the measurement process is to determine the type of location, number of lanes, lane width, and parking conditions. Measurements with a roll meter and measurement times were carried out at night due to sloping traffic so that the measurement process ran smoothly and precisely.

Table 1.

Street Name	Number Of Lanes	Lane Width (M)
Girilaya Street (South Direction)	1	3
Girilaya Street (North Direction)	1	3

2.3 Data Collection Method

In this study the data collection methods used are:

1. Field Survey

The field survey conducted in this study aims to determine the condition and position of the research object, namely the road network in the city of Surabaya correctly and accurately.

2. Documentation Study

The documentation method is a method of collecting data by looking at written records and can be accounted for as well as being strong and official evidence. The documentation method used in this research is to collect spatial data and attribute data from relevant agencies to obtain relevant and accurate data. The agency is the Public Works Department of Highways and the City of Surabaya.

2.4 Data Processing Stage

Data processing using a computer (PC) / Laptop with ArcGIS 10.4 application. After all the data needed in this research is collected, then data processing is carried out to obtain information related to the road network in the city of Surabaya. The steps taken are:

1. Entering and processing data sources
2. Doing digitization
3. Adding spatial data information attributes
4. Display road information
5. Create a digitized Geodatabase
6. Export data using ArcGIS Online
7. Testing online

2.5 Digitizing Maps

Data analysis was carried out after the research data processing was completed. The research results were processed using ArcGIS 10.4 software. The data processing is done by digitizing several themes, including: village boundaries, sub-district boundaries, and roads (based on their classification). So that the final result of the digitization is a web-based geographic information system for the road network in the city of Surabaya.

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Available online at http://proceedings.worldconference.id.
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2.6 Map Layout

A map to be printed must first be arranged in the layout of its supporting properties. This is necessary to clarify the information contained on the map. The layout of the map properties will have an effect on the map information. Therefore, before printing, a map must be designed as well as possible. Some that must be considered or important to include in the layout are:

1. Insert map
2. Map grid
3. Map scale
4. Map legend
5. Map maker label
6. Designing map orientation
7. Map frames

Figure 4. Example of a road network map layout

3. Result and Discussion

3.1 Research Results

Jalan Girilaya is the name of a street in the city of Surabaya. Jalan Girilaya is a central area because from the north it is Jalan Banyu Urip, from the south it is Jalan Kupang Gunung. On the road is the point where there are shops, restaurants, traffic flows that are active in daily activities.

The width of the Girilaya road section is actually 5 meters with the width of each right and left shoulder of 1 meter. In a very densely populated residential area on the side of the road with insufficient parking provided so that many consumers or buyers put motorbikes to cars on the side of the road which results in overcrowding on these roads.

In addition, the increasing number of pedestrians crossing along the road segment, from the flow of slowly moving vehicles such as bicycles and motorcycle tricycles in and out of the roadside. This causes congestion so that congestion often occurs on the Girilaya road. The following is the Geometric data of the 100-meter-long Girilaya road segment.

j. Road Type: 2/2 UD (2 lanes – 2 undivided directions)
k. Road : 1 meter on the right side and 1 meter on the left side
l. Road Width: 5 meters for a total of 2 directions
m. Population : 201,766 inhabitants (2020)

The research to determine the condition of the Girilaya road, a survey was carried out on Wednesday 2 June 2021 to Tuesday 8 June 2021. The survey was carried out for 3 hours. In the morning at 07.00 – 08.00, in the afternoon at 12.00 – 13.00, and in the afternoon at 17.00 – 18.00. The research was carried out by 5 people, 2 surveyors to observe the movement of daily traffic vehicles and 3 people in charge of observing side obstacles that occur on the road segment. Based on data obtained from survey observations, it is continued with the

calculation of traffic volume, road capacity, side obstacle class, degree of saturation, speed and level of service based on the Indonesian Road Capacity Manual (MKJI, 1997).

3.2 Traffic Volume

Traffic volume is the total number of vehicles passing a certain point on a certain road segment at a certain time. Expressed in units of passenger car vehicles (SMP). For the planned traffic volume (VLHR) is the estimated traffic volume at the end of the planned traffic year expressed in pcu/hour. The traffic volume survey is carried out by directly counting the number of vehicles passing the observation point using a counter. The survey was conducted by 3 surveyors at the observation point for each direction of traffic, where the surveyor will calculate the types of vehicles that pass on the road segment by classifying the vehicle classification. The types of vehicles observed are:

n. Light Vehicles (LV): Passenger cars and small trucks (pick ups)
o. Heavy Vehicles (HV): Big trucks
p. Motorcycles (MC): Motorcycles and three-wheeled vehicles
q. Non-motorized vehicles: bicycles and rickshaws

Calculations On Monday in the direction of Kupang Gunung smp/hour (17:00-18:00).

Table 2.

LV x EMP LV	= 540 x 1.0	=	540 smp/jam
HV x EMP HV	= 10 x 1.2	=	12 smp/jam
MC x EMP MC	= 1143 x 0.25	=	285,75 smp/jam

So the total in junior high school / hour is obtained: 540 + 12 + 285.75 = 837.75 junior high school / hour Calculations On Monday in the direction of Banyu Urip smp/hour (17:00-18:00).

Table 3.

LV x EMP LV	= 599 x 1.0	=	599 smp/jam
HV x EMP HV	= 9 x 1.2	=	10.8 smp/jam
MC x EMP MC	= 1113 x 0.25	=	278.25 smp/jam

it can be seen that the maximum volume on Monday afternoon at 17.00 – 18.00 WIB is 1725.8 smp/hour, this is due to the density of trading activities, namely the number of restaurants, shops, and very high hours of returning from work. While the sloping traffic volume occurred on Saturday afternoon at 12.00-13.00 WIB of 989.4 smp/hour due to the quiet activity at that hour.

The data taken in this survey are vehicles that stop and park on the shoulder of the road, pedestrians who are parallel and also crossing the road, vehicles entering and leaving the road and slow vehicles. From this research, it is multiplied by the side resistance weight factor. In this survey, it is conducted with a distance of 100 meters and selects the most segment data. The table of side resistance survey results can be seen in the appendix and the following table of total side resistance is shown in table 1.

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Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

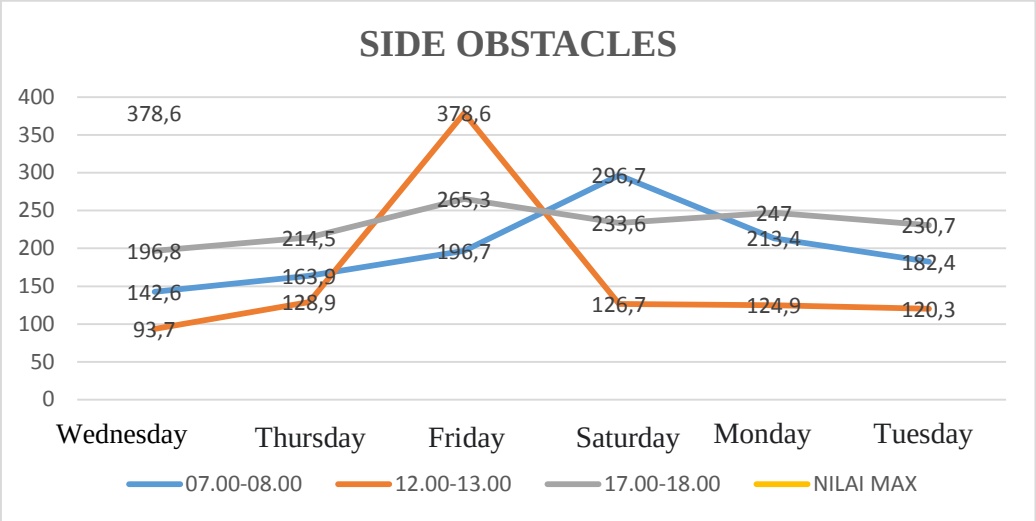

Figure 5. Total side drag results for events per 100 meters per hour (Two-sided)

The Girilaya road section is a type 2 lane 2 undivided direction (2/2 UD), with a width of 3 meters per lane for each lane. The calculation of the speed of free traffic flow is calculated based on the Indonesian Road

Capacity Manual (MKJI, 1997) for urban roads. For the basic free flow speed and adjustment factor taken from the 1997 MKJI, the following is the calculation of the vehicle traffic flow speed based on the (MKJI, 1997).

r. Basic Free Flow Speed of Light Vehicles (km/h) Fvo = 42 km/h
s. Effective Traffic Lane Width Speed (km/h) FVw = -3
t. Adjustment Factor for Side Barrier Conditions FFVsf = 0.93
u. City Size Adjustment Factor FFVcs = 0.90
v. FV = (Fvo + FVw) x FVw x FFVsf x FFVcs FV = 32.6 Km/Hour. Based on the calculation results above, it is found that the speed of free traffic flow on the Girilaya road due to side barriers in the area that has been reviewed is 32.6 Km/Hour. .

3.3. Road Capacity

The capacity of the Girilaya road section uses the (MKJI, 1997) regulation procedure for urban road conditions. The following is the calculation of the capacity with the occurrence of side barriers on the road.

w. Co Basic Capacity = 2900 Km/Hour
x. Road Width Adjustment Factor FCw = 0.87
y. FCsp Directional Separator Adjustment Factor = 0.94
z. FCsf Side Resistance Adjustment Factor = 0.93
aa. City size adjustment factor FCcs = 0.90
bb. Capacity C = Co x FCw x FCsp x FCsf x FCcs C = 1985 smp/hour Based on the above calculation, it can be seen that from the calculation results according to the (MKJI, 1997) procedure, the capacity value of the Girilaya road segment for a total of 2 directions is 1985 smp/hour.

3.4 Degrees of Saturation

The degree of saturation is the ratio between traffic volume and road capacity. The calculation of the degree of saturation in the presence of side resistance can be seen as follows:

DS = Q/C

Information:

Q = Vehicle Volume

C = Capacity

Vehicle volume from the results of the daily traffic survey is on average on Mondays at 17.00 – 18.00 with a total of 1346 pcu/hour.

Capacity (C) = 1985 pcu/hour

Then = 1725.8/1985 =0.869

From the results of the calculation of the degree of saturation, we can see that the recapitulation of the degree of saturation is in table 2.

Table 4. The results of the calculation of the degree of saturation per hour in the presence of side resistance

Time	Wednesday	Thursday	Friday	Saturday	Monday	Tuesday
07.00-08.00	0,7116	0,685	0,746	0,669	0,812	0,752
12.00-13.00	0,5890	0,512	0,541	0,498	0,621	0,663
17.00-18.00	0,7729	0,764	0,669	0,594	0,861	0,810

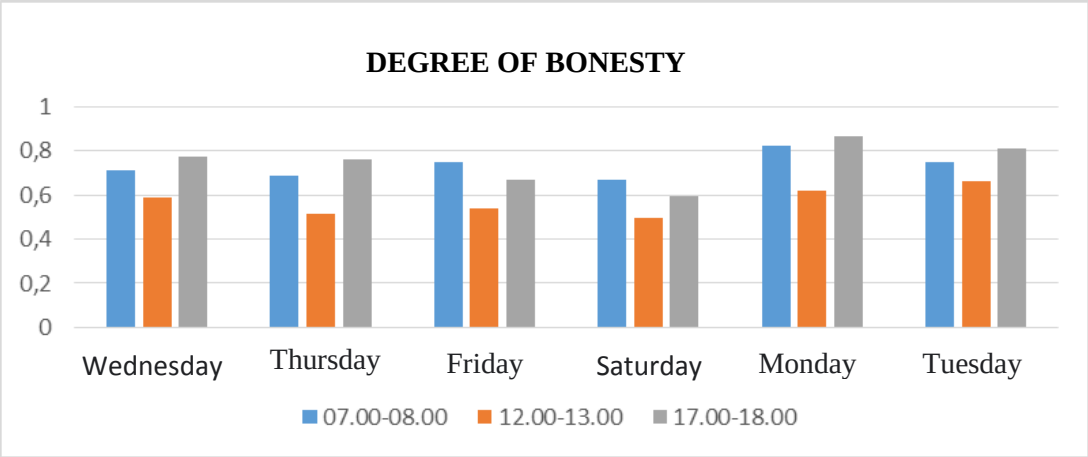

Figure 6. Graph of the Degree of Saturation on the Girilaya Street

Based on the analysis, it can be seen that the value of the degree of saturation that exceeds the maximum limit of the degree of saturation in a few hours of observation time is past the DS limit > 0.75 – 0.80 based on MKJI 1997 even the road capacity up to DS is 0.869, then the results result in the level of service being D, namely: the current is close to no stable and low speed. This makes road performance not optimal and an action needs to be taken to improve traffic management on these roads such as road markings, parking system settings, providing traffic signs on the side of the road.

From the results of the analysis of congestion analysis on the Girilaya road, data analysis was carried out based on procedures using guidelines (MKJI, 1997) so the results of the research can be described as follows:

1. The highest vehicle volume on Monday in the afternoon on Jalan Girilaya at 17.00 – 18.00 WIB is 1606 km/hour. This is due to the high volume of vehicles due to the dense activity of returning home from work and accompanied by high activity around shops, kiosks and restaurants.
2. Side obstacles obtained on Friday at 12.00 - 13.00 WIB are included in the medium side obstacle class (M) which is 396 events / hour due to the road shoulder or the edge of the segment being used as a parking lot and vehicles stopping on the road resulting in disruption of traffic flow on the road Girilaya.
3. The results of the analysis showed that the value of the degree of saturation on Monday in the afternoon at 17.00 – 18.00 WIB was 0.809, so it was produced according to the (MKJI, 1997)guidelines, the level of service for the road section was D, which explained that the flow was approaching unstable and the speed was low.

