

An Application of The Pedestrian Lane on The Yos Sudarso Road In Mamuju City Based on The Complete Street Concept

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Abstract: The incomplete roads, designed only for cars, with limited transportation options make pedestrians, cyclists, and other transport users feel uncomfortable and safe and risk dangerous. Yos Sudarso Road in Mamuju City is a road segment with several activities in various zones, the intensity of activities that occur on the road is very high at certain hours, due to the different activities of the diversity of building functions. The condition of the pedestrian lane on this road does not continue along the road and is not equipped with additional facilities that support the activities and diversity of existing functions. This study aims to identify the condition of pedestrian lanes and analyze the application of pedestrian lanes based on the complete street concept. The type of research used is non-experimental descriptive with the qualitative and quantitative approach, using survey method in the form of direct observation at research sites, interviews and questionnaires. The condition of pedestrian lanes is not suitable based on the complete street concept that does not provide a sense of security and comfort for road users, the need for pedestrian lanes are equipped with street furniture (street lights, seats, tree protector) and lanes for persons with disabilities (blind people, wheels) with a width requirement of 4meters, while the recommendation of pedestrian lane implementation based on pedestrian width requirements and addition of the pedestrian width lane that is, on the left side to the east is made continuously with width 8m and on the right side is made continuous with width 4m.

Keywords: Road Infrastructure, Pedestrian Lane, Complete Street Concept

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I. Introduction

Complete street is a policy in the field of transportation in the form of a planning concept that ensures security for all road users, this concept is very concerned about the physical aspects of the existence of the completeness of a road. When done properly, this policy has many benefits for the city, such as user safety, connectivity, better health, reduced stress and improving economic prosperity [1, 2, 3]. Incomplete roads, designed only for cars, with limited transportation allowance make pedestrians, cyclists, and other transport users feel uncomfortable and safe and risk dangerous. Planning roads that cover pedestrian needs, public transport, and cyclists will make the roads safer and easier for road users to pass [1, 2, 3]. Everyone of all ages and capabilities can access and use these roads. Roads in major cities in Indonesia are currently considered to be less accommodating to the basic needs/physical of a pedestrian-friendly road [4]. One transportation system is the pedestrian mode, although in the transport system we often forget, pedestrians should not be removed, pedestrian modes must be taken into account [5]. Road users need a special line called the pedestrian, a convenient pedestrian lane will cause people to walk. The higher the comfort level of the pedestrian lane, the more people who choose to walk to get access to their activities [6]. The Yos Sudarso Road in Mamuju City belongs to the category of secondary arterial roads [7] is a three-lane two-lane road. The artificial tourist area of the Mananakarra Beach Land of Mamuju Sub-district is located on this road [8], has activities in various zones i.e. offices, hotels, open plaza, markets, ports, mosques, shops and restaurants [9]. The intensity of activities that occur on the road is very high at certain hours; this is due to the different activities of the diversity of building functions. The condition of the pedestrian lane on this road does not continue along the road and is not equipped with additional facilities that support the activities and diversity of existing functions, so it is necessary to assess the condition of the pedestrian lane and analyze how the application of the concept of the pedestrian lane on the road segment based on the complete street concept.

II. Methodology

The type of research used is non-experimental descriptive with qualitative and quantitative approach, using survey method in the form of direct observation at research sites, interviews and questionnaires. To facilitate sampling, the research sites are divided into three segments with segment boundaries based on varying activity levels and the behavior of road users sometimes does not cross/visit locations on each segment.



Figure 1. Research Sites

Source: Processed Products of Google Earth, 2017

III. Results And Discussion

Analysis of Existing Conditions on the Yos Sudarso Road in Mamuju City

Road condition on Yos Sudarso segment 1 has a width of 21.85 m does not have a separator direction with the function of the surrounding buildings such as hotels, government offices, sports fields and settlements in the form of dormitories Kodim. Pedestrian lane as complete street elements available at research location, on segment 1 of Yos Sudarso road is only available in Maleo hotel entrance area, equipped with street furniture and tree protector. The pedestrian lane length is 49.20 m wide by 7.20m in the east towards the 2nd segment. The existing pedestrian lane is not continuous along the road in segment 1.



Figure 2. The pedestrian lane on the road Segment 1

Source: Survey Results 2018

Road condition on Yos Sudarso segment 2 has width 22 m has no directional separation with the function of the surrounding buildings is very diverse and is the center of activity on the Yos Sudarso road.

