

# Analysis of Road Infrastructure Condition Based on Traffic Density in Bengkulu City

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## Abstract

The purpose of this research is to explain the analysis of road infrastructure conditions, in terms of traffic density and road quality in Bengkulu City. The research method uses descriptive with qualitative approach, Research Subjects, are people and government institutions, key informants are all people or officials related to road infrastructure policy makers, traffic density and road quality, such as traffic police, transportation department, PUPR department, BPS Bengkulu City. Informants are people or government institutions/institutions that are the object of research, the number is determined based on the criteria of this research. in the form of structured questions for interviews to Informants, Key informants and Triangulation of data. Data Collection Techniques present the sampling methods and data collection techniques used, such as field surveys, direct observation, or the use of secondary data. The results of the analysis using Neil S. Grigg's Infrastructure Management theory state that the condition of Road Infrastructure in Bengkulu City is good based on the criteria of the transport system (roads and bridges), clean water and sanitation systems and energy and other public facilities.

**Keywords:** Road Infrastructure, Traffic Density, Road Quality.

## 1. Introduction

Good road infrastructure must have several key elements, including surface quality such as road conditions must have a smooth surface and be free of potholes to reduce the risk of accidents and vehicle damage (Ivanova & Masarova, 2013). Besides, the road infrastructure must also be supported by wide roads and have a large capacity (Rose, 2008), where the road must be wide enough to accommodate the existing traffic volume, including space for pedestrians and bicycles. In addition, road infrastructure must also have a good drainage system to prevent waterlogging, which can cause damage to the road and increase the risk of potential accidents.

Bengkulu City is the capital city of Bengkulu Province, which has a fairly busy traffic space (Afryan & Roychansyah, 2019). As Bengkulu City is the center of the economy and government, as in many other cities in Sumatra and even more widely in Indonesia, road infrastructure needs face complex challenges. This is due to population growth, economic development, and urban dynamics that continue to improve and change both from road users, the types of vehicles that use the road, this situation is a serious concern to realise and provide safety and comfort in driving for road users in general.

As a fact, the traffic density and road quality in Bengkulu City are poor (Mase et al., 2023), so that the roads in Bengkulu City are categorised as having inadequate infrastructure. Bengkulu City should be categorised as having good road infrastructure because the



population is not so dense (Wulandari, 2024), the number of vehicles operating is not too large and the mobility of road users is not so dense, but it turns out that Bengkulu City has a high level of traffic accidents, road facilities are also not fulfilled.

The low awareness of traffic obedience for road users is due to the secular attitude of the community, where people tend to think that breaking traffic rules is not a sin, even though the violations committed can cause harm to themselves and others (Nurdin, 2023). Public awareness needs to be intensively improved in various ways and approaches through institutions or community groups, so as to reduce the number of road accidents in Bengkulu City (Ricardianto et al., 2021).

This condition greatly affects the driving patterns or cycles of the drivers, where in this situation vehicles sometimes make behaviours that are not in accordance with the road conditions, for example, light vehicles and motorcycles make zigzag maneuvers creeping slowly towards the front of the queue when the light is red, blocking the flow of traffic by disturbing other vehicles behind overtaking out of place. In the end, there is irregularity in traffic both from the condition of accelerating the speed of the vehicle which causes road traffic to become jammed (Milanes et al., 2012).

The problem of side obstacles also often occurs and is found on several roads in Bengkulu City, especially around the area of shops, commerce, markets close to the terminal of city transport vehicles, this is often the behaviour of drivers of cargo vehicles who have low awareness by not paying attention to the surrounding location, by for example unloading or loading large quantities of goods in the road area. This is a trigger for congestion coupled with narrow roads.

Traffic density is a key indicator for evaluating road capacity and the effectiveness of the transport system in tackling congestion. Meanwhile, optimal road quality plays an important role in ensuring the safety of road users and reducing long-term maintenance costs.

The purpose of this study is to provide a comprehensive picture of the condition of road infrastructure in Bengkulu City. Through this approach, it is expected to identify the main problems faced, potential solutions that can be applied, and relevant policy recommendations to improve the condition of sustainable and competitive road infrastructure.