3.5 Development of a Web-Based Road Network Geographic Information System

The creation of a Web-based road network Geographic Information System is carried out after the research data processing is complete. The research results were processed using ArcGIS 10.4 software. So that the final result of the manufacture is a web-based geographic information system for the road network in the city of Surabaya. The road network to be processed according to road function in the form of arterial, collector and local roads is in the Simokerto District, Genteng District, Tegalsari District, Sawahan District and Gubeng District, Surabaya City. The data processing is done by digitizing several attributes, including:

1. Street Name
2. District Boundaries
3. Village boundaries
4. Road Length
5. Road Width
6. Type of Road Function
7. Type of Pavement
8. Identification of the Base of the Road
9. Identification of the End of the Road.

The road network that will be inventoried is 347 road sections with details:

1. Bubutan sub-district totaling 101 roads
2. Genteng sub-district totaling 83 roads
3. Simokerto Subdistrict with 24 Roads
4. Tegalsari sub-district totaling 72 roads
5. Sawahan sub-district totaling 67 roads

4. Conclussion

Based on the results of road network data management based on Geographic Information Systems and analysis of the Girilaya road segment due to side obstacles that occur, the following conclusions can be drawn:

1. The highest volume of vehicles on the Girilaya road is 1725.8 pcu/hour. This is due to the high volume of vehicles due to the dense activity of returning home from work and accompanied by high activity around shops, kiosks and restaurants.
2. The highest side obstacle is on Friday with the category of moderate side obstacle class (M) 378.6 events/hour, due to the fact that there are many rows of shops, kiosks, restaurants and places of worship for Muslims for Friday prayers, there is no parking space. which is provided properly so that it is very disturbing the traffic flow activity of the Girilaya road.
3. Based on observations that have been made the value of the worst service level is D. This shows that the flow of vehicles is hampered, the speed is low, the volume of vehicles is above capacity.
4. With GIS software, a web-based road network can be created with a web page link https://arcg.is/1bL0CX0 which can find out the classification of the road network in Central Surabaya City according to road function, government administration and axis load, as well as other information such as name the road, the length of the road and the LHR of the road being researched

With GIS software, an interactive web-based geographic information system for the road network in Surabaya can be made that can be accessed by everyone without being limited by time and place, namely via the internet.

From the results of the analysis that has been done, suggestions that can be given by the author are:

1. To reduce the level of side barriers, namely for the surrounding community to be more obedient when driving, not to drag each other, not to put parking on the shoulder of the road during purchase transactions, place the vehicle on land that is thought to be empty, awareness for kiosk owners, shops and restaurants to provide parking space appropriate so as not to disrupt the flow of traffic on the road. And for truck drivers who ignore the time limit for entering the Girilaya road, it causes delays in morning and evening activities.
2. In particular, for the government to complete traffic signs for maximum speed, parking is prohibited, stopping is prohibited and so on and it is hoped that it will not interfere with traffic flow on Girilaya road.
3. The government is expected to expand the road due to the very high volume of traffic on the road and improve the function of the shoulder of the road as a pedestrian area so that it functions properly.
4. Based on the conclusions above, it is recommended that digital data processing should be carried out regularly by the relevant agencies on the road network.

References

Esri. (1990). *Understanding GIS : The ArcInfo Method. Redlands. CA : Environmental System Research Institute*.

MKJI. (1997). *Indonesian Road Capacity Manual (MKJI)*. Public Works Department.

Prahasta, E. (2009). *Konsep-Konsep Dasar SIG*. Informatika.

JWC JOURNAL OF WORLD CONFERENCE
VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Development Risk Management Mbah Buto Mojowarno Suspension Bridge on Regional Development

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Abstract

Infrastructure development in the form of roads and bridges is a government program in an effort to improve facilities and infrastructure. Infrastructure has a fairly strong relationship with social and environmental welfare for the development of a region. Bridges in Indonesia have progressed quite a lot. This is marked by the construction of several types of long bridges that connect one area to another. The construction of the Mbah Buto Suspension Bridge has a very positive role in increasing social activities, transportation facilities and improving the economy of the surrounding community. This study aims to determine the development of the area after the construction of the Mbah Buto Suspension Bridge. This research method uses descriptive quantitative method. The object of this research is the community around the construction site, using primary data sources in the form of questionnaire results, observations, and secondary data which includes supporting documents regarding development. The analytical method used is simple linear regression analysis using SPSS application in the form of validation test, reliability test, t test, and coefficient of determination test. The results of the study indicate that the Infrastructure Development in the form of the Mbah Buto Suspension Bridge has a very positive and significant role in social activities, transportation facilities and the economy of the surrounding community.

Keywords
Infrastructure Development, Risk management, Regional development.

1. Preliminary

Infrastructure or facilities and infrastructure have a very strong relationship to social welfare and environmental quality as well as to the process of economic growth of a region or region. This can be shown by indications that areas with better infrastructure systems usually have higher levels of social welfare and environmental quality as well as better economic growth (Departmen Pekerjaan Umum Badan Penelitian dan Pengembangan Pusat Penelitian dan Pengembangan Jalan dan Jembatan, 2006).

The influence in the era of globalization has a double impact, namely on the one hand this era brings population growth and increasingly unstoppable growth in transportation. In this case, the construction of the Mbah Buto Suspension Bridge is very important given the increasing volume of vehicles and almost uncontrollable. Therefore, the Ministry of Public Works and Public Housing (PUPR) has given the task of the Regional I National Road Implementation Unit of East Java Province to carry out the construction of the Mbah Buto Suspension Bridge so that adequate and proper infrastructure is met.

The method used in this research is descriptive method and survey method. Where the Descriptive Method explains and explains the results obtained from the formulation of the problem, for the Survey Method obtained from respondents as research samples using a questionnaire as a data collection instrument. Departing from the selection of studies regarding the impact of the construction of the Mbah Buto Suspension Bridge on the development of the Jombang Regency area, the title of the thesis is "Analysis of Risk Management of the Construction of the Mbah Buto Suspension Bridge on Regional Development"

2. Research Methods

The data used in this study were obtained from the study of literature and the distribution of questionnaires to the parties concerned in order to complete the analysis carried out. Processing data from the questionnaire using the Likert scale method to determine the risk to be analyzed using the quantitative risk analysis method (Nazir, 2011).

The conceptual framework for research on bridges can be described as follows:

VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

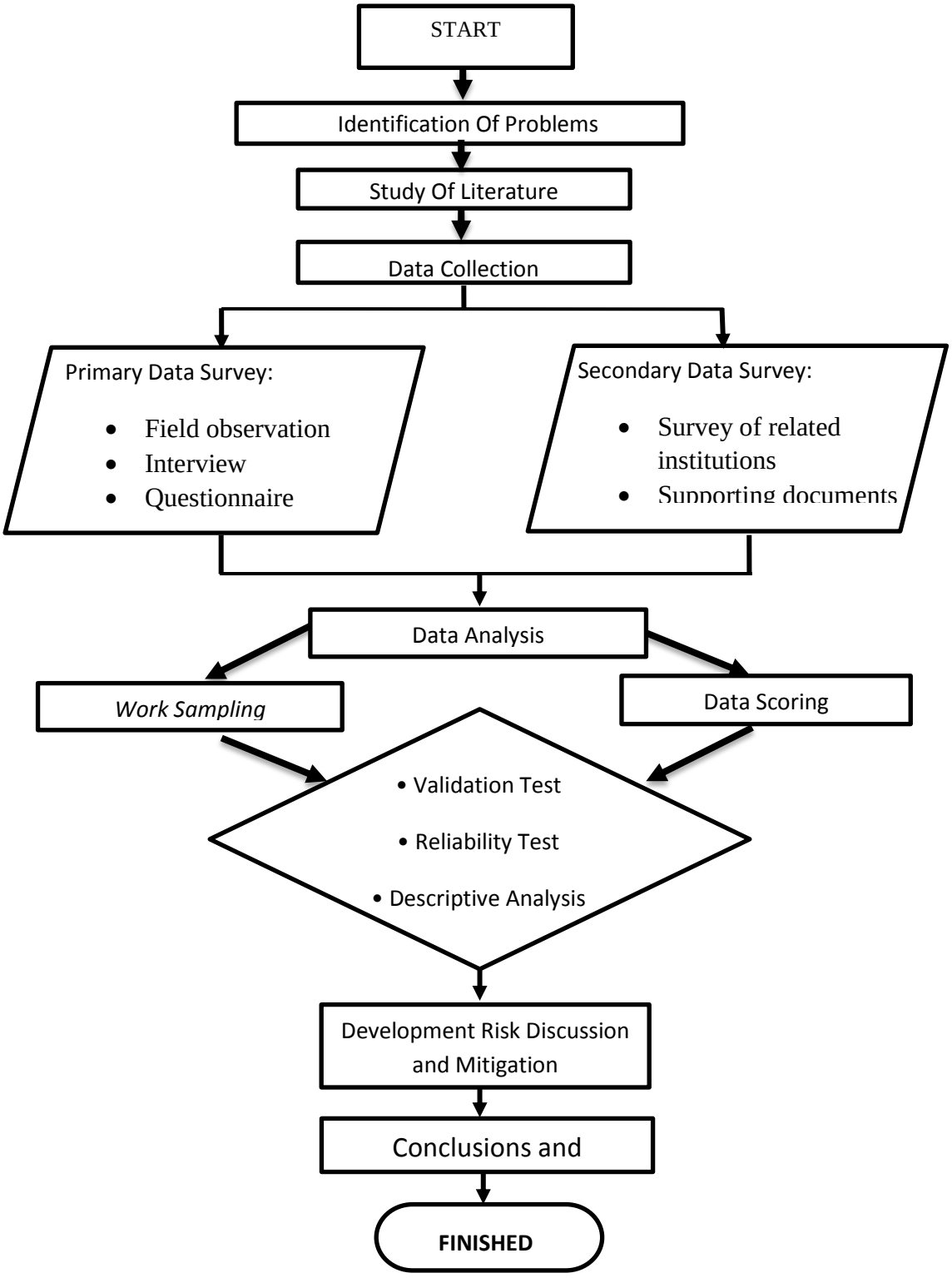

Figure 1.

2.1 Questionnaire Data

The questionnaire was conducted by distributing questionnaires to the respondents as many as 100 questionnaires. The number of respondents' samples was taken from the approach according to Slovin's emulation.

$$n = \frac{N}{1 + N(e)^2}$$

Information:
N = Sample size/number of respondents
N = Population size
E = Percentage of allowance for accuracy of sampling error that can still be tolerated;
e = 0.1
In the Slovin formula there are the following provisions:
The value of e = 0.1 (10%) for a large population
The value of e = 0.2 (20%) for a small population
So the range of samples that can be taken from the Slovin technique is between 10-20% of the research population.(Nanang, 2012)

The total population in this study was 107 employees and 4,193 residents, so the percentage of allowance used was 10% and the calculation results could be rounded up to achieve conformity. So to find out the research sample, with the following calculations:

$$n = \frac{4.300}{1 + 4.300(0,1)^2}$$

$$n = \frac{4.300}{1 + 4.300(0,01)}$$

$$n = \frac{4.300}{1 + 4.300(0,01)}$$

$$n = \frac{4.300}{44}$$

$n = 97,7$; adjusted by the researcher to 100 respondents.

3. Result and Discussion

Compilation of Respondent's Description

The distribution of respondents' answers to the infrastructure development variable can be seen in the following table:

Table 1. Deskripsi Responden Variabel Pembangunan Infrastruktur

Question	SS		S		KS		TS		Total	
	F	%	F	%	F	%	F	%		
X 1	54	54%	46	46%	0	0	0	0	100	100%
X 2	0	0	0	0	36	36%	64	64%	100	100%
X 3	66	66%	34	34%	0	0	0	0	100	100%
X 4	72	72%	28	28%	0	0	0	0	100	100%
X 5	78	78%	22	12%	0	0	0	0	100	100%
X 6	70	70%	30	30%	0	0	0	0	100	100%
X 7	66	66%	34	34%	0	0	0	0	100	100%
X 8	0	0	64	64%	36	36%	0	0	100	100%
X 9	0	0	0	0	32	32%	68	68%	100	100%
X 10	66	66%	34	34%	0	0	0	0	100	100%

3.1 Validity Test

Validation test is used to measure the determination of an item in the questionnaire or scale that you want to measure. In determining whether or not the item is valid. Sunarti, (2012)To find out the level of validity, a validity test will becarried out first using IBM SPSS software, while the output results can be seen from the following table:

3.2 Validity Test Table

Table 2.