The pedestrian lane on the 2nd segment of Yos Sudarso Road is only available on the Manakarra beach platform, with street furniture and tree shelter. The pedestrian lane is divided into two separate sections in the middle, with each different size. The length of the first pedestrian lane is 54.90 m with a width of 7.15m and the

second by a length of 63.50m and width of 8.20 between the two pedestrian lanes, there is an empty area separating the two areas that functioned as a parking lot for Manakarra beach platform with a length of 43.50 and width of 8.82 m.



Figure 3. Pedestrian lane on Segment 2 road

Source: Survey Results 2018

On the Yos Sudarso road segment 3 has a width of 21.25 m and there is a narrowing at the end of the road to the east in front of the Mamuju harbor and Mamuju Al-Quba mosque with a width of 11.4m. Road conditions do not have a directional separator with various building functions.

The 3rd segment pedestrian lane is only available on the left side towards the east of the Mamuju mall building plan, the pedestrian lane is separated by a median of 1.65m wide. A length of 183.8 and width of 5m, the pedestrian lane is not used as function, because it is used as a trading area of street vendors along the length.



Figure 4. Pedestrian lane on Segment 3 road

Source: Survey Results 2018

Traffic conditions in YosSudarso Road section can be seen in Table 1, using the Peder's Volume Formula [5]

$$Q = \frac{N}{T}$$

Notes:

Q = pedestrian flow (person/m/minute)

N = number of passers by (person/m)

T = observation time (minutes)

Table 1. Number and average pedestrian

Directions	Observation Period	Time (T=Minute)	Segment 1				Segment 2				Segment 3			
			Saturday (N = person)	Sunday	Monday	Total	Saturday	Sunday	Monday	Total	Saturday	Sunday	Monday	Total
1	06.00 - 08.00	120	14	101	2	117	5	47	4	56	46	36	14	96
2			23	127	4	154	24	57	6	87	82	83	77	242
1	08.00 - 10.00	120	11	17	0	28	2	17	2	21	16	8	6	30
2			19	22	0	41	8	19	5	32	27	12	26	65
1	10.00 - 12.00	120	2	6	4	12	1	3	4	8	4	19	11	34
2			4	4	12	20	0	3	5	8	5	33	6	44
1	12.00 - 14.00	120	2	0	0	2	0	0	2	2	0	1	6	7
2			0	6	0	6	0	0	2	2	0	0	2	2
1	14.00 - 16.00	120	0	0	0	0	7	11	0	18	30	0	8	38
2			0	3	4	7	0	1	2	3	65	11	8	84
1	16.00 - 18.00	120	1	19	29	49	42	17	0	59	40	17	12	69
2			15	17	15	47	20	26	4	50	46	20	36	102
1	18.00 - 20.00	120	10	12	23	45	24	4	32	60	45	4	21	70
2			15	11	10	36	16	6	24	46	35	12	54	101
1	20.00 - 22.00	120	4	6	2	12	14	0	11	25	15	2	12	29
2			23	4	5	32	10	0	8	18	11	6	13	30
Total T and N			143	355	110	608	173	211	111	495	467	264	312	1043
Total Person/Minute (Q=N/T)			0.15	0.37	0.11	0.63	0.18	0.22	0.12	0.52	0.49	0.28	0.33	1.09
The average person/h (Qx60 minute)			9	22	7	38	11	13	7	31	29	17	20	65

Source: Processed data results, 2018

Notes:

Direction 1 = Direction to port

Direction 2 = Direction to Artery Road

Based on Table 1 we can see that Sunday morning at 06.00-08.00 is the peak of activity with the number of passers passing on segment 1 of 200 people, segment 2 as many as 140 people and 3 segments as many as 119 people. This is influenced because the majority of pedestrians take advantage on the function of this road as a means of sports and tourism in the morning, pedestrian activities decreased before noon, influenced because the road conditions are not equipped with shade trees and pedestrian lanes so that street users, especially pedestrians do not feel comfortable walking on these hours.

The pedestrian activity is slightly elevated towards the afternoon at 16.00 hours, especially on Saturdays and Sundays where pedestrian activity remains stable until 20:00, this is influenced as the weather has begun to support on foot, the entertainment and recreation activities on the Manakarra beach platform are open as well as the activities of street hawkers are also getting crowded.

Pedestrian Lane Needs Analysis of the Complete Street Concept Perceptions of pedestrian safety and the surrounding population

The criteria used in measuring the level of security are the design criteria of the pedestrian lane [10, 11], the measured security is the security of accidents that may arise resulting, road conditions, barriers, visuals etc.

