

Evaluation of Road Complementary Building due to widening of Lilawangsa Road in Langsa City

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Abstract— Langsa City is one of the cities in Aceh province which is doing development in all fields, especially in economy and infrastructure. Road construction and upgrading has been a priority in Langsa City, one of which is Lilawangsa road. The function of Lilawangsa road is as collector road. This road crosses two villages, Paya Bujok Tunong village and Geudubang Jawa village, Langsa Baro subdistrict, Langsa city. Road improvement is done by widening the road, causing the road shoulder no longer exists. However, this is not included with planning for support facilities, such as pavements and green belt. This is a problem especially for pedestrians, because there is no such safe and comfortable facility. The purpose of this research is to evaluate Lilawangsa road Langsa City improvement based on requirement of road section as well as arrangement of pedestrian facility and green belt. Evaluate the eligibility of road function by using road safety audit. The research method was qualitative descriptive method, based on Road Safety Audit. The result is the arrangement of the Lilawangsa road segment is still not meet the standards for the road function as a collector road. There are still parts of the road that are not yet available and have not met the standards. Traffic lines on the Lilawangsa road dominate the Lilawangsa road, making the pedestrian pathway and facilities neglected.

Keywords—component; widening, road, pedestrian, green belt

I. INTRODUCTION

Langsa City is one of the cities in Aceh province which is doing development in all fields, especially in economy and infrastructure. Road development and upgrading has become one of the priorities in Langsa City. The existence of this road infrastructure, make the line between the areas is well connected. One of the roads that has increased is Lilawangsa road. This road crosses two villages (or in Aceh language *gampong*), Paya Bujok Tunong village and Geudubang Jawa village, Langsa Baro subdistrict, Langsa city.

Roads are land transportation infrastructures including all sections of the road as well as auxiliary buildings and equipment intended for traffic which is located on soil surface, above ground surface, below ground and/or water, and above water surface, except railways, road lorries and cable roads (Law No. 38/2004). The roads are part of a road that includes traffic lane, with or without separation path, and road side (RSNI T-14-2004).

There are several things that must be considered about improving the roads, which is parts of the road and its utility, which consists of (Law 38/2004 and PP 34/2006):

1) Road Space or in indonesian Ruang Manfaat Jalan (Rumaja)

Road space is some space of the road that is limited by the width, height, and certain depth set by the organizers of the road. The road space is made to median, road pavement, separation path, roadside, roadside irrigation, sidewalks, slopes, safety thresholds, piles and trenches, culverts, road equipment and other complementary buildings.

2) Space belongs to the street or in indonesian Ruang Milik Jalan (Rumija)

The space belonging to the street is consists road space and a row of road bounded by a certain width, depth, and height. The space belongs to the street is dedicated to road space, road widening and additional traffic lines in the future as well as space requirements for road safety.

3) Road monitoring space or in indonesian Ruang pengawasan jalan (Rumija)

The road monitoring space is a certain space outside the space belonging to the road which is used under the supervision of the road operator.

The parts of the road can be described as follows:

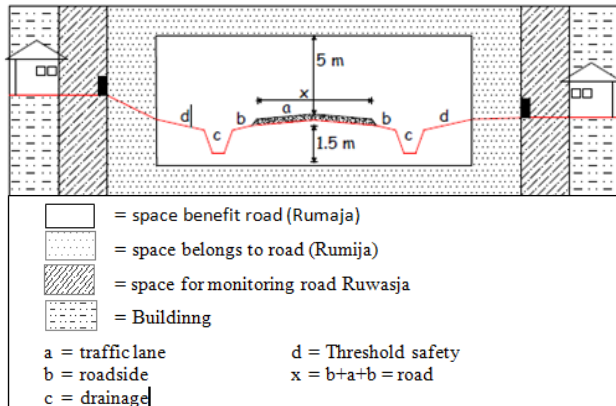


Figure 1. Tipikal Ruang Jalan.
(Source : Classification of Law 38/2004 and PP 34/2006)

The current problem is the road improvement in Langsa City, it is just widening the road and started to ignore the existence of the road. The most ignored thing is the neglect of the infrastructure for pedestrians, in addition, many trees which is also as the green belt lost when widening the road (traffic lane).