Case Processing Summary		N	%
Cases	Valid	100	100.0
	Excluded	0	.0
	Total	100	100.0

Source : Researcher's

In the Case Processing Summary table, it can be seen that the Cases Valid row states that the number of respondents is 100 and the percentage shows 100%, this indicates that the 100 respondents are valid and no respondents are included in the Excluded category. Then, to find out whether the results of the calculation of the data are reliable and consistent or reliable, it can be seen in the Reability Statistics table. Like the table below:

Table 3. Results Reliabilitas

Reliability Statistics	
Cronbach's Alpha	N of Items
.592	10

Source : Researcher Calculation

The results of the Cronbach's Alpha reliability test calculation (r count) can be seen in the Cronbach's Alpha column, which is 0.592 with N of Items indicating that the number of items or the number of statements that the researcher inputs is 10. So it can be said that the results of Cronbach's Alpha for 10 data or 10 statement, which is 0.592

3.3 Simple Linear Regression Analysis

Simple regression analysis is used to predict or test the effect of one independent variable or independent variable on the dependent variable or dependent variable. If the score of the independent variable is known, then the score of the dependent variable can be predicted. Regression analysis can also be done to determine the linearity of the dependent variable with the independent variable. The simple regression model shown to predict the value of the Infrastructure Development variable, from the results of research data processing as follows:

Table 4. Simple Linear Regression Analysis Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-1.000	.000		-4421675.638	.000
With the bridge, it can improve the economy of the surrounding community	1.000	.000	.230	36998596.474	.000
The existence of a bridge has a negative impact on the surrounding environment	1.000	.000	.222	37935886.838	.000
There are many benefits of having a bridge	1.000	.000	.219	37513210.263	.000
Residents are happy with the new infrastructure	1.000	.000	.208	34981983.775	.000
With the new infrastructure, residents can carry out activities well	1.000	.000	.192	32268719.150	.000
The new bridge contributes a lot to residents' activities	1.000	.000	.216	33873304.320	.000
The new bridge doesn't support anything	1.000	.000	.216	32291622.512	.000
With the bridge, residents can work well	3.000	.000	.657	95303472.546	.000

Source: Researcher's Calculation

R2 Test (Coefficient of Determination)

The value of the coefficient of determination is between 0 and 1. The value of the coefficient of determination that is close to 0 (zero) means that the ability of all independent variables to explain the dependent variable is very limited, while the value of the coefficient of determination that is close to 1 means that the independent variable almost provides the information described to predict the variation of the dependent variable.

4. Conclussion

Based on the research, the researchers concluded as follows:

1. From the respondents' descriptions, local residents on average strongly agree that infrastructure development in the form of the Mbah Buto Suspension Bridge has a positive impact. As in statement 5 (X5) with a percentage gain of 78% of respondents, for respondents who chose to agree had the highest percentage value as much as 64% of respondents were in statement 8 (X8), while for respondents who did not agree the highest was in statement 8 (X8) and statement 2 (X2) as many as 72 respondents, for respondents who chose to disagree the most were in statement 9 (X9) as many as 68% of respondents.
2. The results of the survey on community satisfaction with infrastructure in the form of bridges. With 100 respondents, with percentage results, Dissatisfied = 13.2%, Less Satisfied = 10.4%, Satisfied = 29.2%, Very Satisfied = 47.2%. it can be concluded that the average community around is very satisfied with the new infrastructure in the form of the Mbah Buto Suspension Bridge.
3. For handling the risk of statement 10 (X10) it can be done by avoiding activities that can interfere with the activities of residents when crossing the bridge. Like selling in the bridge area, because it causes crowds and congestion in the bridge area. Meanwhile, the handling of the risk of statement 2(X2) can be done by reducing waste disposal in the bridge area by recycling it to become a new form or a new function.

4. Suggestions

Based on the research above, the suggestions that researchers put forward are:

1. This research can later be developed with periodic improvements, with the limitation that this research does not check the soil density and mud content in the radius around the bridge, where the mud content can also affect the elevation in the next few years.
2. There needs to be awareness from both the project implementer and the surrounding community, that this bridge project is a project that is useful for the public interest. So, from any party, it is hoped that

they will not take their own advantage and forget that the purpose of this project is to be in the public interest.

3. Further research is needed to improve this research by increasing the number of data samples to be studied and extending the research period so that the results obtained are accurate and varied. Furthermore, it is expected to expand research so that more knowledge can be obtained.

References

Departmen Pekerjaan Umum Badan Penelitian dan Pengembangan Pusat Penelitian dan Pengembangan Jalan dan Jembatan. (2006). *Ministry of Public Works Agency For Research And Development Research and Development Centre For Roads and Bridges*. Departmen Pekerjaan Umum Badan Penelitian dan Pengembangan Pusat Penelitian dan Pengembangan Jalan dan Jembatan.

Nanang, M. (2012). *Quantitative Research Methods Content Analysis and Secondary Data Analysis*. King Grafindo Persada.

Nazir, M. (2011). *Research methodology*. Ghalia Indonesia.

Sunarti, R. and. (2012). Community Empowerment in Improving the Quality of Slum Settlements in PNPM Activities in Muareja Village, Tegal City. *PWK Tennis Journal*, *1*, 46–65.

Biography / Biographies

Ita Zeftin Trisnawati, born in the city of Surabaya on September 9, 1995. is the eldest of two children. My father's name is Sutrisno (late) and my mother's name is Dwi Harini. My father was born in Surakarta on 25 June 1963 and my mother is the same as my father's birthplace on 15 April 1964. I have been through Education at PKK Kalijudan Surabaya Kindergarten, Kalijudan Public Elementary School II Surabaya, 18 Surabaya Junior High School, 6 Surabaya State Vocational School and studied at the University Narotama Surabaya. While studying, he participated in a bridge competition held by another university. That's what adds to my experience. And when he was in college, he also participated in organizations that were on campus which further added to his experience in organizing.

JWC JOURNAL OF WORLD CONFERENCE
VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Evaluation of The Capacity of The Araya Pump House in Managing Flood of Kalibokor Channel Sisi Jl. Arief Rachman Hakim

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Abstract

Kalibokor Channel is one of the primary channels in East Surabaya. This channel overflows during the rainy season. The inundation height that occurs is between 0-15 cm. Some of the flood-prone areas that the channel passes through are Manyar, Klampis, Gebang Putih, and JL. Arif Rahman Hakim. The Surabaya City Government built the araya pump house as a helper for the Kalibokor channel in order to reduce inundation on Jl. Arief Rachman Hakim and reduce the load on the Kalibokor pump house. The study was conducted by calculating the value of the planned rain and flood discharge, then analyzing the existing one and ending by recommending a new pump capacity design. The results of the analysis calculation obtained that the planned discharge entered the Kalibokor primary channel on the side of Jl. Arief Rachman Hakim is 18.56 m3/s while the existing capacity of the Kalibokor primary channel on the side of Jl. Arief Rachman Hakim can only accommodate a capacity of 16.6 m3/s.

Keywords
Drainage, Flood Control, Long-Storage, Pump House, Shortcut

1. Introduction

a. Background

The large population and increasingly modern city conditions have made changes in the use of green open land into residential buildings and office buildings. This can lead to clean water problems. The problem caused by this water is puddles that often occur during the rainy season. This inundation arises due to the lack of order in the existing drainage system and the arrangement of the existing system.

Some of the flood-prone areas that the channel passes through are Manyar, Klampis, Gebang Putih, and JL. Arif Rahman Hakim. These areas are densely populated and traffic-intensive areas. So that it will cause unrest in the community if there is a flood, such as traffic jams and road damage. So we need an auxiliary pump to overcome it. In this case the auxiliary pump that is used is the Araya Pump House.

Araya Pump House is located on Jl. Arief Rahman Hakim No. 7 Surabaya, to be precise next to the Surabaya Oncology Hospital. The Surabaya City Government built the araya pump house as a helper for the Kalibokor channel in order to reduce inundation on Jl. Arief Rachman Hakim and reduce the load on the Kalibokor pump house. This pump house was built with the aim of being a Kalibokor drain to be divided into the Semolowaru channel.

b. Formulation of the Problem

1. What is the design flood discharge that enters the Kalibokor channel on the side of Jl. Arief Rachman Hakim?
2. What is the existing capacity of the Araya channel and the Kalibokor primary channel?
3. How does the Araya pump house affect the long storage of the Kalibokor channel?

2. Study of Literature

Long storage is a water storage system that utilizes the longitudinal channel of the river itself as a reservoir. In the construction of long storage, a weir is needed as the main building because the weir serves to raise water to a certain elevation so that water can be accommodated in the river. With the storage in long storage, the peak time of flooding can be slowed down so that the downstream flood discharge can be reduced. Therefore, long storage can be used as a structural flood control system.

Each river catchment area has special characteristics and different characteristics, this requires great care in applying an appropriate theory to the relevant drainage area. Therefore, before starting the long storage construction planning, it is necessary to refer to the existing specifications and which are in accordance with the characteristics of the watershed, such as topography, watershed area (DAS), soil data, and environmental conditions.

The literature review is intended to briefly describe the theoretical basics of long storage planning that will be used in the calculation of construction and complementary buildings. The theoretical bases that will be presented include hydrological analysis, hydraulics analysis, dimensional planning and building stability (Soewarno, 1995).

3. Research Method

3.1 Data Source

The data used in this study were sourced from the relevant Department's report. In addition, literature study is also carried out by collecting and studying books, reports, journals and other literature related to the titles discussed in this study as well as data from field surveys and interviews with communities around the research location which are more or less needed. as reference.

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3.2 Research Flowchat

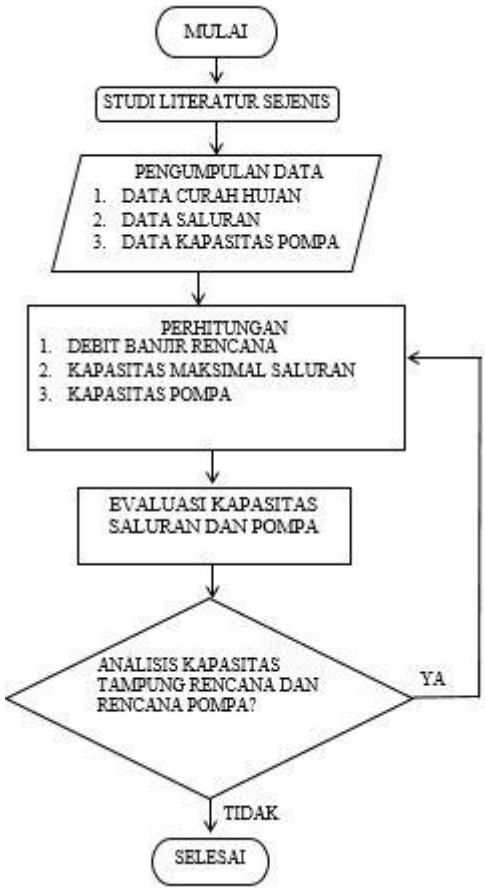


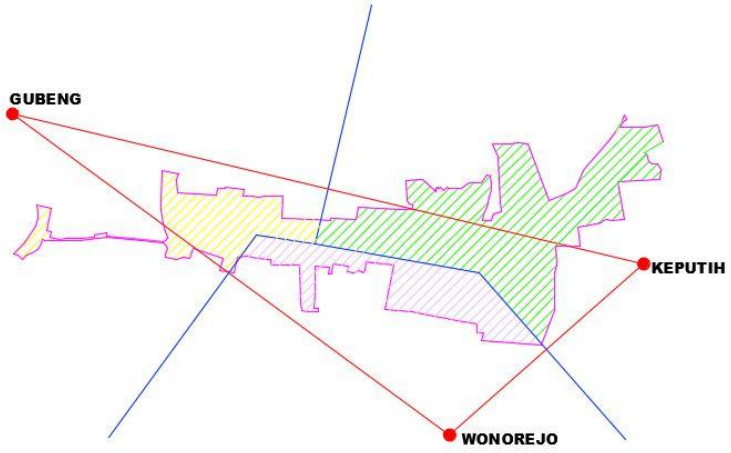
Figure 1. Research Flowchart

4. Results and Discussion

Tabel 1. Data Curah Hujan

No	Year	Curah hujan Maksimum (mm)		
		Stasiun Keputih	Stasiun Wonorejo	Stasiun Gubeng
1	2011	78	94	98
2	2012	85	95	106
3	2013	80	85	87
4	2014	134	100	83
5	2015	84	109	63
6	2016	164	121	108
7	2017	124	122	114
8	2018	49	85	73
9	2019	50	66	76
10	2020	102	97	107

VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)



(Kementerian Pekerjaan Umum dan Perumahan Rakyat, 2014)
Figure 2. Poligon Theissen Kalibokor

Luas DAS:
Stasiun Keputih = 4,5533992 km2
Stasiun Wonorejo = 1,7745811 km2
Stasiun Gubeng = 1,5752509 km2
Total Luas DAS = 7,9032312 km2

Tabel 2 Data Curah Hujan Stasiun

No.	Year	Curah Hujan
1	2011	82,19
2	2012	84,26
3	2013	84,91
4	2014	115,40
5	2015	85,03
6	2016	141,19
7	2017	121,96
8	2018	60,27
9	2019	58,77
10	2020	100,88
TOTAL		934,85

Metode Log Person III
Log Xt = Log Xrt +(k*S)
Xt = 10^Log Xt

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Available online at http://proceedings.worldconference.id.
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Tabel 3. Perhitungan Intensitas Curah Hujan