Based on Table 2, respondents feel less safe passing on the road research sites on foot, with the intensity of crossing the road that is sometimes, the number of each respondent on each segment varies while the respondents who feel safe passing on the road research site on foot have more respondents small where the intensity of crossing the road is sometimes and rarely. Overall, the response to safety passing on the streets on foot is less secure.

Table 2. Perceptions of pedestrian safety

How Often Respondents Crosses the Road	Do respondents feel safe passing on this street on foot?				Total
	Very Secure	Secure	Less Secure	Not Safe	
Segment 1					
Very often (≥ 7 times a week)	1	2	2	1	6
Often (5 - 6 times a week)	4	3	5	1	13
Sometimes (3 - 4 times a week)	1	6	12	4	23
Rarely (1-2 times a week)	1	6	10	1	18
Total	7	17	29	7	60
Segment 2					

Very often (≥ 7 times a week)	1	1	1	0	3
Often (5 - 6 times a week)	1	4	7	1	13
Sometimes (3 - 4 times a week)	0	6	9	3	18
Rarely (1-2 times a week)	2	7	8	9	26
Total	4	18	25	13	60
Segment 3					
Very often (≥ 7 times a week)	3	4	3	2	12
Often (5 - 6 times a week)	1	3	9	1	14
Sometimes (3 - 4 times a week)	4	3	8	5	20
Rarely (1-2 times a week)	0	0	7	7	14
Total	8	10	27	15	60

Source: Results of the questionnaire, 2018

Perceptions of pedestrian and resident respondents

The criteria used in measuring the comfort level are the design criteria for pedestrian lanes, such as because there are pedestrian, non-slippery places, no puddles, equipped with shade trees, good lighting, there are signs, there are disability lanes no parking vehicles/street vendors are blocking [10,11]. Measures measured are comfortable feelings when passing based on the availability of infrastructure, geometry, protection, visual and lighting.

Table 3. Perceptions of pedestrian responses

How Often Respondents Crosses the Road	Do respondents feel comfortable passing on this Road by foot				Total
	Very comfortable	Comfort	Less comfortable	Uncomfortable	
Segment 1					
Very often (≥ 7 times a week)	0	3	2	1	6
Often (5 - 6 times a week)	0	7	2	4	13
Sometimes (3 - 4 times a week)	0	6	6	11	23
Rarely (1-2 times a week)	0	4	9	5	18
Total	0	20	19	21	60
Segment 2					
Very often (≥ 7 times a week)	0	1	2	0	3
Often (5 - 6 times a week)	1	3	4	5	13
Sometimes (3 - 4 times a week)	1	5	7	5	18
Rarely (1-2 times a week)	0	7	9	10	26
Total	2	16	22	20	60
Segment 3					
Very often (≥ 7 times a week)	1	4	4	3	12
Often (5 - 6 times a week)	1	1	5	7	14
Sometimes (3 - 4 times a week)	2	4	6	8	20
Rarely (1-2 times a week)	0	0	6	8	14
Total	4	9	21	26	60

Source: Results of the questionnaire, 2018

Based on Table 3, it can be seen that respondents feel uncomfortable crossing the road of research, location on foot, the number of respondents who chose 21 respondents in segment 1, 20 respondents segment 2 and 26 respondents segment 3, with intensity across the road as a whole that is sometimes. In the segment 1 respondents who feel comfortable as much as 20 respondents with the intensity of crossing the road that is often and sometimes, segment 2 of 6 respondents and segment 3 as many as 9 respondents with intensity sometimes as much. Respondents who chose very comfortable feeling were very small from all segments totaling 6 respondents in segment 1 no one chose this criterion. The overall response to the feeling of passing through the streets on foot is uncomfortable.

Perception of the pedestrian lane

Perceptions of pedestrian lanes taken from pedestrian respondents and local people, based on questionnaire results from the first question, respondents answered felt need to be provided a pedestrian lane where the intensity of respondents across the road varies.