The purpose of this research is to evaluate the improvement of Lilawangsa road, Langsa city road based on requirement of road section and also the arrangement of pedestrian facility and green belt. Evaluate the eligibility of road function by using road safety audit. A road safety audit is a formal testing of an existing and future road or traffic project, or variety of work which has interaction with road users, conducted independently by trusted examiners to see the potential accidents and safety appearance of a road (Austroads, 1994 in Pd T-17-2005-B, 2005).

The research use qualitative descriptive method using primary data as the main data obtained from the survey results from the location and compare it with the existing theories and regulations.

Lilawangsa road results still do not meet the standards for the road function as a collector road. There are still parts of the road that are not yet available and have not met the standards. Traffic lines on the Lilawangsa road dominate the road, making the pedestrian pathway and facilities neglected.

II. METHODOLOGY

Lilawangsa Road in Paya Bujuk Tunong village and Geudubang Jawa village, Langsa Baro is a secondary road collector network as a city road. Lilawangsa Road has 2.15 km length (Qanun RTRW No. 12/2013). Collector road is a road that serves the collector/divider transport with medium distance travel, medium average speed and number of entrances are limited (Classification of Law 38/2004 and PP 34/2006).

The evaluation of Lilawangsa road improvements at Paya Bujuk Tunong village and Geudubang Jawa village, Langsa Baro use data that is obtained from direct observation in the

field, which are condition of existing road (road description) and its complementary building.

A. Data Processing Process

Existing road geometry and complementary conditions (environmental conditions) are obtained by taking direct measurements in the field and then compared with the standard requirement in the form of geometric parameters section of the road, as in the table below:

TABLE I. PARTS OF ROADS AND THE SIZE

Road Segments	Allotment	Measure				
Rumaja (space benefit road)	Road	(Artery & Collector) Width = Road (Artery & Collector) Height min = 5.00 m (Artery & Collector) Depth min = 1.50 m Measure adjustable the width of front road and circumstances environment in certain things, can be used as drainage environment, where size is set based on GUIDELINES (PerMen) Situational.				
	Drainage					
	Security Threshold					
Rumija (space belongs to road)	Rumaja + Certain one-way road	Rumaja, widening road, Additional line L.L, safety	Minimum Width (m)	Freeway	Highway	Road
		Certain line can be used as green open space		30	25	15
Ruwasja (space for monitoring road)	Certain space except Rumija	barrier-free view for driver, construction safety, and securing road function	Ruwasja Minimum Width (m)			
			SJJ	Arteri	Collector	Local
			Primary	15	10	7
			Secondary	15	5	3
Ruwasja (space for monitoring road)	Certain space except Rumija	barrier-free view for driver, construction safety, and securing road function	Bridge	100 m to downstream and 100 m to upstream		

Source : Classification of Law 38/2004 and PP 34/2006

TABLE II. PROVISION OF ROAD GEOMETRICAL DIMENSION

Road Classi- fy	Freeways			Highways			Roads			Streets		
Road Function	Arteri & Collector			Arteri & Collector			Primary Collector			Local & Environment		
Field	D	B	G	D	B	G	D	B	G	D	B	G
Rumaja Mini-mum Width (m)	-	-	30	-	-	25	-	-	15	-	-	11
Speed Planning (km/h)	100-120	80-100	80	80-100	40-60	60-80	60-80	40-60	40	20-40	20-40	20-40
Minimum ways width (m)	2 (2x3,6)	3 (2x3,6)	4 (2x3,5)	5 (2x3,6)	6 (2x3,5)	7 (2x3,5)	2x3,5			(2x3,6)		
Minimum Median Width (m)	6	4,5	3	6	4	2	2			2		
Superelevation maximum	8 %			10 %			10 %			Without Superelevation		
Careen	10%			10%			10%			10%		

Source : Classification of Law 38/2004 and PP 34/2006

Some of the things done in this phase are (according to road safety audit):