T	R 24						
(Jam)	R2	R5	R10	R20	R25	R50	R100
	94,3491	114,0885	124,5623	130,4906	133,5579	138,6319	142,6612
1	32,7090	39,5523	43,1833	45,2386	46,3019	48,0610	49,4579
2	20,6054	24,9164	27,2038	28,4985	29,1684	30,2765	31,1565
3	15,7248	19,0148	20,7604	21,7484	22,2596	23,1053	23,7769
4	12,9806	15,6963	17,1373	17,9529	18,3749	19,0730	19,6274
5	11,1863	13,5267	14,7685	15,4714	15,8350	16,4366	16,9144
6	9,9060	11,9785	13,0782	13,7007	14,0227	14,5554	14,9785
7	8,9386	10,8087	11,8010	12,3626	12,6532	13,1339	13,5156
8	8,1772	9,8881	10,7958	11,3096	11,5755	12,0153	12,3645
9	7,5597	9,1413	9,9805	10,4556	10,7013	11,1079	11,4307
10	7,0469	8,5213	9,3036	9,7464	9,9754	10,3544	10,6554
11	6,6131	7,9967	8,7308	9,1463	9,3613	9,7170	9,9994
12	6,2404	7,5460	8,2388	8,6309	8,8337	9,1694	9,4359
13	5,9161	7,1539	7,8107	8,1824	8,3747	8,6929	8,9455
15	5,3778	6,5030	7,0999	7,4379	7,6127	7,9019	8,1316
16	5,1513	6,2291	6,8009	7,1246	7,2921	7,5691	7,7891
17	4,9473	5,9824	6,5316	6,8424	7,0033	7,2693	7,4806
18	4,7623	5,7587	6,2874	6,5866	6,7414	6,9975	7,2009
19	4,5937	5,5548	6,0648	6,3534	6,5027	6,7498	6,9460
20	4,4393	5,3681	5,8609	6,1398	6,2841	6,5229	6,7125
21	4,2972	5,1963	5,6733	5,9433	6,0830	6,3141	6,4976
22	4,1660	5,0376	5,5001	5,7618	5,8973	6,1213	6,2992
23	4,0443	4,8905	5,3395	5,5936	5,7251	5,9426	6,1153
24	3,9312	4,7537	5,1901	5,4371	5,5649	5,7763	5,9442

Tabel 4. Rekapitulasi Analisis Debit Banjir Rencana Saluran Tersier

No	Tertiary Channel Name	Hasper	Rasional	Weduwen
1	Sal. Manyar Tirtoyoso	1,739798881	0,761132	3,3645235
2	Sal. Manyar Sabrangan	1,594179409	0,813575	2,7557176
3	Sal. Manyar Tirtosari	0,809838756	1,325663	0,6376216
4	Sal. Manyar Tortomoyo Sabrangan	0,936450227	1,205389	0,8480809
5	Sal. Raya Manyar Indah	0,555457189	1,652808	0,3290473
6	Sal. Klampis Ngasem	0,674652179	1,481627	0,4567548
7	Sal. Klampis Asih	0,961101155	1,184287	0,8942091
8	Sal. Klampis Indah	0,815039633	1,320287	0,6454396
9	Sal. Manyar Kertoadi Selatan	0,687648753	1,465108	0,4723756
10	Sal. Klampis Sacharosa	0,963703982	1,182098	0,8991829

Tabel 5. Rekapitulasi Analisis Debit Banjir Rencana Saluran Sekunder

No	Tertiary Channel Name	Hasper	Rasional	Weduwen
1	Sal. Sekunder Manyar Tirtosari	2,281669262	2,10129	2,1827089
2	Saluran Manyar Tirtomoyo	1,619274702	2,634083	1,1203773
3	Sal. Sekunder Manyar Tirtoyoso	2,281669262	2,10129	2,2289777
4	Sal. Sekunder UPB	2,945073908	1,739219	3,9686571

Tabel 6. Rekapitulasi Analisis Debit Banjir Rencana Saluran Primer

No	Channel Name Primer	Hasper	Rasional	Weduwen
1	Sal. Kalibokor Sisi Jl. Menur Pumpungan	6,659733044	4,679935	7,0895069
2	Sal. Primer Kalibokor Sisi Jl. Arief Rachman Hakim	9,497251257	3,526657	16,668175

In this case, the method used is the Hasper method because the calculation results are the most suitable.

Tabel 7. Perbandingan Debit Eksisting dan Debit Rencana Saluran Tersier

Channel Name	Q eksisting	Q Plan	Description
Sal. Manyar Tirtoyoso	1,431801511	1,739798881	NOT OK
Sal. Manyar Sabrangan	2,155802893	1,594179409	OKE
Sal. Manyar Tirtosari	1,431801511	0,809838756	OKE
Sal. Manyar Tortomoyo Sabrangan	0,861311735	0,936450227	NOT OK
Sal. Raya Manyar Indah	1,033574082	0,555457189	OKE
Sal. Klampis Ngasem	1,618467243	0,674652179	OKE
Sal. Klampis Asih	2,155802893	0,961101155	OKE
Sal. Klampis Indah	0,789689048	0,815039633	NOT OK
Sal. Manyar Kertoadi Selatan	3,752381489	0,687648753	OKE
Sal. Klampis Sacharosa	1,618467243	0,963703982	OKE

Tabel 8. Debit Yang Masuk Ke Sal. Sekunder Manyar Tirtoyoso

Channel Name	Q Plan
Sal. Manyar Tirtoyoso	1,431801511
Sal. Manyar Sabrangan	2,155802893
Sal. Manyar Tirtosari	1,431801511
Sal. Manyar Tortomoyo Sabrangan	0,861311735
Total	5,880717651

Tabel 9. Debit Yang Masuk Ke Sal. Sekunder UPB

Channel Name	Q Plan
Sal. Klampis Asih	0,9611012
Sal. Klampis Indah	0,8150396
Sal. Manyar Kertoadi Selatan	0,6876488
Sal. Klampis Sacharosa	0,963704
Total	**3,4274935**

Tabel 10. Perbandingan Debit Eksisting Dan Total Debit Rencana Saluran Sekunder

Name	Q Eksisting	Q Plan	Q Enter	Q Plan Total	Description
Sal. Sekunder Manyar Tirtosari	3,752381489	2,816 69262	0	2,2816692 62	OKE
Sal. Sekunder Manyar Tirtomoyo	8,081220356	1,6192 74702	0	1,6192747 02	OKE
Sal. Sekunder Manyar Tirtoyoso	5,468988617	2,2816 69262	5,880717 651	8,1623869 13	NOT OKE
Sal. Sekunder UPB	8,081220356	2,9450 73908	3,427493 523	6,3725674 31	OKE

Tabel 11. Debit Yang Masuk Ke Sal. Primer Kalibokor Sisi Menur Pumpungan

Channel Name	Q Plan
Sal. Raya Manyar Indah	0,5554572
Sal. Klampis Ngasem	0,6746522
Sal. Sekunder Manyar Tirtosari	2,2816693
Sal. Sekunder Manyar Tirtomoyo	1,6192747
Sal. Sekunder Manyar Tirtoyoso	8,1623869
Total	**13,29344**

Debit Yang Keluar Dari Sal. Primer Kalibokor Sisi Menur Pumpungan

a. Sebesar 20% debit yang keluar menuju Sal. Menur
b. Sebesar 20% debit yang keluar menuju Sal. Teratas

Tabel 12. Perbandingan Debit Eksisting dan Total Debit Rencana yang masuk ke Sal. Primer Kalibokor Sisi Menur Pumpungan

Name	Q Eksisting	Q Plan	Q Enter	Q Out Ke Sal. Menur	Q Out Ke Sal. Teratas	Q Plan Total	Description
Sal. Primer Kalibokor Sisi Menur Pumpungan	16,608 812	6,659 733	13,293 4402	3,990634658	3,192507726	12,7700 309	OKE

Tabel 13. Debit yang masuk ke Sal. Primer Kalibokor Sisi Arief Rachman Hakim

Channel Name	Q Plan
Sal. Sekunder UPB	3,4274935
Sal. Primer Kalibokor Sisi Menur Pumpungan	12,770031
Total	**16,197524**

Debit Yang Keluar Dari Sal. Primer Kalibokor Sisi Arief Rachman Hakim

a. Sebesar 15% debit yang keluar menuju Sal. Araya Barat
b. Sebesar 15% debit yang keluar menuju Sal. Araya Timur

Tabel 14. Perbandingan Debit Eksisting dan Total Debit Rencana yang masuk ke Sal. Primer Kalibokor Sisi Arief Rachman Hakim

Name	Q Eksisting	Q Plan	Q Enter	Q Out Ke Sal. Araya Barat	Q Out Ke Sal. Araya Timur	Q Plan Total	Description
Sal. Primer Kalibokor Sisi Arief Rachman Hakim	16,608 81183	9,4972 51257	16,197 52443	3,8542 16353	3,276083 9	18,56 4475 43	NOT OKE

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Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Tabel 15. Perhitungan Debit Yang Keluar Dari Sal. Primer Kalibokor

Name	Q Eksisting	Q Plan	Q Enter	Q Plan Total	Description
Sal. Menur	2,155802893	3,212298694	3,990634658	7,202933352	NOT OKE
Sal. Teratas	2,155802893	0,684103624	3,192507726	3,87661135	NOT OKE
Sal. Araya Barat	2,155802893	1,068355643	3,854216353	4,922571995	NOT OKE
Sal. Araya Timur	2,155802893	2,4394927	3,2760839	5,715576599	NOT OKE

Tabel 16. Perhitungan Kebutuhan Pompa Eksisting Rumah Pompa Araya = 1 m3/det

	Q Maks m3/detik	Vt m3	ntc detik	Qp m3
Polder Pompa Araya	2,16	40	3600	1,937

Tabel 17. Analisa pompa eksisting Rumah Pompa Araya untuk kapasitas Sal. Araya Timur

Channel	Qp Sal	Kapasitas Pompa Eksisting	Analisis
Sal. Araya Timur	1,937	1	NOT OKE

Selisih kapasitas pompa yang dibutuhkan = 0,937 m3/sec
Perhitungan Kebutuhan Pompa Untuk Debit Rencana
Kapasitas Tampung Debit Saluran = 2,155802893
Kapasitas Debit Masuk = 5,715576599
Selisih Debit = 3,559773706

Tabel 18. Perhitungan Kebutuhan Pompa Untuk Debit Rencana

	Q Maks m3/detik	Vt m3	ntc detik	Qp m3
Polder Pompa Araya	3,56	40	3600	3,279

Tabel 19. Analisa pompa eksisting Rumah Pompa Araya untuk Debit rencana Sal. Araya Timur

Channel	Qp Sal	Capaciti Pompa Eksisting	Analisis
Sal. Araya Timur	3,279	1	NOT OKE

Based on the above calculation, it is known that the pump capacity for the Araya Pump House in the non-rainy conditions and the planned Q5 rain conditions are both insufficient.

5. Conclusions and Suggestions

1. Sum of flow plan Kalibokor chanel Arief Rachman Hakim side.

Table 20.

No	Name	Q (m3/det)
1	Q10 Sal. Kalibokor sisi Arief Rachman Hakim	9,49
2	Q masuk dari Sal. Kalibokor sisi Menur Pumpungan	16,19
	TOTAL	25,68

Tabel 21. Debit yang keluar dari Sal. Kalibokor sisi Arief Rachman Hakim

No	Name	Q (m3/det)
1	Q keluar menuju Sal. Araya Barat	3,85
2	Q keluar menuju Sal. Araya Timur	3,27
	TOTAL	7,12

2. Existing dimensions Sal. Arief Rachman Hakim's Kalibokor side is 16.6 m3/s, while the accumulated discharge plan is Sal. The Kalibokor on the side of Arief Rachman Hakim is 18.65 m3/s. Then there is an overflow of 1.96 m3/s. After normalization and removal of sediment in the channel, it was found that the discharge was able to be accommodated by Sal. Arief Rachman Hakim's Kalibokor is 22.58 m3/s.
3. The operation of Araya Pump House is still not able to accommodate the discharge that enters Sal. East Araya. An additional pump capacity of 2.25 m3/s is required.
4. To deal with the inundation that occurred in the Kalibokor channel, efforts were made to repair the collapsed slab around the Kalibokor channel using sheet pile walls, build a pump house at the side of the West Araya channel, build bozem and mini bozes around the Kalibokor channel.

References

Kementerian Pekerjaan Umum dan Perumahan Rakyat. (2014). Peraturan Menteri Pekerjaan Umum Republik Indonesia Nomor/3/PRT/M/2013. Tentang Penyelenggaraan Prasarana Dan Sarana Persampahan Dalam Penanganan Sampah Rumah Tangga Dan Sampah Sejenis Sampah Rumah Tangga, 1–374.

Soewarno. (1995). Hidrologi Aplikasi Metode Statistik Untuk A*nalisa Data*. Penerbit Nova.

VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Construction Safety Planning Method Based on Project Loan (Lot 8 Jarit-Puger Road Project Case Study)

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Abstract

The development of infrastructure in Indonesia has increased with the implementation of national strategic projects. With the increasing growth of infrastructure development in Indonesia and the increasing number of work-related accidents on the site. Accidents at work occur because of the lack of attention to implementation and monitoring. The success of the project is not measured merely in terms of performance, but in the application of occupational safety and health to a project and becomes one of the benchmarks for success. To control the implementation of Occupational Safety and Health in the project, a Construction Safety Plan is required, while compiled in the Construction Safety Plan document included in the Construction Safety Management System document. The research methodology used data collected in the field. Collect data from implementation case studies and comparisons related to construction safety planning documents against applicable regulations through field observations using documentation, questionnaires, observations and documentation methodology. Based on the analytical results conducted in this study, there are five elements to prepare the construction safety plan documents. Reduce the number of work-related accidents by planning, monitoring, and evaluating work-related accidents. There is an expectation that further analysis of the factors that cause work accidents by adding research objects to reduce work accidents in construction projects. For the analysis, the authors hope that the causes of industrial accidents will be more detailed by adding research topics to reduce accidents in construction projects.