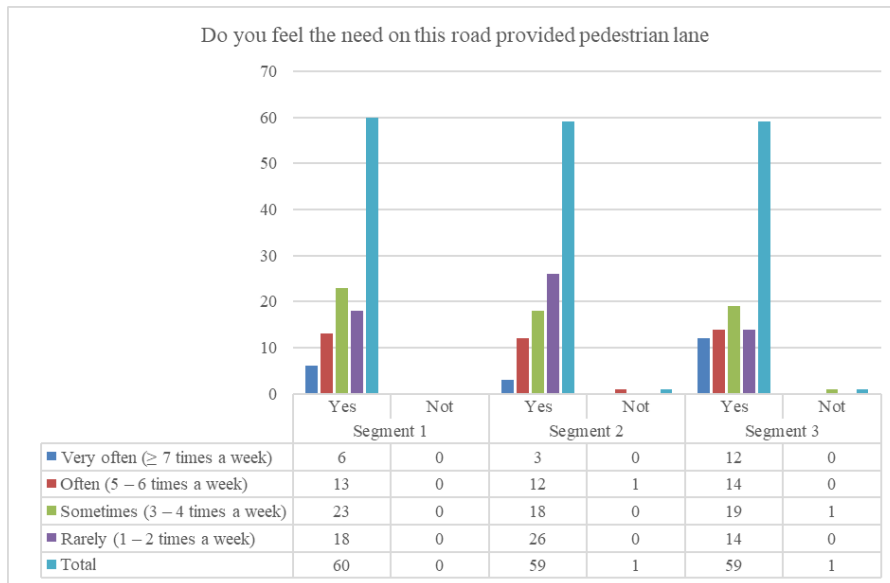


Figure 5. Graph of response to walking lane

Source: Results of the questionnaire, 2018

For the second question of the questionnaire results, from 60 respondents in segment 1, segment 2, and segment 3 more than 90% of respondents said they felt the need was provided by street furniture (street lamps, seats, trees) in walking tracks with respondent intensity across the street often.

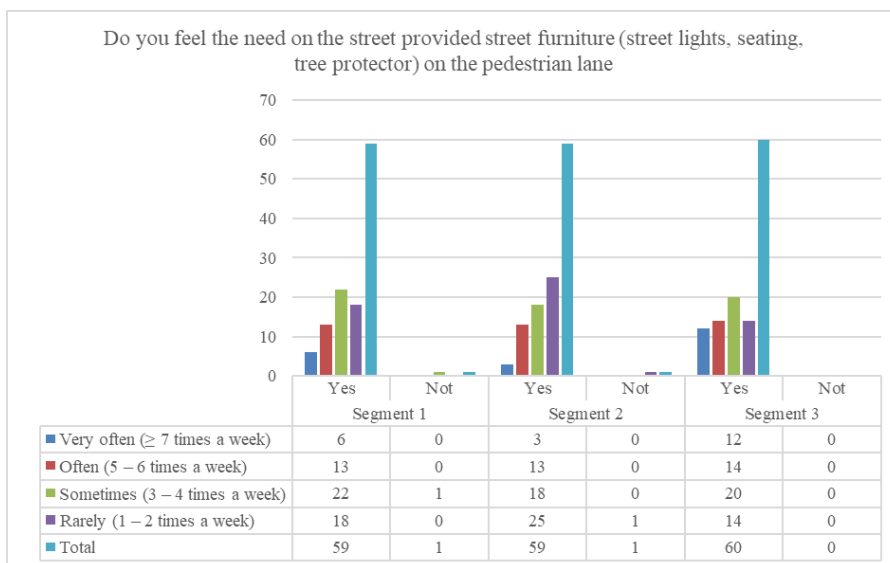


Figure 6. Graph of response to street furniture

Source: Results of the questionnaire, 2018

For the third question on segment 1, 2 and segment 3 of 60 respondents over 90% of respondents who feel the need to be provided a special lane for disabilities (blind people, wheelchair users) on walking lanes with intensity across the street sometimes