- 1) field survey preparation, consisting of:
 - a) prepare location data and maps;
 - b) prepare survey equipment, and
 - c) prepare survey forms as needed when specific data is required.
- 2) field inspection using road safety audit checklist:
 - a) conduct a field check using the prepared road safety audit checklist;
 - b) use the checklist based on the checklist's instructions as follows:
 - i. checklists are only used in accordance with the type of road safety audit to be done;
 - ii. fill in the answer column with a brief answer on the A / T column, such as A (exist) and T (none);
 - iii. if you need an answer in dimension / size, fill it with the size you see in the field, and
 - iv. check in the order of the problems as listed in the checklist.
 - c) after that, collect the results of checklists.
- 3) survey lapangan lanjutan :
 - a) evaluate audit results (checklists) and photo camera shoots;
 - b) Further surveys are required when there are specific issues such as pedestrian data requirements.
 - c) conduct a field survey in accordance with needs that refer to standard manuals or survey guides;
 - d) data retrieval just 1 (one day) and done for limited sampling, and
 - e) collect all the next survey results.

B. Stage of data analysis

The data that has been processed, analyzed by using road safety audit, the things that are done:

- 1) analysis the results of checklist implementation:
 - a) check each checklist results and focus on the results of the checks indicating "T" or "No" answers;
 - b) identify parts of the road design that are not up to standard;
 - c) identify parts of complementary roads that do not meet technical requirements, and
 - d) identify parts of road support facilities that are deemed to be inadequate technical requirements, etc.
- 2) Road drawings / sketches:
 - a) make a sketch / map of the observed location;
 - b) take the measurement results into the map, and

- c) mark the parts that do not meet the standards (eg, road width, roadside width is not adequate, etc.)
- 3) survey analysis through camera results:
 - a) identify parts of geometry design, complementary buildings, supporting facilities that are not meeting technical requirements;
 - b) identify the road map that is not perfect;
 - c) identify the pedestrian crossing movement map, and
 - d) identify the type of land use developed around the road.

III. RESULTS AND DISCUSSION

Lilawangsa road is the main access to the Paya Bujuk Tunong village, Geudubang Jawa village, Geudubang Aceh village, and Lengkong village, through street Ahmad Yani which is the arterial road in Langsa City. On this road there are also *geuchik* (chief of village) Paya Bujuk Tunong office, Paya Bujuk Tunong mosque, UPTD PKM Langsa Baro, Office of Tuha Peut Geudubang Jawa, Jawa Geudubang mosque, and STIKES Harapan Ibu. The location of the research can be seen in figure 2 below:

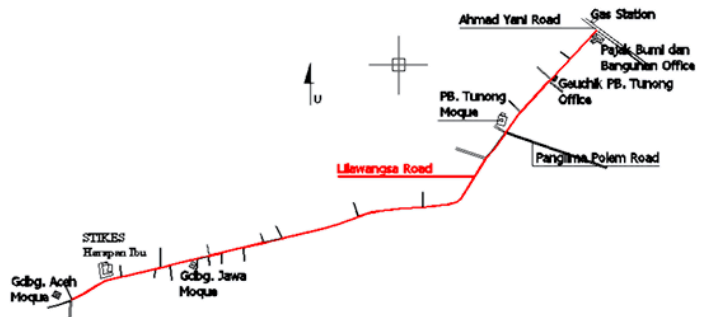


Figure 2. Research Location Maps.

In 2017, the entire Lilawangsa road has increased steadily. The improvement is done by widening the traffic and re-doing the road with asphalt. However, most of the road in Geudubang Jawa village until the time of the research has not been done asphaltting. (project is running).

A. Description of the Road

The following descriptions of Lilawangsa road:

- 1) Length of road : 2,150 meters
- 2) Road width : $\pm$ 7.5 meters
- 3) Road function : Collector Road
- 4) Road construction : Asphalt

The current condition of Lilawangsa road is not all the same in every part. The location of the drainage and the distance of the building to the side of the road is not the same as well. Lilawangsa road has a separator that separates two traffic lanes with one-way road, such as separating fast and slow traffic lines or separating paths with different functions (Pd T-16-2004-B). This indicates that there is already a clear separation between the two paths.