Keywords
Occupational Safety and Health, Safety Management System document

1. Introduction

1.1. Background

Infrastructure development in Indonesia in the space of five years has increased, various development achievements in national strategic projects in connectivity infrastructure and outside connectivity infrastructure. According to Minister of Public Works and Public Housing (PUPR) Basuki Hadimuljono said, the condition of Indonesia's infrastructure is still far behind other countries in Southeast Asia (Alexander, 2020).

From the increase in the budget of infrastructure development in Indonesia from year to year is increasing, but there are still work accidents, currently the success rate of a project is not only seen from its performance, butthe application of K3 Construction on a project becomes one of the benchmarks.

With the acceleration carried out by the Indonesian government in infrastructure development to control the implementation of construction came iso 45001:2018 *Occupational Health and Safety Management System*regulation, then came Ministry of Public Works and Public Housing regulation No. 21/PRT/M/2019 on Construction Safety Management System Guidelines (SMKK) in force since December 30, 2019, Replacing the Regulation of the Minister of PUPR No. 02/ PRT / M / 2018 on Changes to the Regulation of the Minister of Public Works No. 05 / PRT / M / 2014 on Guidelines for Occupational Safety and Health Management System (SMK3) Construction in the Field of Public Works has undergone changes in inactive status. [1]

With the emergence of various regulations for occupational health and safety management is expected to be able to parse the factors that can be caused during the implementation of construction work well and can reduce work *accidents*in the safety plan/ construction safety planning on construction work. Development with *a loan* financing scheme will be of more concern, so that a good safety *plan*/ construction safety planning canbe adjusted to the construction work on the Development of Trans *South-South Java Road Project (TRSS) Lot 8 Jarit-Puger* or Lot 8 Road Development: Jarit-Puger.

1.2 Problem Formulation

a. With the emergence of various regulations ISO 45001:2018, regulation PUPR No. 21 / PRT / M / 2019 what are the differences between construction safety plan documents and the influence on the Lot 8 Jarit-Puger Road Construction project?
b. What are the advantages and disadvantages of the document of the construction safety plan of lot 8 Jarit-Puger road construction project in ISO 45001:2018 regulation, regulation PUPR No. 21/PRT/M/2019?
c. How is the evaluation carried out if there is a change in the regulation of the construction safety plan document during the construction work on the Lot 8 Jarit-Puger Road Construction project?

1.3 Problem Limitations

The research compared the appropriate construction safety planning methods to be applied to the project with the *IsDB loan* funding scheme on lot 8 Jarit-Puger Road development.

1.4 Research objectives

a. Find out the proper construction safety plan documents for loan projects *by* comparing ISO 45001:2018 regulations, regulation PUPR No. 21/PRT/M/2019 on the Lot 8 Jarit-Puger Road construction project.
b. Knowing the advantages and disadvantages of the construction safety plan document in ISO 45001:2018 regulation, regulation PUPR No. 21/PRT/M/2019
c. Knowing the evaluation carried out in case of changes in the regulation of construction safety plan documents during construction work on the Lot 8 Jarit-Puger Road Construction project

2. Library Review

A construction project is a series of activities carried out only once and generally in the short term. In the series of activities, there is a process that processes project resources into a result of activities in the form of buildings (Ervianto, 2002). A project is a temporary activity that takes place over a limited period of time, with a certain allocation of resources and intended to carry out tasks whose objectives have been clearly outlined (Suharto, 1995). Work accident prevention efforts need to be done as early as possible before it is too late (Ervianto, 2005). As for the things / actions that may be done, among others:

Identify each type of work at risk and group them according to their risks

1. Here is training for construction workers according to their skills
2. Conduct more intensive supervision of the implementation of work
3. Provide work support tools for the duration of the project
4. Implementing arrangements at the construction project site

According to the Regulation of the Minister of PUPR No. 21/PRT/M/2019 on Guidelines for Construction Safety Management System, Construction Occupational Safety and Health hereinafter referred to as K3 Construction is all activities to ensure and protect the safety and health of workers through efforts to prevent occupational accidents and occupational diseases in Construction Work.

Construction safety is all technical activities to support construction work in realizing the fulfillment of safety, safety, health and sustainability standards that ensure the safety of construction engineering, occupational safety and health, public safety and the environment. Construction Safety Plan (RKK) is a complete document of SMKK implementation plan and is a unity with contract documents. RKK is one of the conditions in the election document.

There are several SMK3 standards that apply internationally and nationally. International and national SMK3 standards, including ISO 45001:2018 Occupational Health and Safety replace OHSAS 18001: 2007 on Occupational Health and Safety Assessment Series, Government Regulation No. 50 of 2012 on Implementation of Occupational Safety Management System, Regulation of the Minister of Public Works and Public Housing Number 21/PRT/M/2019 on Construction Safety Management System Guidelines.

3. Research Methods

3.1 Research Methods

Research methods are scientific procedures, steps, or procedures in obtaining data for research purposes that have a specific purpose and usefulness. According to (Sugiyono, 2018) research methods are a scientific way of obtaining data for specific purposes and uses.

3.2 Research Procedure

Research methods used in research are literature studies, comparative analysis and discussion. The research stage in the literature study of this study refers to (Nazir, 1988), as follows:

a. Formulate and define issues related to construction safety plan documents;
b. Search and research literature that has to do with construction safety plan documents;

c. Formulate theoretical frameworks and hypotheses and assumptions used in the research of construction safety plan documents;
d. Create a research design, conduct data analysis from various literature;
e. Make generalizations of conclusions;
f. Prepare a report by way of scientific writing.

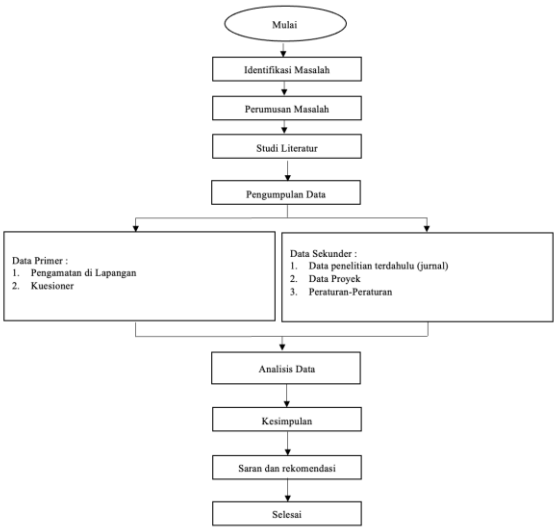

Figure 1. Research Flow Chart

3.3 Materials or Materials

According to (Sugiyono, 2016) Primary data is a data source that directly provides data to data collectors. Primary data sources are obtained through interview activities with research subjects and by observation or direct observation in the field.

Primary data obtained from project data and observations in the lot 8 Jarit-Puger Road Development field is RK3K (Contract Work Safety and Health Plan) or now becomes RKK (Construction Safety Plan). Secondary data is obtained by a researcher indirectly from the object, but through other sources, both oral and written. The data is the Regulation of the Minister of PUPR Number 21/PRT/M/2019 on Construction Safety Management System Guidelines, ISO 45001:2018 *Occupational health and safety management systems* and research journals.

3.4 Tools or Instruments

Instruments are tools or facilities used by research in collecting data so that the work is easier and the results are better, so it is easy to process (Suharsimi. Arikunto, 2006). In this study researchers used observation methods, documentation and interviews.

3.5 Variable Research

A research variable is a unit of attributes or properties or values of people objects or activities that have certain variations set by researchers to be studied and drawn conclusions (Sugiyono, 2007). Variables used by researchers based on The Minister of Public Works and Public Housing Regulation No. 21 of 2019 on Construction Work Safety Management System Guidelines, consisting of Leadership and Work Participation in Construction Safety, Construction Safety Planning, Construction Safety Support, Construction Safety Operations and Construction Safety Performance Evaluation become variables or indicators in comparison and interviews in conducting engineering data collection of researchers.

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Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Table 1. Table Comparison of Construction Safety Plan Documents

No.	Indicators	Rule 1	Rule 2	Rule 3
1.	Leadership and Work Participation in The Construction Ministry			
2.	Construction Safety Plan			
3.	Construction Safety Support			
4.	Construction Safety Operations			
5.	Evaluation of Construction Safety Performance			

3.6 Data Analysis

Qualitative data analysisby describing the data that the author finds during observations and documents of construction safety plans. Methods used in data analysis include:

5. Data Analyst

This analysis is used to find out the profile of respondents, the method used is to assess the respondent's answer to the question to be asked to theresearcher, namely regarding the respondent's personal data. The percentage size of respondents' answers will show the characteristics of respondents using the likert scale with 5 (five) scales, *semantic differences* or rating *scale* calculations using formulas.

$$\sum Skor_{observasi} = (jumlah \times skor\ TP) + (jumlah \times skor\ KP) + (jumlah \times skor\ CP) + (jumlah \times P) + (jumlah \times SP)$$

$$Skor\ yang\ diharapkan = \frac{\sum skor\ observasi}{\sum skor_{\ yang\ diharapkan}} \times 100\%$$

Information:
TP: It doesn't matter.
KP: Less Important
CP: It's pretty important.
Q: Important
SP: Very important

6. Comparative

Comparative methods are the relevances between several data from various sentences, opinions obtained, after which compared between the data to be drawn conclusions. (Surachmad, 1970).

7. Observation

Observation method is a method of collecting data based on the results of observations from researchers on the focus of research conducted either directly or indirectly.

4. Discussion

Based on a questionnaire distributed to 15 respondents in the project environment, obtaining a score of 86.39% was categorized as important, the review of the list of questions based on pupr minister regulation No. 21 of 2019 concerning the Guidelines for Construction Safety Management System.

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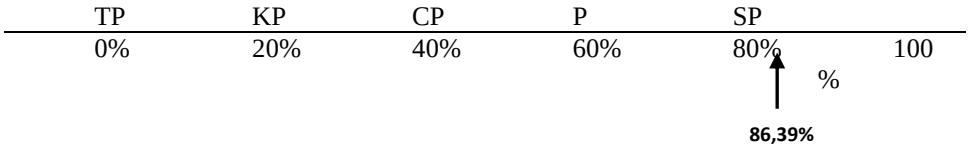
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Table 2. Pcalculates eligibility percentage

Respondents	TP	KP	CP	P	SP	Total	maximum value	Percentage of eligibility (%)
	1	2	3	4	5			
1	0	0	84	192	70	346	450	76,89
2	0	0	0	8	440	448	450	99,56
3	0	0	9	252	120	381	450	84,67
4	0	0	9	300	60	369	450	82,00
5	0	0	27	212	140	379	450	84,22
6	0	0	6	184	210	400	450	88,89
7	0	0	12	36	385	433	450	96,22
8	0	0	3	344	15	362	450	80,44
9	1	2	138	160	10	311	450	69,11
10	0	0	0	88	340	428	450	95,11
11	0	0	3	96	325	424	450	94,22
12	0	0	0	292	85	377	450	83,78
13	0	0	0	348	15	363	450	80,67
14	0	0	0	4	445	449	450	99,78
15	1	2	30	248	80	361	450	80,22
				Average				86,39

Source: Author's Processed Results, 2021

The total observation score of 15 respondents obtained a score of 86.39% expected which is 450 (100%) with a very important category. Based on the criteria in the eligibility table according to (S. Arikunto, 2009), the percentage of the total score is included in the Category of Worthy. The presentation of the scale according to the percentage of the total score according to (S. Arikunto, 2009) in detail can be described as follows:



Information:
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SP: Very important

Construction safety plan documents are one of the requirements in technical offer documents when service providers follow the procurement of construction work. This document covers in terms of cost, socialization, risk identification, hazards, implementation and evaluation of project activities. From the RKK document at the time of the offer by the service provider then resensified, discussed and approved by the relevant PPK in the discussion of the preparation meeting for the implementation of construction work*(preconstruction meeting)*and became part of the contract document. The approved RKK document then becomes an RKK implementation document and the relevant parties are obliged to implement and control the implementation of RKK consistently.

Service providers are obliged to upgrade RKK in accordance with working conditions because RKK documents are integrated with RMPK (Construction Work Quality Plan) documents because construction safety activities follow from observation or identification of the implementation of work.

From the results of research and observations researchers can be interesting that the RKK document can change when it occurs.

1. Changes in new jobs or jobs as well as changes in the scope of work on contracts, including additional/less work;
2. Work accidents that result in loss of work time, death and/or permanent disability.
3. Change of officials in the project environment.

RKK documents can be updated by the service provider at the time of the construction work addendum and poured in the contract addendum. If the construction work contract runs with a single year contract (SYC) it is permissible to keep using the previous regulation until the work expires at the end of the year or the service provider can apply for changes at the time of the work addendum, while for the plural year contract or Multi Years Contract (MYC) if the regulation changes related to construction work then the service provider can make changes during the work addendum or at the turn of the new year.

Service users conduct supervision of RKK implementation and evaluate the performance of SMKK implementation implemented by service providers, in conducting supervision and evaluation of service users can be assisted by K3 Construction experts and/ or construction safety officers.

Lot 8 Jarit-Puger Road Development Project still uses the guidelines of The Minister of Pu Regulation No. 5 of 2014 because procurement and work contracts took place before the emergence of new regulations in 2019,so that in implementation stilluse theold regulations but for construction safety planning documents need to attach K3 officer certificates with conditions namely architectural, civil, mechanical, electrical and/or environmental governance (ASMET) and quality assurance and quality control letters, so that there are adjustments to regulations from service users.