## 2. Method

### 2.1. Type of Research

In this research methodology, there are 2 types of research carried out, namely:

#### 1. Literature Study

In this study, references were collected on matters related to the process and implementation of good road infrastructure from various sources including: literature, papers, regulations, both national and international books and journals. This study aims to determine the theoretical basis that supports the research. In addition, the literature study was made as the basis for making a list of interview questions.

#### 2. Field Study

This informal field observation is in the form of data on road infrastructure, namely direct interviews with officers, heads of departments, road users and experts in the field of road infrastructure.

### 2.2. Data Collection Procedure

The data collection method uses primary data and secondary data. Primary data is a data source obtained directly from the original source or first party. Which is done by means of

documentation and field surveys. Field surveys were conducted to find out how heavy the traffic is in Bengkulu City and to find out the condition of road quality in Bengkulu City. This activity also aims to conduct non-formal interviews to find out the problems and factors that can cause traffic congestion and decline in road quality in Bengkulu City.

Secondary data obtained directly from the field in the form of, among others:

1. Traffic density data, details of the density of motorised traffic flow in Bengkulu city, obtained from DLLAJR, BPS, and Department of Transportation,
2. Road Quality Data, is detailed data on road conditions in Bengkulu City consisting of, Smooth road surface, Quality road materials, Proper road design, Well-functioning drainage, Adequate road lighting, Pedestrian facilities, and Accessibility of routine road maintenance.

### 2.3. Research Methods

The method used in this research is descriptive method with qualitative approach. Research Subjects, are people and government agencies/institutions that are the target of research. Informants are people in charge of the Public Works Agency, DLLAJR, BPS, and Transportation Agency, the number of which is determined and developed based on the needs of this research. Key informants are the heads of government agencies/institutions that are the object of research, the number of which is determined based on the criteria of this research. Triangulation was conducted to evaluate the answers from the informants and key informants, to infrastructure lecturers, or traffic observers, or road infrastructure experts.

## 3. Results and Discussion

### 3.1. Research Results

#### 3.1.1. Traffic Density in Bengkulu City

Based on data and observations made by researchers in Bengkulu City, it is known that the level of traffic density is categorised as Medium (26 Vehicles/Km), this is in accordance with the number of vehicles and the length of roads in Bengkulu City. Quoting the theory of Morlok (1991) Traffic density can be defined as the number of vehicles occupying a certain length of road or lane which is generally expressed as the number of vehicles per kilometre per lane (if the road consists of many lanes) density is the number of vehicles observed divided by the length of the road.

The results of researchers' observations of the highest peak hour traffic volume calculations on three road sections in Bengkulu City can be seen in the table below 1 below.