There is no pedestrian mall on the road, but the green belt is also reduced. More details about the condition of Lilawangsa road seen in some photos of the following street situation:



Figure 3. Condition sta.+ 0.00.

In this section, visible conditions, there are no pedestrian mall and row of shophouses along the road.



Figure 4. *geuchik Paya Bujok Tunong office.*

In Figure 4, there is still a green belt, but there is no pedestrian mall.



Figure 5. Drainage condition.

On this road segment already built drainage on both sides of the road, but there is a section of road that has no drain on one of the roadside.



Figure 6. Parking on the traffic lane.

The unavailability of parking facilities in every building, especially shophouses, resulted in traffic lanes used for parking vehicles.



Figure 7. The condition of pedestrians.

Pedestrians walk on traffic lane. This is the effect from unavailability of pedestrian mall on the road.

B. Road Segments

Road Segments consisting of Rumaja, Rumija and Ruwasja. descriptions of Lilawangsa road can be seen on cross section of the road in figure 8 below:

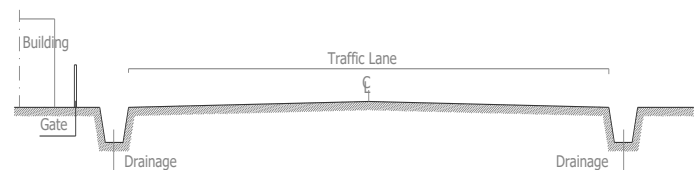


Figure 8. Cross Section A.

In Figure 8 above shows that there is no clear boundary between Space Benefit Road (Rumaja) with Road Owned Space (Rumija). Rumaja on this section of the road is only intended for traffic and drainage, but not seen the road shoulder.

Lilawangsa road conditions in other parts, such as sketch of the following pieces:

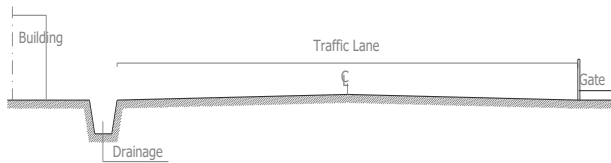


Figure 9. Cross Section B.

This part of the road is not visible drainage on the right side of the road. Direct traffic lane borders the fence of citizens' houses. In this section also do not look any shoulder of the road.

The result of field recognition and description data of the road above will then be adjusted to the table of the parts of the road space and its size, as follows:

TABLE III. DESCRIPTION OF THE ROAD

Road Segments			Yes (A) / No (T)	Standard	Field Existing
RUMAJA	Road	Traffic Lane	A	2 x 3.5 m	2 x 3.75 m
		Roadside	T	A	-
		Median/ Separator	A	A	Separator
	Drainage		A	A	0,60 m
	Security Threshold	Constructi on safety	A	A	Talud
RUMIJA	Rumaja + Certain One-way	Green belt	Partially	15 m	± 9 m
RUWASAJA	Certain space out of RUMIJA	Old Building	Different	5 m	Min. 1 m
		New Building	A		≥ 5 m
	Pedestrian Mall		T	0.45 - 4 m	-
	Parking Facility		Limited	A	On the traffic lane or shophouses yard
	Street Lighting		A	> 2.5 m	± 7 m

From the table above, there are some parts of the road that are not yet available and not in accordance with applicable standards. In Rumaja, the traffic, drainage and safety thresholds are up to the prevailing standards, but there is no roadside yet. The roadside is part of the roads area to accommodate the stop vehicle, emergency purposes, and for side support for the bottom layer, and the surface layer (RSNI T-14-2004).

Rumija section, the space for the green belt has not met the standards, there are some that do not have a green belt. This is due to the widening of traffic lanes. The green belt is part of the pedestrian mall, green open space, and can add aesthetic value from the road.

Ruwasja on Lilawangsa road is not all the same. This is related to the allowed Building Border Line (GSB). But in new buildings, ruwasja already meets the standards. There is no Pedestrian path along Lilawangsa road. So, pedestrians use the traffic lane for walking. Pedestrian path can be part of rumaja or rumija.