As for the results of research from construction safety planning documents from service providers, there is no format or template for the control of infectious diseases, to take steps to protect workers from the current coronavirus or the spread of infectious diseases, it is necessary to make a risk assessment of Covid-19 and this is expected to help in managing and protecting workers. All you have to do is identify the activities or work situations that could lead to transmission of the virus, who could be at risk, how likely a person or worker could be exposed. Here is an example table to control coronavirustransmission.

Table 3. Identify the dangers of spreading infectious diseases/covid on the project

Any danger	Who might be harmed?	Control/control	Further actions to control risk	Who needs to take action?	When action is needed
*example Coronavirus spreads when it doesn't wash your hands	Worker Contractor Consultant Partners in and out of the project scope Visitors	Provide water, soap, drying in hand washing facilities Provide information on how to wash your hands properly and display posters Find handwashing places Placing a barcode scan for visitors as a preliminary check when there is a visit	Conduct monitoring,and supervision to ensure workers Put up a sign to encourage workers to wash their hands Identify hand washing facilities	Field K3 expert	

5. Conclusion

Based on research on Construction Work Safety Planning Methods in accordance with Project Loan (Case Study of Lot 8 Jarit-Puger Road Construction Project) concluded, among others:

Comparison between ISO 45001:2018 regulation and PUPR Ministerial Regulation No. 21/PRT/M/2019 with construction safety plan document on Lot 8 Jarit-Puger project there is a difference in the numbering clause contained in each of the five elements of SMKK in PUPR Ministerial Regulation No. 21/PRT/M/2019 with ISO 45001:2018 regulations including leadership and workforce participation in Construction Safety; Construction Safety planning; Construction Safety support; Construction Safety operations and evaluation of the performance of the implementation of the Construction Safety Management System as well as in the preparation of no differences in the two regulations.

Pupr Ministerial Regulation No. 21/PRT/M/2019 has advantages in the preparation of construction safety plans using 86 indicators and has a template or example format and has shortcomings in format examples. Deficiencies between pupr ministerial regulation no. 21/PRT/M/2019 and ISO 45001:2018 there is no detailed discussion for infectious diseases (epidemiology) in the construction environment.

Evaluations conducted in the event of a regulatory change to the construction safety plan document during construction work on the Lot 8 Jarit-Puger road construction project can be done with changes to the construction safety plan document at the time of the work addendum or the turn of the budget year to follow the latest regulations.

6. Suggestion

The advice obtained as a development material for future research can be continued by using the latest regulations, namely the Minister of Public Works and Public Housing Regulation No. 21 / PRT / M / 2019 on SMKK and can compare with other regulations. Can be added format / identification list on the dangers of infectious diseases in the construction work environment during the current pandemic.

From the results of this research is expected to provide insights both academics, practitioners and the government in the field of construction safety regarding construction safety planning both from planning there are five elements that need to be considered in the preparation that are in accordance with the construction association can be implemented and controlled through evaluation to prevent the occurrence of construction work accidents.

References

Alexander, H. B. (2020). *Basuki Curhat, Indonesia's Infrastructure Is Still Losing to Vietnam, Thailand and Malaysia Page all - Kompas.com*. https://properti.kompas.com/read/2020/06/27/121611721/basuki-curhatinfrastruktur-indonesia-masih-kalah-dari-vietnam-thailand-dan?page=all

Arikunto, S. (2009). Research Procedures A Practical Approach. Revised Edition 6. Jakarta. *Rineka Cipta. ISO 45001:2018 Occupational Health and Safety Management System Ministry of PUPR, "Permen PUPR No.21", Construction Health Management System Guidelines*, *1*, 1–25.

Arikunto, Suharsimi. (2006). *Prosedur Penelitian, Suatu Pendekatan Praktik* (Rinneka Cipta (ed.)).

Nazir, M. (1988). *ResearchMethods*. Ghalia.

Sugiyono. (2007). *Qualitative Quantitative Research Method and R&D*. Alfabeta.

Sugiyono. (2016). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. PT Alfabe.

Sugiyono. (2018). *Combination Research Methods (Mixed Methods)*. CV Alfabet.

Surachmad, W. (1970). *Basic and Technical Research*. Tarsito.

VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Analysis of Road Flexible Pavement Using The Bina Marga Method on Road Area of Aituto – Ainaro (Km 89 + 000 To Km 112 + 000) Timor Leste

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Abstract

The highway is one of the transportation infrastructure that is being used to support economic activities. However, often on the road there is damage to the pavement which makes the comfort of the rider disturbed. One of them is Jalan Aituto – Ainaro Timor – leste, this road is a connecting road from the district city to the village. The purpose of this study was to determine in planning the thickness of flexible pavement on the 1987 SKBI Component Analysis Method, the 2017 Highways Method and the Dimensions of Edge Channels. The method used is an unstructured observation method and data collection in the form of primary data about the condition of the area on the Aituto - Ainaro Timor - Leste Road and secondary data in the form of LHR data, CBR data, road geometric data and rainfall data. From the results of the analysis of the component analysis method, the surface layer uses Asphalt MS 340 with a thickness of AC-WC 5 cm AC-BC 5 cm, the upper foundation layer uses Aggregate Class A with a thickness of 20 cm, and the sub-base layer uses Aggregate Class B with a thickness of 10 cm. . Meanwhile, from the results of the 2017 Bina Marga analysis, it was obtained that the surface layer used AC - WC with a thickness of 4 cm and AC - BC with a thickness of 6 cm, the upper foundation layer used AC - Base with a thickness of 14 cm and the lower foundation layer used LPA class A with a thickness of 30 cm. . The shape of the edge channel is rectangular with the channel dimensions calculated from the calculation of the channel width 0.8 m, channel height 0.7 m and girder height 0.6 m. and sub-base layer using Aggregate Class B with a thickness of 10 cm. Meanwhile, from the results of the 2017 Bina Marga analysis, it was obtained that the surface layer used AC - WC with a thickness of 4 cm and AC - BC with a thickness of 6 cm, the upper foundation layer used AC - Base with a thickness of 14 cm and the lower foundation layer used LPA class A with a thickness of 30 cm. . The shape of the edge channel is rectangular with the channel dimensions calculated from the calculation of the channel width 0.8 m, channel height 0.7 m and girder height 0.6 m. and sub-base layer using Aggregate Class B with a thickness of 10 cm. Meanwhile, from the results of the 2017 Bina Marga analysis, it was obtained that the surface layer used AC - WC with a thickness of 4 cm and AC - BC with a thickness of 6 cm, the upper foundation layer used AC - Base with a thickness of 14 cm and the lower foundation layer used LPA class A with a thickness of 30 cm. . The shape of the edge channel is rectangular with the channel dimensions calculated from the calculation of the channel width 0.8 m, channel height 0.7 m and girder height 0.6 m.

Keywords
Bina Marga Method 2017, Pavement Thickness Analysis, 1987 SKBI Component Analysis

1. Preliminary

a. Background

Road pavement is one of the main structures that are important for road construction, where the pavement layer serves to withstand and accept the volume of traffic loads and spread it to the layer below it and forward it to the subgrade during the service life. Based on the binding material of the road pavement layer, it is divided into two categories, namely the flexible pavement layer using asphalt and the rigid pavement layer using cement.

A good pavement function certainly requires an effective pavement method so that the design and performance of the road runs optimally. Indonesia has regulations and guidelines in the planning of road pavement structures which are the result of modification and adjustment of methods from several developed countries such as the Road Note (UK)

b. Problem Formulation

Based on the background that has been described, the formulation of the problem to be studied is:

1. What is the thickness of the flexible pavement layer required in the Analysis method.
2. How is the comparison of the flexible pavement thickness for each method: the 1987 Component Analysis Method and the 2017 Road Pavement Manual?
3. What are the dimensions of the curb channel

c. Scope of problem

The problem constraints used in the study are:

1. This study uses secondary data and primary data in the form of LHR data and CBR data
2. The methods used in this research are:
   a. Component Analysis Method 1987
   b. Road Pavement Manual 2017
3. Planning of pavement layer thickness on AITUTO – AINARO Road Area (KM89 + 000 TO KM 112 + 000 TIMOR – LESTE".
4. This plan does not include road shoulder planning, road complementary buildings.
5. Not planning soil improvement methods

1.1 Research Objectives

The aims and objectives of this research are as follows;

1. Knowing the thickness of flexible pavement on the AITUTO - AINARO Road Area with the 1987 Component Analysis Method and the 2017 Road Pavement Manual.
2. Knowing the ratio of flexible pavement thickness of each Bina Marga method: 1987 Component Analysis Method and 2017 Road Pavement Manual.
3. Knowing how many dimensions of curbside channel.

1.2 Research Benefits

This research can provide benefits as a comparative review in planning effective flexible pavement thickness using the Bina Marga method which may be used as reference material and consideration by related parties in formulating road construction techniques on the AITUTO - AINARO road area according to actual conditions.

2. Literature Review

2.1. Previous Research

Based on research from Muhamad Nauval Araka, Gerson Simbolan, Bagus Hario Setiadji, Ahmadi, (2015) entitled "Comparative Analysis of Flexible Pavement Thickness Planning Using the BinaMarga Method (Case Study of Jalan Piringsurat Batas Kedu Timur)". The results of the study using the (Bina Marga, 2002)method obtained a total pavement thickness of 55 cm, in the 2013 bina marga regulations the total pavement thickness was 94 cm. From this research, it can be concluded that the (Bina Marga, 2002)regulation does not have clear written reference parameters, but planning parameters are provided that can give planners the freedom to design the thickness of the pavement.

2.2 Pavement

Road pavement is a mixture of aggregate with binder used in serving the traffic load of vehicles. The aggregate used is crushed stone or split stone while the binding material used is asphalt, cement, or clay.

1. Subgrade
2. Lower Foundation Layer
3. Top Foundation Layer
4. Surface Coating

2.3. Design Parameters of Flexible Pavement Design

In the process of planning the thickness of flexible pavement there are several things that need to be considered and can affect the results of planning the pavement structure, including the following:

1. Road Function

Functional classification of roads in Indonesia based on the laws and regulations of (Anonim, 2009) can be distinguished into:

a. Primary Arterial Path
b. Secondary Arterial Path
c. Primary Local Road

d. Secondary local road
e. Primary Collector Street
f. Secondary Collector Street
g. Primary Neighborhood Road

2. Road Plan Life
3. Traffic Load
4. Bearing Capacity of Subgrade

2.4 Method of Analysis of SKBI1987 Components

The calculation of pavement thickness using the Bina Marga method uses the 1981 revised AASHTO' as the source which has been adjusted to environmental conditions, nature, soil properties, and types of layers used in Indonesia and is an improvement from the guidelines for Highway Flexible Pavement Thickness No.01/PD/B/1983

1. Traffic

Number of Lanes and Vehicle Distribution Coefficient (C)

The number of lanes is determined from the width of the road planning pavement

The vehicle distribution coefficient (C) for light vehicles and heavy vehicles passing on the planned roadway is determined

2. Axis Load Equivalent Figure

Equivalent Number (E) for each axle load group (each vehicle).

3. Traffic Load
   a. Average Daily Traffic (LHR)
   b. Initial Equivalent Cross (LEP)
   c. Final Equivalent Cross (LEA)
   d. Central Equivalent Cross (LET)
   e. Plan Equivalent Cross (LER)
4. What is CBR

CBR or California Bearing Ratio is a comparison between the penetration load of a layer of soil or pavement against standard materials carried out with the same depth and speed of penetration.

5. Determination of Subgrade Bearing Capacity (DDT) and the price of California Ratio (CBR)
   1) Analytical
   2) Graphically
6. Rational Factor

Rational Factor (FR) is the condition of the field which includes the form of alignment (bends and controls), the percentage of heavy vehicles that stop and the weather climate (rainfall).

7. Surface Index (Ip)

This Surface Index expresses the value of the flatness or smoothness and manageability of the surface related to the level of service for passing traffic.

8. Relative Strength Coefficient

The coefficient of relative strength (a) of each material and its use as a surface layer, top foundation, and sub foundation is determined by correlation according to the Marshall test, compressive strength, and CBR values.

9. Pavement Thickness Index

Pavement Thickness Index (ITP) is obtained by drawing a line on the nomogram graph, the selection of the nomogram is determined from the results of each IP0 and IPt values.

10. Pavement component analysis

This pavement planning calculation is based on the relative strength of each long-term pavement layer, where the determination of pavement thickness is stated by the ITP.

2.5 Road Pavement Manual 2017

The 2017 Road Pavement Design Manual is a complement and revision of the 2013 Road Pavement Design Manual and uses Pt T-01-2002-B and Pd T-14-2003 pavements as the source by sharpening the following aspects: determination of design life, discounted lifecycle low cost, practical construction, and efficient use of materials.