**Table 1. Peak Hour Traffic Volume Data**

No	Nama / Ruas Jalan	Arah Jalan	Hari/Tanggal	Interval Waktu (Pukul/Jam)	Jenis Kendaraan			Jumlah (Kendaraan/Jam)
					MP	KS	SM	
1	2	3	4	5	6=(x1)	7=(x1,2)	8=(x0,25)	9
A	Jalan Natadirja (Jalan Nasional)	Jalan Adam Malik - Jalan Sutoyo	Senin, 18 November 2024	07.00 - 08.00	552	110	912	912
		Jalan Adam Malik - Jalan Sutoyo	Rabu, 20 November 2024	07.15 - 08.15	575	147	923	982
		Jalan Adam Malik - Jalan Sutoyo	Jum'at, 22 November 2024	06.45 - 07.45	459	162	657	798
		Jalan Sutoyo-Jalan Adam Malik	Selasa, 19 November 2024	17.00 - 18.00	551	101	929	904
		Jalan Sutoyo-Jalan Adam Malik	Kamis, 21 November 2024	16.45 - 17.45	511	115	810	852
		Jalan Sutoyo-Jalan Adam Malik	Jum'at, 22 November 2024	16.00 - 17.00	404	113	687	711
<b>Jumlah rata-rata kendaraan di jalan Nasional / Jam</b>								<b>860</b>
B	Jalan Hibrida (Jalan Provinsi)	Jalan Sumur Dewa - Jalan Salak	Selasa, 19 November 2024	07.00 - 08.00	388	102	612	663
		Jalan Sumur Dewa - Jalan Salak	Kamis, 21 November 2024	07.15 - 08.15	419	99	523	669
		Jalan Sumur Dewa - Jalan Salak	Sabtu, 23 November 2024	06.45 - 07.45	361	109	454	605
		Jalan Salak - Jalan Sumur Dewa	Senin, 18 November 2024	17.00 - 18.00	401	99	569	662
		Jalan Salak - Jalan Sumur Dewa	Rabu, 20 November 2024	16.45 - 17.45	349	101	510	598
		Jalan Salak - Jalan Sumur Dewa	Sabtu, 23 November 2024	16.00 - 17.00	304	109	487	557
<b>Jumlah rata-rata kendaraan di jalan Provinsi / Jam</b>								<b>626</b>
C	Jalan Flamboyen (Jalan Kota/Kab)	Jalan Rafflesia - Jalan S. Parman	Senin, 18 November 2024	07.00 - 08.00	252	62	212	276
		Jalan Rafflesia - Jalan S. Parman	Rabu, 20 November 2024	07.15 - 08.15	275	56	223	398
		Jalan Rafflesia - Jalan S. Parman	Jum'at, 22 November 2024	06.45 - 07.45	239	83	257	403
		Jalan S. Parman - Jalan Rafflesia	Selasa, 19 November 2024	17.00 - 18.00	251	76	279	412
		Jalan S. Parman - Jalan Rafflesia	Kamis, 21 November 2024	16.45 - 17.45	211	54	210	328
		Jalan S. Parman - Jalan Rafflesia	Jum'at, 22 November 2024	16.00 - 17.00	254	82	287	424
<b>Jumlah rata-rata kendaraan di jalan Kota / Jam</b>								<b>391</b>
<b>Keterangan :</b>					Jumlah rata-rata kendaraan di jalan			1.303
Menurut Pedoman Kapasitas Jalan Indonesia (PKJI 2024) untuk nilai ekuivalensi yaitu :					Kecepatan rata-rata kendaraan / jam di dalam kota			50
1 Mobil Penumpang (MP) : 1					Jumlah kendaraan per jam adalah.....			<b>26,000</b>
2 Kendaraan Sedang (KS) : 1,2								
3 Sepeda Motor (SM) : 0,25								

Source: Researcher processed data, 2024

From the observations made at the research location, geometric data was obtained on road sections in Bengkulu City, there are 3 (three) road sections studied, namely Natadirja Street, Hibrida Street and Flamboyan Street, according to road status, namely National roads, Provincial roads and City / Regency roads, as shown in Table 2 below.

**Table 2. Road Geometric Data**

No	Description	Road Name / Section		
		Natadija	Hibrada	Flamboyan
1	Road Status	National	Provincial	City
2	Road Function	Primary Artery	Collector	Local
3	Road Length	2.200 m	4.200 m	1.100 m
4	Road Width	8 m	6 m	4 m
5	Median Width	1,5 m	1,2 m	1,1 m
6	Sidewalk Width	2,5 m	2,2 m	1,1 m

Source: Researcher processed data, 2024

The following data on the number of vehicles in Bengkulu City based on sources from the Bengkulu City Statistics Agency (BPS) is 429,507 units of vehicles, consisting of various types of vehicles, namely, passenger cars, buses, trucks, motorbikes and others.

**Table 3. Number of Vehicles in Bengkulu City in 2021 - 2024**

District/City	Year	Passenger Car	Bus	Truck	Motorcycle	Total Vehicle
Bengkulu	2021	51.293	914	22.112	285.499	359.818
	2022	51.680	909	21.980	293.191	367.760
	2023	53.098	897	22.114	303.736	379.845
	Oct 2024	54.550	967	23.450	350.540	429.507

Source: BPS data 2023; and project consultant data 2024

### 3.1.2. Traffic Speed

Based on information from interviews with officials from the Bengkulu City Transportation Department, the maximum speed limit for driving in urban areas is 50 kilometres per hour. The following are the rules for driving speed limits on various types of roads:

1. Free flow: 60 kilometers per hour at the lowest
2. Freeway: 100 kilometers per hour at most
3. Intercity roads: 80 kilometers per hour at most
4. Inner city roads: 50 kilometers per hour at most
5. Residential areas: maximum 30 kilometers per hour

Referring to this decision, the speed in Bengkulu City is 50 Km/hour, while the number of vehicles in traffic in Bengkulu City is recorded at an average of 1,303 vehicles/hour. If calculated based on Morlok's (1991) theory, the density is known to be 26.060 vehicles/Km or rounded up to Traffic density in Bengkulu City is 26 (twenty-six) vehicles/Km.