C. Part of Road Space

Land use is the arrangement of land use along the road, arranged in such a way based on its designation and adapted to road function (Pd T-17-2005-B). The function of the land/area in general at Sub Service Center 4 (Langa Baro Subdistrict) is for Trade, Industry, Household, Education, Health, Office and Plantation (Qanun RTRW 12/2013).

The road operational stage audit is used at the beginning of the operation of a road and for already operated segments. The road safety audit in this phase aims to examine:

- 1) Consistency of application of overall road geometry standards;

In this study, the road geometry standard is limited to only the parts of the road in Table 3. So based on the Table the Lilawangsa road still does not meet the standards as collector road. There are still parts of the road that are not yet available and not in accordance with applicable standards.

- 2) Consistency of the application of road markings, placement of signs, and complementary buildings of roads;

Based on Table 3 above, for point b, facilities are available only on separators and street lighting.

- 3) The effect of land use development on traffic conditions;

Land use in the area was once as residential areas. Along with the development and construction of the city, the road is defined as an office and trade area, although there are some settlements. The effect is the widening of the roads.

- 4) Traffic and pedestrian characteristics;

The traffic lane dominates the Lilawangsa road, so the pedestrian trails and facilities are neglected. In this study, the author tries to design the needs of pedestrian paths and supporting facilities.

- 5) Road lighting conditions.

Street lighting in this area works well. The height of the lamp illumination already meets the standard and does not result in glare and the light is not obstructed.

Based on the results of the road safety audit above, it can be said that Lilawangsa Langa city road has not met the criteria of a decent road. There are still parts of the road that are not yet available, such as pedestrian mall, road marking, placement of road signs, and road complementary buildings.

D. Pedestrian Mall

Pedestrians are people who walks in the Road Traffic Area. Pedestrians are entitled to the availability of supporting facilities in the form of sidewalks, crossings, and other facilities (Law 22/2009).

Pedestrian facilities, sidewalks or often called pedestrian path are generally parallel to the axis of the road and higher than the pavement surfaces to ensure the safety of pedestrians concerned. Pedestrian path is to facilitate the movement of pedestrians from one place to another by ensuring the safety and comfort aspects of pedestrians.

The pedestrian space is a necessary space for pedestrians to stand and walk calculated on the dimensions of the human body when carrying goods or walking with other pedestrians either in silent or in motion. The minimum space requirement mentioned above should take into consideration the condition of pedestrian behavior in carrying out the movement, both when carrying goods, or walking together with other pedestrians, in a stationary or moving condition as the following figure.

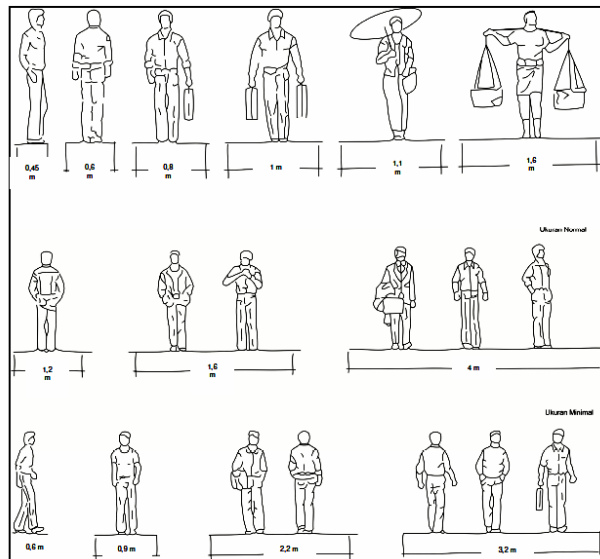


Figure 10. Space needed for people as individual, Carrying Stuff, and Walking Together.

(Source : Permen PU no. 03/PRT/M/2014)

Based on existing field and regulatory conditions, then the Lilawangsa road requires pedestrian. The pedestrian dimension is adjusted to the condition and availability of space on the road. Given that the entire road is a traffic lane, the pedestrian will be planned over the existing channel.