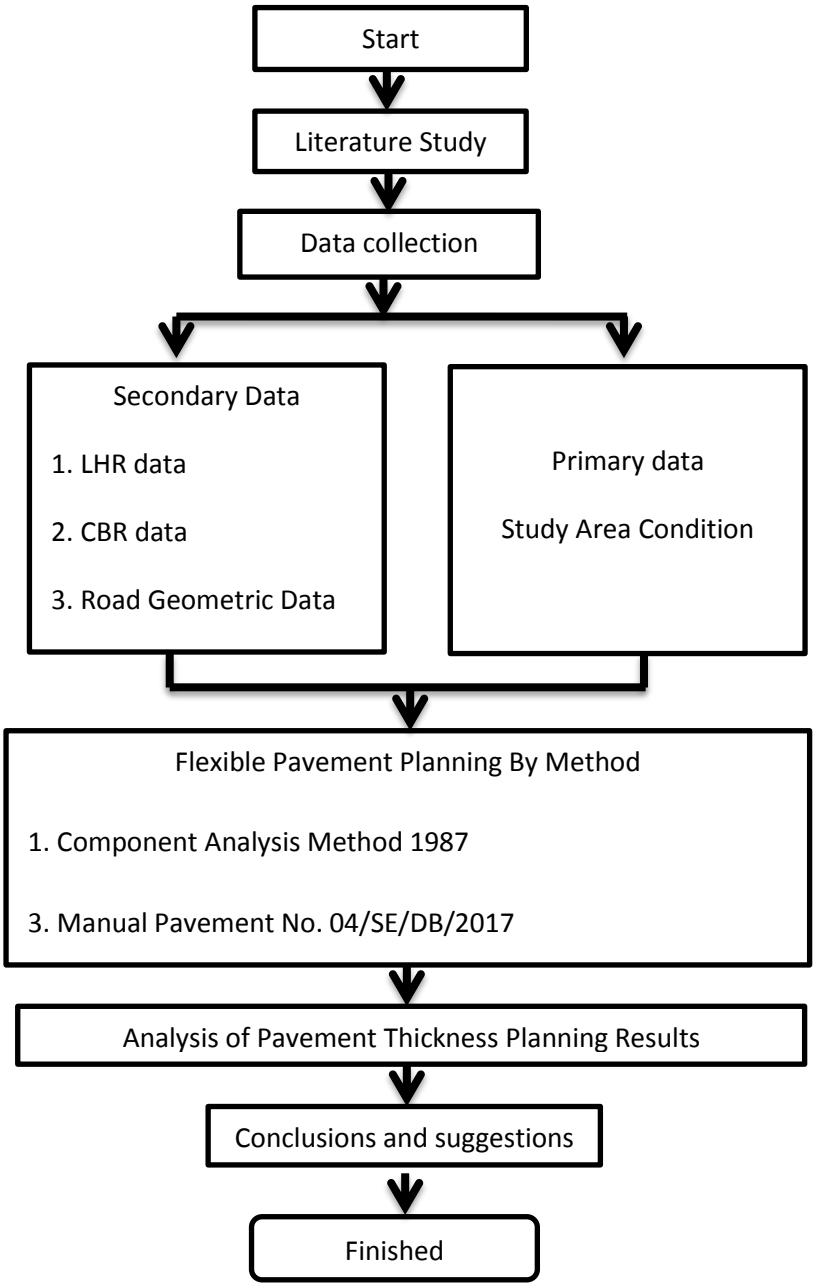
2.6 Channel Dimensions

The effect of water on road pavement due to the penetration of rainwater through cracks, joints, pavement surfaces. Effect of trapped water in the pavement structure

VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

3. Research Methods

3.1 Research Flowchart



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Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

4. Results And Discussion

4.1 Average Daily Traffic Data Aituto,Ainaro Timor – Leste

Table 1. LHR data for Aituto Street, Ainaro Timor – Leste (2015 – 2020)

Transportation type	LHR 2015	LHR 2016	LHR 2017	LHR 2018	LHR 2019	LHR 2020
2 ton car	170	185	201	220	233	246
Big 3 ton bus	28	29	31	32	33	34
Small Truck 2 axle 6 ton	37	39	41	43	45	46
Big Truck 2 Axis 13 tons	40	41	44	45	47	48

Source: PT Chongqing international corporation (CICO)

1. Traffic Growth

In accordance with current data obtained from Ministerio Das Obras Publicas on Aituto Street, Ainaro Timor - Leste

Car

Traffic Growth $= \frac{246-233}{233} x100 = 5{,}57\%$

Bus

Traffic Growth = $\frac{34-33}{33} x100 = 3{,}03\%$

2 Axis Small Truck 6 tons

Traffic Growth = $\frac{46-45}{45} x100 = 2{,}22\%$

2 Axis Big Truck 13 tons

Traffic Growth = $\frac{48-47}{47}$x100 $= 2{,}12\%$

2. Pavement Thickness Arrangement Planning

To design a flexible pavement layer, in general, the minimum thickness of the surface layer is determined based on table 2.10 and the top foundation layer based on table 2.11 with the ITP value, the minimum thickness of each layer is determined as follows:

Surface coating
Type (Asphalt MS 340 kg)
(al): 0.26
Minimum thickness (D1) = 7.5 cm, then D1 = 10 cm
Top foundation layer
Type : Aggregate class A
(a2) : 0.14
Minimum thickness (D2) = 20 cm
Sub foundation layer
Type : Class B Aggregate
(a3) : 0.13
So, the thickness of the sub-base layer is calculated using equation 2.8 as follows:

ITP = a1.D1 + a2.D2 + a3.D3
6.7 = (0.26 x 10) + (0.14 x 20) + (0.13 x D3)
6.7 = 2.6 + 2.8 + 0.13 x D3
6.7-2.6-2.8 = 0.13D3
6.5 = 0.13D3
D3 = $\frac{1{,}3}{0{,}13} = 10\ cm$

VOLUME 4 | NUMBER 1 | JANUARY 2022
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ISSN: 2656-1174 (online)

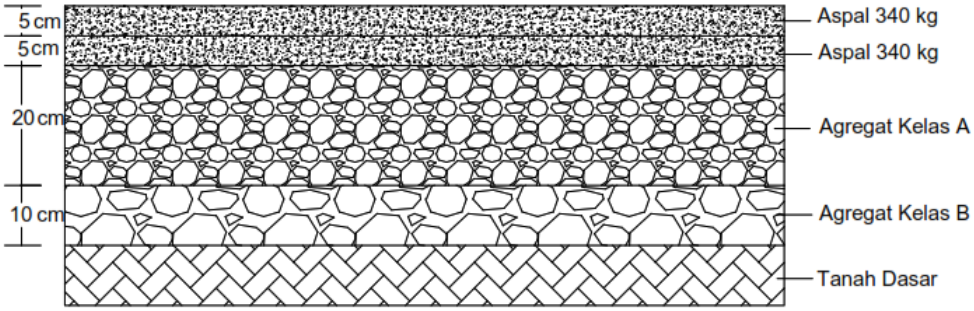

Figure 1. Pavement Thickness Based on the 1987 SKBI

4.2 Manual Pavement Calculation of Road Pavement (REVISION JUNE 2017) No.04/SE/Db/2017

1. Traffic Plan
   a. Planned life
   b. Traffic growth factor (R)
   c. Distribution factor and lane capacity
   d. Cumulative standard axle load (CESA)

Table 2. Cesa Value Calculation

Transportation type	LHR 2019	VDF4	VDF5	VDF4	VDF5
2 Ton Car	246	0.3	0.2	152,643	305,286
Big Bus 3 ton	34	1.0	1.0	210.97	210.97
Small Truck 2 Axis 6 Ton	46	0.8	0.8	228,344	228,344
2 Axis Big Truck 13 Ton	48	1.6	1.7	476.544	844.169
Total	-	-	-	1068	1588,769

2. Selection of Pavement Structure

From the calculation results obtained ESA5 20 years =1588,769 > 10 – 30 million ESA, then from Table 2.32 the pavement type was selected using the 3 flexible pavement design chart. Then the ESA5 value is included in the FFF5 struktur structure

From Table 4.8 for the selection of the type of pavement using design chart 3. Where in the design chart 3 types of pavement use AC – modified WC or modified SMA with CBT (ESA rank).

3. Drainage Coefficient (M)

It is planned that the Aituto, Ainaro Timor - Leste road is equipped with excellent drainage channels, stagnant water disappears within 2 hours, with a water content close to saturation of 1% - 5%, the drainage coefficient value is based on table 2.19 is taken 1.

4. Road foundation design procedure

The result of the subgrade CBR is 17.12% from table 2.21, so the subgrade CBR on the Aituto road, Ainaro Timor - Leste is included in the subgrade strength class SG6, which means that there is no need to increase the subgrade.

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Available online at http://proceedings.worldconference.id.
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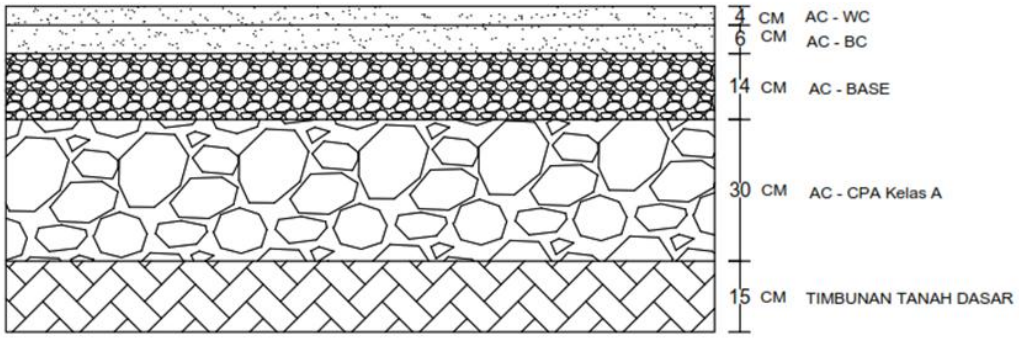

Figure 2. Road Pavement Manual /2017

4.5 Discussion

Based on road pavement planning which refers to the 1987 Component Analysis Method, the flexible pavement design on the surface layer uses MS 744 kg with a thickness of AC – WC 5 cm AC – BC 5 cm, the top foundation layer uses Class A Aggregate with a thickness of 20 cm, the sub foundation layer using Class B Aggregate with a thickness of 15 cm. The planning of the disrupted road pavement in the 2017 Road Pavement Manual Method obtained a flexible pavement arrangement design with a design chart 3b obtained a flexible pavement arrangement design on the surface layer using AC - WC with a thickness of 4 cm and AC - BC with a thickness of 6 cm, the top foundation layer using AC – Base with a thickness of 8 cm, and the sub-base layer using LPA class A with a thickness of 30 cm.

5. Conclusion

Based on the calculation of 2 methods of flexible pavement thickness are as follows:

1. Based on road pavement planning that refers to the 1987 Component Analysis Method, the design of the flexible pavement arrangement in the surface layer uses Asphalt MS 340 kg with a thickness of 7.5 cm, the upper foundation layer uses class A aggregate with a thickness of 20 cm, the sub-base layer uses class C aggregate with a thickness of 20 cm. 10 cm thick.
2. From the two methods, different results were obtained, namely based on road pavement planning which refers to the 2017 Road Pavement Manual Method, the flexible pavement arrangement design with the 3B design chart obtained the flexible pavement arrangement design on the surface layer using AC - WC with a thickness of 4 cm and AC - BC with a thickness of 6 cm, the upper foundation layer using AC - Base with a thickness of 14 cm, and the lower foundation layer using LPA class A with a thickness of 30 cm.
3. Based on the results of the calculation of the dimensions of the drainage channel using a method that is in accordance with the rules used in planning drainage, it is found that the channel width is 0.8 m, the channel height is 0.7 m and the buffer height is 0.6 m with a rectangular channel shape.

References

Ahmadi, A. dan S. (2015). *Psikologi Belajar*. PT Rineka Cipta.

Anonim. (2009). *Undang-Undang No.22 tahun 2009, Tentang Lalu Lintas dan Angkutan Jalan*. Pemerintah Republik Indonesia.

Bina Marga. (2002). *Pedoman Perencanaan Tebal Perkerasan Lentur Pt. T-01- 2002-B*. Departemen Pekerjaan Umum Direktorat Jendral Bina Marga.

VOLUME 4 | NUMBER 1 | JANUARY 2022
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Analysis of Road Widening Reviewed From The Service Level of Kedung Jajang – Ranuyoso, Lumajang

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Abstract

Indonesia is a developing country that has various problems, one of which is congestion. Congestion occurs because of the high population, population mobility and poor road facilities. The congestion that occurs in Lumajang Regency is on the Kedungjajang - Ranuyoso road. Congestion is caused by the high mobility of the population to work, and the high side barriers.
The purpose of this study was to determine the cause of congestion, the amount of road capacity, and the comparison of the level of road service before and after widening the Kedungjajang - Ranuyoso road. Data collection uses measurement data analysis techniques and documentation that was carried out before and after the widening of the Kedungjajang - Ranuyoso road section.
The results showed that the cause of congestion that occurred on Jalan Kedungjajang-Ranuyoso Lumajang was the lack of effective road width, the amount of traffic capacity of the Kedungjajang-Ranuyoso Lumajang road before the widening of the road was 2,291 smp/jam, the amount of traffic capacity of the Kedungjajang-Ranuyoso road Lumajang after road widening is 3069.94 smp/jam, changes in the level of service for the Kedungjajang-Ranuyoso road Lumajang before and after road widening have increased by 2 levels, which originally had a road service level value of "E" to "C" which means the condition the original flow before road widening was unstable current, the speed sometimes stopped, demand was approaching

Keywords
Congestion, Road Capacity, Road Service Level, Road Widening.