The criterion of traffic density per kilometre is often used to classify traffic conditions. These classifications are usually based on traffic studies and linked to level of service (LOS).

If according to the criteria of traffic density per kilometre, then the traffic density in Bengkulu City is categorised as medium density, because the traffic density is 26.060 rounded up to 26 (twenty-six) vehicles/Km.

In accordance with the results of interviews with Bengkulu City Police officers, said that the level of congestion in Bengkulu City is relatively small, this is because the number of vehicles is still relatively moderate, road sections or areas of traffic density usually occur in the morning and evening. This was stated by police officer Sanputri Riska, interview 19 November 2024 at 08.45;

*'...traffic crowds usually occur in the morning between 07.00 - 08.30 WIB The next density occurs in the afternoon at 17.00 - 18.30 when employees, workers and schoolchildren return from their activities.'*

Traffic police officers together with officers from the Bengkulu City Transportation Office always work together to regulate vehicle traffic and other road users in several locations that are prone to vehicle congestion at the times mentioned above, especially at intersections and campus areas, schools, offices both government and private.

### 3.1.3. Relationship with LOS (Level of Service)

Road traffic density criteria have a rating that is used to analyse traffic, namely LOS (Level of Service). Level of Service values vary from A to F. If the road traffic density is rated 'A' then it is the best category, while if the traffic density is rated 'F' then it is the worst category. If the road traffic density is rated 'A' then it is the best category, while if the traffic density value is 'F' then it is the worst category. Level of Service values consist of:

1. LOS (Level of Service) A: Very rare vehicles, smooth conditions (0-10 vehicles/km).
2. LOS (Level of Service) B-D: Density increases, flow is still stable (10-60 vehicles/km).
3. LOS (Level of Service) E: High density, almost reaching maximum capacity (60-80 vehicles/km).
4. LOS (Level of Service) F: Severe congestion, flow interrupted ( $\geq 80$  vehicles/km).

These criteria vary depending on the type of road (motorway, urban road, or rural road) and the specific study area. Based on the LOS (Level of Service) criteria, the traffic density in Bengkulu City is 26 (twenty-six) Vehicles/Km, then the category is rated 'B' (density increases, flow is still stable) because the Level of Service B-D category Density increases, flow is still stable (10-60 vehicles / km).

From this data, if using the traffic density formula, transport analysis can be used to measure road sections used by vehicles. In general, traffic density is calculated as the number of vehicles per unit length of road.

The data shows that the traffic flow (Q) is 1,303 vehicles per hour obtained from the data Traffic density (K) 26,060 Vehicles/Km multiplied by the average vehicle speed (V) 50 Kilometres per hour.

Notes:

- a. Under low density conditions, vehicles tend to move at high speeds.
- b. At high density (congestion), vehicle speeds decrease dramatically, and traffic flow decreases even though the number of vehicles increases.

The model is often used in transport planning to evaluate road performance and find solutions to congestion problems.

### 3.1.4. Road Quality in Bengkulu City

The theory of road quality using PEQI (Pedestrian Environmental Quality Index) Criteria according to Jan Gehl (1971) relates to the ability of the road to serve road users, the criteria are :

- a. Safety: The amount of friction between the vehicle tyres and the road surface, which is influenced by tyre shape, road structure and weather. Vehicle Safety: Tyre friction and factors affecting it. The friction between vehicle tyres and the road surface is an important element for safe driving. Factors that affect the amount of friction include:
  - 1) Tyre shape and design
    - a) Tread pattern: Tyre tread is designed to improve traction or the tyre's ability to grip the road surface. Tyres with deep and wide patterns tend to be better on wet or muddy roads, while tyres with smoother patterns are suitable for dry and tarmac roads.
    - b) Tyre type: Winter tyres have a rubber composition and tread pattern designed to provide better road traction/grip on snowy or slippery roads.
  - 2) Road structure
    - a) Road surface: Rough road surfaces (such as asphalt with gravel) increase friction, while smooth surfaces (such as polished concrete roads) have lower friction.
    - b) Road condition: Potholes, cracks or puddles affect the friction between the tyres and the road.
  - 3) Weather Factors
    - a) Rain: Standing water can cause aquaplaning, where tyres lose contact with the road surface.
    - b) Snow or ice: The road becomes very slippery, requiring special tyres or tyre chains to increase friction.
    - c) Extreme heat: Can reduce tyre grip due to changes in tyre material properties.
- b. Pavement Structure: The physical condition of the road, such as cracking, rutting and corrugation.