Pedestrian must also have free space to provide pedestrian privacy which ensures safety, and has a free view of the surrounding activities as well as the overall road corridor. For that, the pedestrian path should have a minimum free space of 2.5 meters. This provision relates to the height of the installation of lamps, markers, signs and signage.

Lilawangsa is a collector road. Therefore, pedestrian planning is a segregation with traffic lane, this means the separation of space between the pedestrian network and the

traffic lane, for example, has a high difference with the road. More details about the pedestrian plan are in the following figure:

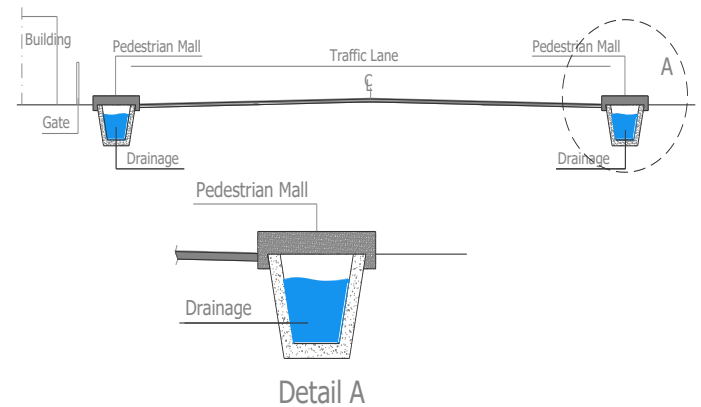


Figure 11. Pedestrian Mall Planning.

Pedestrian path material is planned to use materials that are friendly to people with disabilities, it is materials with a texture that is not slippery (surface material rough/rise). There is also a tile texture as a guide and a warning and ramp at each intersection. Pedestrian path development should avoid potentially life-threatening hazards such as rail and holes along the path..



Figure 12. Material of Pedestrian Mall.

E. Green Belt

The green belt is one of the pedestrian path infrastructure. Green belt is the plants placement path and other landscape elements located within the road space and the road monitoring space (Permen PU 05 / PRT / M / 2008). On the road side, green open space can be provided with plant placement between 20-30% of rumija. To determine the selection of plant species, need to consider 2 (two) things, that are the function of plants and their placement requirements. It is recommended to choose a typical local plant species, favored by birds, and low evapotranspiration rate.

Green belt can be use as accessibility, safety, comfort, beauty, convenience, and interaction on the pedestrian mall. On Lilawangsa road, there is no special space for the green

belt. So, there will be some alternative planning that can be used, there are:

- 1) *Alternative I: Using the edge of a 0.5 meter wide traffic line on both sides for the green belt. The type of plant used for alternative I are plant as accessibility or road guide (Figure.13).*

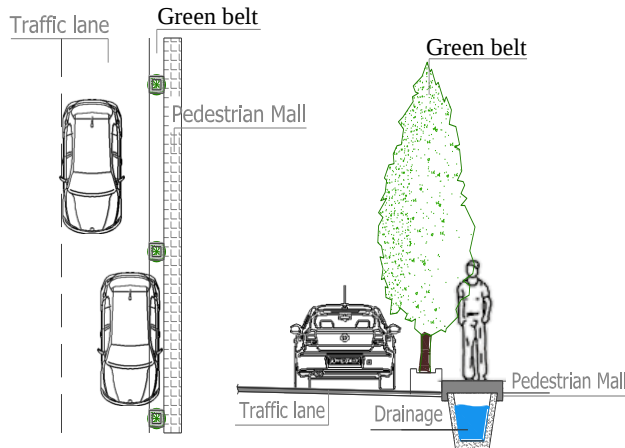


Figure 13. Alternative I.

Based on the picture above, the plant must use a container of pots, so that the existing asphalt is not damaged. The selected plants are red shoots (*Syzygium oleana*). This plant has a rounded stem and hard. The red buds grow high so that the view is not disturbed. Red shoot tree planting can be done in the garden and inside the pot container.