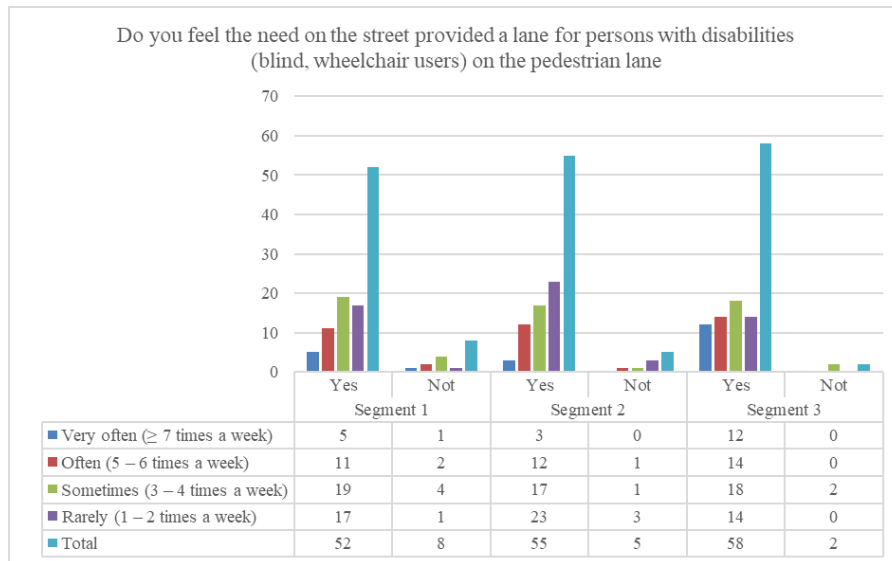


Figure 7. Graph of response to lane for persons with disabilities

Source: Results of the 2018 questionnaire

Wide Requirements for Pedestrian Lanes

In the ideal circumstances to obtain the minimum width of the pedestrian lane (W) is used a formula as bellow[10]:

$$w = \frac{p}{3,5} + 1,5$$

Notes::

P = pedestrian volume (person/minute/meter)

W = Pedestrian width Lane

Based on the existing pedestrian data in each segment, the minimum width of the pedestrian lane is obtained in each segment according to Table 4.

Table 4. Minimum Width of each Segment Pedestrian Lane

Segment	Pedestrian Volume (P)	Pedestrian Width Lane (W)
Segment 1	0,47	1,63
Segment 2	0,52	1,65
Segment 3	1,09	1,81

Source: Processed data results, 2018

On Table 4, the minimum pedestrian lane width is taken from the largest width requirement if the pedestrian lane is continuously made from segment 1 to segment 3. In addition, of pedestrian lane width if equipped with facilities based on Table 5 [10].

Table 5. Addition of Pedestrian Width Lane

No.	Facility	Additional Width (Cm)
1	Wheelchair	100-120
2	Lighting lamppost	75-100
3	A traffic light pole	100-120
4	Traffic signs	75-100
5	Mailbox	100-120
6	Wastebasket	100
7	Shade plants	60-120
8	Flower pot	150

Source: Pedestrian Planning Guidelines On Public Roads, Publisher of Public Works, 1999

Considering the minimum effective width of the pedestrian space, the number of people passing through, the additional facility on the pedestrian lane is found that the width of the pedestrian lane on the YosSudarso road is 4m where the width is greater than the width of the specified minimum limit of 2m [12].

The Implementation of the Pedestrian Lane from the Complete Street Concept

The existing pedestrian lane conditions are only left to the east of the research location, while on the right side of the research site to the east has no pedestrian lane.

Based on the results of the needs analysis on the road segment that respondents who cross the road expect to be provided pedestrian lane, street furniture (street lights, seats, tree shelter) in pedestrian lanes, lanes for persons with disabilities (blind people, wheelchair users) on pedestrian lanes legs, the application of the concept of pedestrian lane equipped with street furniture and lanes of persons with disabilities on the road of the research sites should pay attention to the minimum effective width of pedestrian space, the number of people passing through, additional facilities on the pedestrian lane.

Recommended pedestrian lane as a complete street element is a pedestrian lane that has street furniture and people with disability lane with the following division. On the left side is made continuously with width 8m, following the existing laying on the left side of segment 1 and segment 2, existing street furniture has been added to add the lane for people with disability, while in existing existing 3 segment is recommended to be replaced by continuous from segment 2 On the right side of research site to the east, based on pedestrian width requirements and the addition of pedestrian width, recommendation/pedestrian lane as a complete street element is made continuously with 4m width in street furniture and lane for persons with disabilities. On this side of recommended street furniture is street lights and tree protector.

IV. Conclusion

The condition of the pedestrian lane on the YosSudarso road in Mamuju city is not suitable based on the complete street concept that does not provide a sense of security and comfort for road users. Pedestrian lane with street furniture and protective trees are continuing along the road and are only available on the left side of the road to the east of the study site.

The need for pedestrian lane on the Yos Sudarso Road of Mamuju city is a pedestrian lane equipped with street furniture (street light, seating, tree protection) and lane for persons with disabilities (blind, wheelchair users). Taking into account the minimum effective width of the pedestrian space, the number of people passing by, the additional facilities on the pedestrian lane obtained the need for wide pedestrian lane on YosSudarso roads is 4m. Recommended pedestrian lane as a complete street element based on pedestrian width requirement and the addition of pedestrian width is a pedestrian street with street furniture and disability lane, on the left side of the study area to the east is made continuously with width 8m while on the right side is made continuous with 4m width.

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