1. Introduction

In this modern era, the transportation system has developed for the better, driving comfort and transportation also play an important role because it can make it easier for users. Transportation is very necessary seen from the level of activity of the surrounding community. The development of road transportation in urban areas caused by technological advances, increasing population, and transportation facilities will become a necessity resulting in traffic infrastructure such as parking locations, road areas increase (Andriansyah, 2015). In big cities and developing cities, Indonesia is currently experiencing very rapid development in the field of transportation. So it requires transportation infrastructure, one of which is roads. The road is a means in the form of a circulation space made to facilitate transportation by land (Stone, 1974).

Lumajang City is a world tourist destination that is recognized for its unique natural and cultural beauty, so it has good economic and tourism potential which has led to the rapid development of transportation systems that operate on the road. The level of good and highest road service has provisions of A < 0.6 where at this service level the vehicle can move according to the planned speed of the road without any disturbances and obstacles. Furthermore, this level of service decreases to a service level of F > 1 where traffic is jammed (Irianto, 2014).

The movement of traffic flows through one of the roads in Lumajang City, namely the Kedungjajang-Ranuyoso Lumajang road which is one of the main roads. The Kedungjajang-Ranuyoso Lumajang road section every day has a very high level of traffic density due to residential areas. The purpose of this study is to evaluate the Kedungjajang-Ranuyoso Lumajang road segment from the existing point of view and then predict it in the next 5 years. Furthermore, this study aims to anticipate problems that exist in the flow of the Kedungjajang-Ranuyoso Lumajang road such as congestion. Jalan Kedungjajang-Ranuyoso Lumajang is a road that has a high level of activity because in this area there are educational activities, trade, offices, and also as an alternative route. This causes several traffic problems such as congestion due to the irregularity of vehicles on the Kedungjajang-Ranuyoso Lumajang road so that researchers are interested in taking a case study on the Kedungjajang-Ranuyoso Lumajang road.

The purposes of this study include knowing the causes of congestion that occur on the Kedungjajang-Ranuyoso Lumajang road, knowing the traffic capacity of the Kedungjajang-Ranuyoso Lumajang road before road widening, knowing the traffic capacity of the Kedungjajang-Ranuyoso Lumajang road after road widening,

knowing changes in service levels. the Kedungjajang-Ranuyoso Lumajang road before and after road widening. The method used in this study under MKJI. Some of the basic formulas and theories used are:

C = Co x FCw x FCsp x FCsf x FCcs
Where :
C = Road segment capacity (SMP/Jam)
Co = Basic capacity
FCw = Capacity adjustment factor for traffic lane width
FCsp = Capacity adjustment factor for separator and direction
FCsf = Capacity adjustment factor for side resistance
FCcs = Capacity adjustment factor for city size

DS = Q/C
Where :
DS = Degree of saturation
Q = Traffic flow (smp/jam)
C = Capacity (smp/jam)

2. Methodology

This research was conducted in a residential area which has an impact on the widening of the Kedungjajang-Ranuyoso Lumajang road which is one of the main roads. To find out the impact before and after road widening. The pros and cons of research are very important and depend on the research method described and used. Preparation, data collection, and analysis carried out in scientific research has the aim of obtaining relevant materials or objects and accurate analysis results so that they can be recognized as good and correct.

To obtain the data as desired and needed, the research uses a technique, a procedure, and tools that can make optimal results. Then it can also find out what impact variables can affect road widening to residential areas, as well as on the overall main activities of residents. The problems that have been formulated are attempted to be evaluated and reviewed in this study by focusing on several methods used in solving the problem formulation.

In every research, you need a tool or something that can facilitate the implementation of the research, this research is no exception, where the tools are as follows: Meter, Mobile (to document and record research locations), PC or Laptop (use for inputting data). data to be processed), Motorcycle (to access the research location), Microsoft Excel (used to process numerical data to be processed as primary and secondary data).

Procedures in collecting data in this study include; a) Secondary Data. This secondary data needs to be obtained and known for research because it can help complete the variables and coefficients that will be discussed, in this secondary data can also use descriptive methods, where descriptive methods can explain and explain the results obtained from the problem formulation. The secondary data of this research is in the form of detailed engineering drawings at the location of the Kedungjajang-Ranuyoso Lumajang road case study. b) Primary Data. This primary data is to make direct observations of the object and find out for sure later the case study will be examined and the problem is known, in the development of this Primary Data a method is needed for its implementation, the method that can be used in this Primary Data is the Survey Method where research with sources The main data and information were obtained from respondents as the research sample by using a questionnaire as a data collection instrument. Then in this Primary Data: location survey, respondent survey (in this respondent's data it can and can be ascertained that road widening can be a value of satisfaction for residents). C) Observation. Observation is a study in which the researcher makes direct observations of the object of research. d) Literature study. A literature study is a method of collecting data by reading journals, literature, and references related to previous research and research related to the current research.(Direktorat Jenderal Bina Marga., 1997)

In this research sample, there are 3 elements support and will be discussed, including Environment (Questionnaire / Respondent Survey), Roads (addition of the Kedungjajang - Ranuyoso road), LHR (Average daily traffic).

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3. Result and Discussion

Table 1. Volume Recapitulation Before Road Widening

Time	Monday Total Vehicles (smp/jam)	Tuesday Total Vehicles (smp/jam)	Saturday Total Vehicles (smp/jam)
06.00-07.00	1839	880	1955
07.00-08.00	1402	1569	1492
08.00-09.00	1079	1405	1165
11.00-12.00	894	1062	1049
12.00-13.00	830	1211	991
16.00-17.00	1173	1383	1287

From the recapitulation table, it can be seen that the highest volume of vehicles is on Saturday at 06.00-07.00 which is as many as 1955smp/hour. This highest volume of vehicles will be used to calculate in the next calculation to support the calculation and determination of the level of road service before widening the Kedungjajang-Ranuyoso road segment. Based on the data, it is known that Road Type: 2 lanes are not separated. of 2,900 smp/ja. Based on the data, it is known that the type of road before widening the road is 2 lanes not separated and the effective road width is 7 meters. So, it can also be seen that the lane width adjustment factor (FCw) is 1.00. Based on the data, it is known that the type of road before widening the road is 2 lanes not separated and the effective road width is 7 meters with a split direction setting of 50% - 50%. Then it can also be seen that the traffic direction adjustment factor (FCsp) before road widening is 1.00. Based on the data, it is known that the type of road before widening the road is 2 lanes not separated and the effective shoulder width is 0.9 meters with the condition of the commercial area of market activity besides. Then it can also be seen that the side resistance class code is VH and the magnitude of the curb and shoulder adjustment factor (FCsf) is 0.79. Based on the data, it is known that the size of Lumajang City is about 1.5 million people. Then it can be seen that the city size factor (FCcs) is 1.00. Capacity, Degree of Saturation, before road widening:

C = Co x FCw x FCsp x FCsf x FCcs
C = 2900 smp/jam x 1,00 x 1,00 x 0,79 x 1,00
C = 2.291 smp/jam

DS = Q/C
DS = 1955smp/jam / 2291 smp/jam
DS = 0,853

With the value of the degree of saturation of 0.853, it can be seen that the level of road service can be symbolized by the letter "E". This means that the condition of traffic flow on the Kedungjajang – Ranuyoso road section is unstable, the speed sometimes stops, demand is approaching capacity. Therefore, it is necessary to widen the road so that a higher level of road service is obtained than before.

Tabel 2. Volume Recapitulation After Road Widening

TIME	Sunday Total Vehicle (smp/jam)	Thursday Total Vehicle (smp/jam)	wednesday Total Vehicle (smp/jam)
06.00-07.00	1744	1590	2047
07.00-08.00	1409	1333	1644
08.00-09.00	1032	911	1271
11.00-12.00	1005	911	1085
16.00-17.00	1953	1835	2263

From the recapitulation table, it can be seen that the highest volume of vehicles is on Saturday at 16.00-17.00 which is as many as 2263 smp/hour. This highest vehicle volume will later be used for calculations in the next calculation to support the calculation and determination of the level of road service after the widening of the Kedungjajang-Ranuyoso road segment. Based on the data, it is known that Road Type : 2 lanes are not separated. So, the capacity of the road before widening is 2,900 smp/hour. Based on the data, it is known that the type of road after road widening is 2 lanes not separated and the effective road width is 11 meters. So, it can also be seen that the lane width adjustment factor (FCw) is 1.34. Based on the data, it is known that the type of road after road widening is 2 lanes not separated and the effective road width is 11 meters with a split direction setting of 50% - 50%. Then it can also be seen that the traffic direction adjustment factor (FCsp) after road

widening is 1.00. Based on the data, it is known that the type of road after road widening is 2 lanes not separated and the effective shoulder width is 0.9 meters with the condition of the commercial area of market activity besides. Then it can also be seen that the side resistance class code is VH and the magnitude of the curb and shoulder adjustment factor (FCsf) is 0.79. The capacity and degree of saturation after road widening are

C = Co x FCw x FCsp x FCsf x FCcs
C = 2900 smp/jam x 1,34 x 1,00 x 0,79 x 1,00
C = 3069,94 smp/jam

DS = Q/C
DS = 2263smp/jam / 3069,94 smp/jam
DS = 0,737

With the value of the degree of saturation of 0.737, it can be seen that the level of road service can be symbolized by the letter "C". This means that the condition of the traffic flow on the Kedungjajang – Ranuyoso road is a stable flow, but the speed and movement of vehicles are controlled. Through this, it can also be seen that there has been a change in the level of road service between before road widening and after road widening. The comparison was made on the Kedungjajang-Ranuyoso road, Lumajang to find out the effectiveness of road widening that has been carried out by the local government with various considerations. The comparison is made according to the highest volume obtained before and after road widening, namely Saturday, June 20, 2020 at 06.00-07.00, which is as many as 1955smp/jam and Saturday, May 29, 2021 at 16.00-17.00, which is 2263smp/hour.

Tabel 3. Comparative Recapitulation of Road Service Levels

Date	Time	Volume	Detail	Service Level	Conditions
Saturday, 20 June 2020	06.00-07.00	1955smp/jam	Before Road Widening	E	Unstable flow speed sometimes stops, Demand is approaching capacity
Saturday, 29 May 2021	16.00-17.00	2263smp/jam	After Road Widening	C	Steady flow, but vehicle speed and motion capacity

Changes that occur before and after road widening are an increase in the level of road service by 2 levels. This proves that the road widening that occurs has a positive impact on the effectiveness of road widening and improving traffic flow conditions. Although the traffic condition of the Kedungjajang – Ranuyoso Lumajang road after road widening has a stable flow, the speed and movement of vehicles are controlled. This can be improved again by taking into account the various kinds of congestion solutions that exist, including one of them is transportation management which has been discussed by the author in sub-chapter 2.16. Apart from transportation management, there are also other solutions to reduce congestion, namely the installation of traffic signs. The types of traffic signs that need to be installed on the Jalan Kedungjajang-Ranuyono Lumajang section need to be adjusted to the conditions in the field. Conditions in the field illustrate the number of side obstacles caused by the number of vehicles that stop and park along the road. Therefore, the types of traffic signs that need to be installed on the Jalan Kedungjajang – Ranuyoso Lumajang section as a form of one solution to unravel congestion are as follows: No parking signs, stop signs, warning signs for a lot of pedestrian traffic. Thus, it is hoped that congestion problems will be reduced and will not arise again in the future so that road users can take advantage of effective road facilities. (Prasetyo, 2019).

4. Conclussion

Based on research that has been carried out with a series of processes in it, the following conclusions have been obtained: The cause of congestion that occurs on Jalan Kedungjajang-Ranuyoso Lumajang is the lack of effective road width. This is evident after the road widening, the level of road service changed for the better 2 levels above, The amount of traffic capacity of the Kedungjajang-Ranuyoso Lumajang road before the widening of the road was 2,291 smp/jam which was taken from the highest volume on Saturday, June 20 2020 at 06.00-07.00, The amount of traffic capacity for the Kedungjajang-Ranuyoso Lumajang road after the widening of the road is 3069.94 smp/jam which is taken from the highest volume on Saturday, May 29, 2021 at 16.00-17.00, Changes in the level of service for the Kedungjajang-road Ranuyoso Lumajang before and after road widening experienced an increase of 2 levels, which originally had a road service level value of "E" to "C" which means the original current condition before road widening was unstable flow, speed sometimes stopped, demand was approaching current capacity after road widening the flow becomes stable, but the speed and motion of the vehicle control.

Based on the research that has been carried out with a series of processes in it, some suggestions are as follows: Conduct periodic research and surveys related to road widening to increase rider satisfaction and reduce congestion that causes various kinds of losses. road widening, conducting further research and surveys on road widening with other factors besides the level of road service and also with different methods for example by questionnaires to road users, and so on.

References

Andriansyah. (2015). *Manajemen Transportasi dalam Kajian dan Teori*. Fakultas Ilmu Sosial dan Ilmu Politik Universitas Prof. Dr. Moestopo Beragama.

Direktorat Jenderal Bina Marga. (1997). *Manual Kapasitas Jalan Indonesia*.

Irianto, K. (2014). *Gizi Seimbang dalam Kesehatan Reproduksi (Balanced Nutrition in Reproductive Health)*. Alfabeta.

Prasetyo, H. E. & T. (2019). *nalisis Tingkat Pelayanan Jalan (Studi Kasus Jalan Ciledug Raya, Depan Universitas Budhi Luhur Jakarta Selatan)*. eminar Nasional Sains dan Teknologi 2019 Fakultas Teknik Universitas Muhammadiyah.

Stone. (1974). Pengertian Infrastruktur menurut American Public Works Association. *Jurnal Infrastruktur Kodoatie*.