The calculation of pavement structure is known by calculating the physical condition of the road such as cracking, rutting, and corrugation, although the calculation of pavement structure does not have a single formula because each damage is influenced by various factors such as pavement structure design, materials, traffic, and environment. The following is the calculation of the pavement structure of each defect:

#### 1) Cracking

Cracking on roads is often calculated in terms of the area affected by cracking or the percentage of crack length compared to the total road area. Cracking data on Lake Road from the direction of Simpang Empat Padang Harapan to Simpang Empat Danau Singaran Pati Subdistrict, road length 810 metres, road sheet 6.00 metres there is a level of cracking damage as much as 190 metres long and 4 metres wide.

The calculation is :

$$CR = \frac{(190 \times 4) = 760M2}{(810 \times 6) = 4.860M2} \times 100 \% = 0,156\%$$

Thus, the level of road cracking on Danau Street is 0.156% The occurrence of road cracks is found on 15 (fifteen) other similar roads in Bengkulu City, so it can be calculated that road cracks exist as much as 15 roads x 1.156% = 2.340%, following the data on the length of the road where the cracks are calculated.

**Table 4. Length of Roads by City, Province and National Government of Bengkulu City in 2023**

No.	Name of sub-district	Road Length			Total Road Length (KM)
		City (KM)	Province (KM)	National(KM)	
1	Teluk Segara sub-district	41,48	1,80	2,40	45,48
2	Sungai Serut sub-district	1.866,17	3,20	3,80	1.873,17
3	M. Bangkahulu sub-district	122,43	7,85	13,45	144,43
4	Gading Cempaka Sub-district	114,12	3,10	3,10	121.12
5	Ratu Agung sub-district	99,88	2,40	2,80	103,88
6	Ratu Samban Sub-district	57,25	3,30	4,55	62,25
7	Singaran Pati sub-district	120,31	4,10	2,85	127,31
8	Selebar sub-district	128,63	5,10	3,85	138,63
9	Kamp. Malay sub-district	86,13	8,15	11,20	107,13
	TOTAL LENGTH	2.636,40	39,00	48,00	2.723,40

Source: bps data 2023; and project consultant data 2024

From the results of research and observation of road cracks in Bengkulu City, seen in the picture below;



**Figure 1. Cracked Road Condition in Bengkulu City**

Source: Researcher’s Data Document, 2024

That maximum road quality can create ideal driver comfort is achieved through a combination of appropriate physical road design, good traffic management, and regular maintenance. Infrastructure that takes these elements into account not only enhances comfort but also supports transport safety and efficiency, as stated by a resource person

*“the condition of roads in Bengkulu City is in good condition with hot mix asphalt, sidewalks are partially good, but need maintenance, especially cleaning garbage and sand that enters the closed channel under the sidewalk”*

Similarly, Mr Arif, a private sector employee, said that

*“Traffic lights need to be installed at all intersections, especially in the Bentiring area. It was also conveyed that there is a need for a pedestrian bridge (JPO) around Cendana Sawah Lebar road because of the location of school complexes such as SMKN1, SMKN2,*

*SMPN 2, SMAN5 and SMAN2 as well as offices namely the Sports Office, Marine Office, Education Office and Raflesia Hospital,”*

Another resource person was a student of SMAN 5 Kota Bengkulu who expressed the hope and desire for the improvement of pedestrian sidewalks equipped with road barriers so that motorbikes and other vehicles do not use or park on the sidewalks, as well as expecting the creation of a larger and more comfortable bus stop where waiting for public transportation, as shown.

### **3.1.5. Road Infrastructure Condition in Bengkulu City**

The current condition of road infrastructure in Bengkulu City continues to improve to support public convenience. The Bengkulu City Government has always endeavoured to improve services by rehabilitating and upgrading roads through a priority policy on 22 (twenty-two) road sections, including Hibrida Raya Street, Kalimantan Street, and Sungai Rupert Street. These improvements include repaving and drainage improvements to prevent flooding and further road damage.

In addition, improvement efforts in the region have also received support from the central government through the Presidential Instruction (Inpres) programme on accelerating road development in various provinces, including Bengkulu City. Local governments are directed to prioritise budget allocations to complete infrastructure projects that are important to the people of Bengkulu City.

The condition of drains in Bengkulu City is currently facing various challenges. The Bengkulu City Government has allocated a budget of around Rp 1 billion in 2024 for drainage improvements to reduce the risk of waterlogging and improve existing infrastructure. These improvements include work on main drains that often experience blockages due to rubbish and sedimentation.

For example, an evaluation in the residential area of Puri Lestari 2 showed that most of the drainage channels there require better management. While the channel capacity is still within safe limits, improvements in design, regular maintenance and environmentally friendly strategies are needed to ensure sustainability. Drainage channels in this area have a variety of types, such as upright and sloping walls, but inundation problems remain frequent due to high rainfall and sub-optimal waste management.



**Figure 2. Drainage channel in Bumi Ayu village, Bengkulu City**  
Source of Researcher Data Document, 2024

The Bengkulu City Public Works and Spatial Planning (PUPR) Office through the Water Resources (SDA) Division has revitalised drainage (making new siring) in Graha Asri Housing in Pekan Sabtu, Selebar District, Bengkulu City, according to information from the Bengkulu City PUPR newsletter, that the Head of the SDA Division (Kabid) Yosef Fery Yorizal said the

making of new drainage was carried out to prevent or control water when it rains so that it does not overflow excessively so that flooding does not occur.

The construction of the Siring or drainage was carried out according to the needs of the residents, in order to prevent the occurrence of standing water (flooding) in the housing area. The drainage that has been completed has a length of about 50 metres, hoping that the drainage that has been built can be useful and maintained by local residents. This year, the PUPR Office is aggressively normalising waterways, drainage and tributaries. This programme is carried out according to the direction of the Bengkulu City Government and according to the flood management plan.

a. Transportation

Bengkulu City has a number of road and transport infrastructure facilities that continue to be developed to support mobility and connectivity between regions. Here are some of the main facilities:

1) Road Infrastructure:

The Bengkulu City Government has allocated a significant budget for road improvements within the city, including neighbourhood roads in residential areas. In 2024, priority will be given to routine maintenance and reconstruction to maintain road quality. This year, Bengkulu City PUPR has successfully completed projects to upgrade and repair Kampung Bugis road and TPA (garbage) road in Air Sebakul using hotmix asphalt. This development was carried out with the aim of improving the quality and capacity of roads to support the smooth flow of traffic and increase the happiness of Bengkulu City residents.

The paving project activities aim to improve road infrastructure to ensure smooth traffic and comfort for passing residents. Therefore, the government of Bengkulu City is making improvements despite facing several challenges. The paving project is part of the Bengkulu City government's programme carried out by the PUPR Office. The implementation of road construction and improvement in Bengkulu City is carried out in several stages from planning, to implementation tailored to the needs and interests of the community so that it can be a means of supporting mobility to support the economy and welfare.

In addition, the PUPR Agency is planning several other road improvement projects that are expected to support economic growth and mobility of Bengkulu City residents. Dinas PUPR demonstrates its commitment to improving the quality of life of the community through infrastructure improvements. The long-term benefits of these projects will have a significant positive impact on the lives of the citizens of Bengkulu City and its surroundings.

Based on an interview with the head of the Road and Bridge Section of the Bengkulu City PUPR, it is also conveyed that several other public facilities will be built to support the roads in Bengkulu city and the road in Betungan as an access channel for the Bengkulu - Taba Penanjung toll road.





**Figure 3. Road Improvement in Bengkulu City**

The Bengkulu - Taba Penanjung Toll Road is part of the Bengkulu-Lubuk Linggau Toll Road that connects Bengkulu City with Central Bengkulu Regency. This toll road is the first phase of the Trans Sumatra national project. The construction starts from Air Sebakul-Bentungan highway, Betungan sub-district, Selebarn sub-district, Bengkulu City to Sukarami village, Central Bengkulu Regency with a length of 17.6 kilometres. This toll road is one of the national projects that will connect access to all of Sumatra and Java or often referred to as the Trans Sumatra Toll Road as a National Strategic Project.



**Figure 4. Bengkulu TOL Transport Facility**

Source <https://bengkulu.wahananews.co>

## 2) Traffic Light

The Bengkulu City Transportation Department together with the Bengkulu Police Traffic Unit have conducted amdal (Traffic Impact Analysis) studies at several road intersections in Bengkulu City, in this case the realisation of the installation of traffic lights at several intersections including at the Kebun Tebeng Village Intersection, precisely at the Tebeng Church intersection and in Timur Indah Village, namely at the intersection of three Al Barokah Timur Indah mosques.

The efforts made by the Bengkulu City Transportation Department in fulfilling road infrastructure facilities are always subject to continuous evaluation, monitoring and planning, this was conveyed by Mr. Tinton Yusuf as the head of the traffic section, he said that there was still a lack of several facilities such as street lights, traffic lights due to limited funding from the Bengkulu City Government, the same thing was also conveyed by Ms. Ria as the Head of the General Head of the Bengkulu City Transportation Department, that facilities such as

Pedestrian Bridges (JPO) bus stops and lighting at night at every bus stop and community activity centre need to be reproduced. She also said that Bengkulu City still needs School Buses or Free Student Buses to support the mobility of students and university students in Bengkulu City.

The installation of traffic lights in Bengkulu City is being carried out to overcome congestion and improve the increasingly complex traffic arrangements. In Bengkulu City there are still several road intersections that have not been equipped with traffic lights, through the plan of the Bengkulu City Transportation Office in the future will be implemented the installation of traffic lights and Zebra crossings (crossing people / pedestrians) at all road intersections.

### 3) Pedestrian Sidewalks, Closed and Open Drainage/Sewers

Sidewalks, or culverts hidden underground, so as to maintain closed channels, and open channels are an important part of urban infrastructure in Bengkulu City to support community mobility, city aesthetics, and drainage management. Closed drainage is a system of drains whose upper part is closed and serves to drain rainwater, wastewater, and water from sidewalks, roads, and yards. This system keeps the neighbourhood clean and tidy.

Closed drainage can help prevent standing water that can damage roads and property, and reduce the risk of flooding. Some of the problems that often occur in drainage systems include: Increase in population, Neglect of waste management process, Land subsidence, Lack of coordination and synchronisation of existing infrastructure, Lack of public awareness. Here is an overview of all three:

#### a) Sidewalks in Bengkulu City

Sidewalks are used as pedestrian paths to provide comfort and safety from vehicle traffic, however, they still need repair and tidying up, this can be seen along Cendana Street and Jati Street, however, there are still several locations that are poorly maintained or even not available. As for concerns, or the need for understanding to the community, there are still illegal parking, street vendors, and lack of maintenance such as throwing garbage out of place so that it looks dirty on the sidewalk in several locations.

#### b) Closed Channels

A closed channel is a channel designed to drain rainwater and waste around the road efficiently so as not to disturb the aesthetics of the environment, and the area above the channel can still be used for other functions, such as trotuars with pedestrian trotuars, or others for densely populated areas and business or trade centres need closed drainage channels to reduce standing water during rain and city aesthetics. Closed channels have disadvantages, one of which is that the channels are often clogged due to garbage or sedimentation, so they need and require periodic and periodic maintenance, in terms of the cost of building / making closed channels and maintenance tend to be more expensive and complicated.

#### c) Open Channels

In open channels, the construction is faster, used to drain rainwater from the road surface. Also, a temporary solution in residential areas as a disposal of household wastewater, it is often found in residential or suburban areas that have not been fully integrated with closed channels. In terms of maintenance open channels maintenance and manufacturing costs are relatively cheaper than closed channels, however, the weakness is that more space is used and the risk of becoming a place of accumulation of garbage by people who are not orderly in disposing of garbage and causing inundation if not properly maintained, as well as aesthetically not good, reducing the beauty of the city.



**Figure 5. Sidewalks, Closed and Open Waterways**

Source Researcher document, 2024

### 3.1.6. Efforts of the Bengkulu City Government

The Bengkulu City Government is working to improve this infrastructure through a number of activities, including revitalising and renovating sidewalks by adding supporting facilities such as street lights, pedestrian signs, small parks planted with flowers and trees. There is also a regular programme of drainage cleaning to reduce flooding during the rainy season and the community is being educated in maintaining cleanliness by not littering the drainage channels.

### 3.2. Discussion

Based on the theory of the American Public Works Association (Stone, 1974) in Kodoatie, R.J. 2005) road infrastructure must fulfil a wide range of physical criteria required by public agents for government functions such as water supply, electric power, waste disposal, transport and services to facilitate social and economic objectives. The infrastructure needed to fulfil basic human needs in the social and economic sphere includes transport, irrigation, drainage, buildings, and other public facilities (Ahmadian et al., 2023).

Based on the research data, it is known that the condition of road infrastructure in Bengkulu City is generally good, this is due to the attention of the Bengkulu City Government to periodically carry out routine maintenance and reconstruction in several locations / sections to maintain road quality because the transportation sector is a priority scale to support the economy and social community, as well as supporting facilities for road infrastructure for security, smooth traffic such as adding and maintaining traffic light facilities (traffic lights).

The Bengkulu City Transportation Department together with the Bengkulu Police Traffic Unit (SATLANTAS) have conducted amdal (traffic impact analysis) studies at several road intersections in Bengkulu City, in this case the realisation of the installation of traffic lights at several intersections including at the Kebun Tebeng Village Intersection, precisely at the Tebeng Church intersection and in Timur Indah Village, namely at the intersection of the three Al Barokah Timur Indah mosques.

The installation of traffic lights in Bengkulu City was carried out to anticipate the occurrence of high traffic at any time, such as during national-scale activities or annual events (*tabot*). However, in Bengkulu City there are still several road junctions that have not been equipped with traffic lights. The Bengkulu City Transportation Department has planned to install traffic lights and Zebra crossings at all road intersections, including facilitating people with disabilities.

Completeness of road infrastructure is also complemented by sidewalks, closed channels, and open channels which are an important part of the durability and quality of roads to support community mobility, as well as city aesthetics, and good drainage management, so as to keep the environment clean and tidy.

Road infrastructure is also complemented by public facilities, government and private buildings and other public facilities needed to fulfil basic human needs, both social and economic needs. Based on this, it can be stated that the road infrastructure in Bengkulu City is good, however, it still needs the addition of several facilities needed by the community such as the Pedestrian Bridge (JPO) that crosses over the road, especially in the areas of schools, business centres, markets and government offices, as well as road signs and markings and crossing areas or zebra crossings, crossings equipped with Pelican Crossing with traffic lights, diffable buttons for crossing equipped with loudspeakers as a sign so that motorists know that someone is about to cross the road.

## 4. Conclusion

Based on the results of the analysis and referring to the theory of the American Public Work Association (Stone, 1974) states that road infrastructure must fulfil various kinds of physical criteria required by public agents. That the condition of road infrastructure in Bengkulu City is adequate for the category of small cities and is generally good, this is because the Bengkulu City government carries out routine maintenance on infrastructure and periodic reconstruction to maintain condition and quality.

Based on the results of the above conclusions the researcher suggests, as follows:

1. To the Bengkulu City Government to control population growth (quantity), while improving the quality of the population as human resources through the formation of character education that integrates intellectual, emotional and spiritual education. In terms of services to the community, especially for the convenience of road users, both motorists and pedestrians, the Bengkulu City Government should immediately build pedestrian bridges (JPO) on roads that are crowded centres (schools, shopping centres, government offices and public service centres) adding pedestrian crossings (zebra crossings) with Pelican Crossing complete with traffic lights, buttons for disabled people to cross equipped with loudspeakers as a sign so that motorists know that someone is about to cross the road.
2. Traffic density, the researcher suggests:
  - a. In terms of traffic density, researchers suggest that the Bengkulu City Government and the people of Bengkulu City maintain the quantity/population of the population by not inviting their relatives to urbanise to Bengkulu City so as to reduce the mobility of vehicle volumes on the road, reduce the use of private vehicles, the Bengkulu City Government adds public transport vehicles, such as city buses, student buses and angok, participate in maintaining assets and other public facilities.
  - b. In terms of road quality, researchers suggest that the Bengkulu City Government increase the routine evaluation and monitoring of road quality conditions periodically and periodically so that services to the community are optimal and good.

To other fellow students to conduct similar research with informants and a larger sample so as to improve the quality of road infrastructure in Bengkulu.

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