This tree plants with a distance of ± 5 meters, so there will be a space between the two plants formed as roadside. The roadside is part of the road area adjacent to the traffic lane to accommodate the stop vehicle, emergency purposes, and for side support for the bottom layer, and the surface layer (RSNI T-14-2004).

Positive impact of this alternative is the formation of the roadside, the presence of plants as a steer and aesthetics on the road Lilawangsa.

The adverse impact is the width of the traffic lane is reduced (6.5 m) and not in accordance with the standard width (Table 3).

- 2) *Alternative II: Utilize the space available between rumija and ruwasja road. However this is a bit difficult to implement because not all the way is available (Alternative II a- Figure 14). This alternative is also recommended to utilize the building yard which is still in ruwasja street to become part of the green belt. Types of plants used are those that can be use as shade (Alternative II b- Figure 15).*

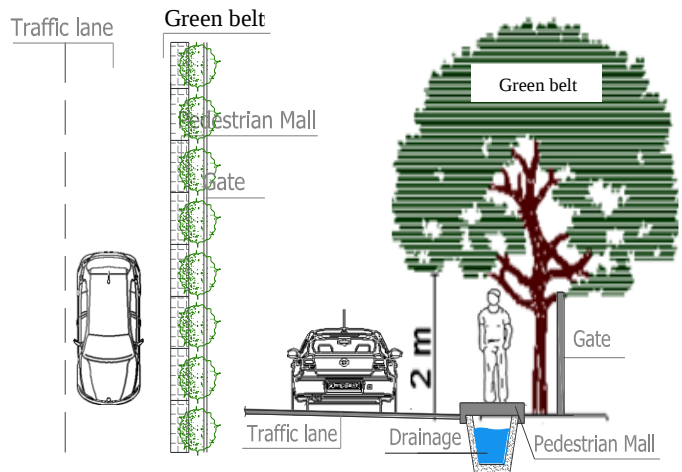


Figure 14. Alternative II a.

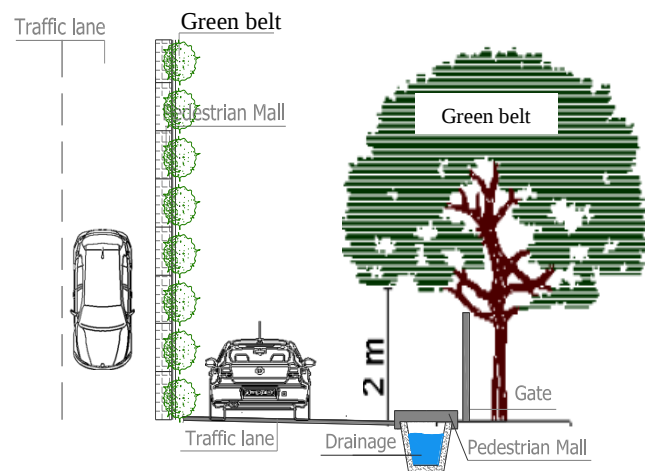


Figure 15. Alternative II b.

Plants that suitable for this alternative are the cape trees (*Mimusops elengi*) or trees with the same function. This kind of tree can be use as a shade plant, noise reducer, and wind breaker. This tree has the characteristics for growing 2 meters branch above the ground and do not ducked, so it will not disturb the pedestrians, solid leaf, derived from seed propagation, and not easily uprooted. This tree will be planted in a line with a distance of <2 meters.

The positive impact of this alternative is the traffic path of Lilawangsa road is not disturbed, neither the width nor the road construction and plants as a guide, shade, noise absorbers, wind breakers and aesthetics on the road Lilawangsa. The adverse impact is there is no available space on the drainage side all the way, and there should be clear rules regarding to the utilization of ruwasja.

Taking into both alternatives, it should be integrated between Alternative I and Alternative II. The author tries to reduce the negative impact of both alternatives through alternative III.

- 3) *Alternative III : green belt planning is done as in Alternative I, but only on one side of the road, so that the width of the traffic line remains in accordance with the standard, which is 7 meters. While on the other side utilize the available space on the drainage edge (Figure. 16 dan Figure 17).*

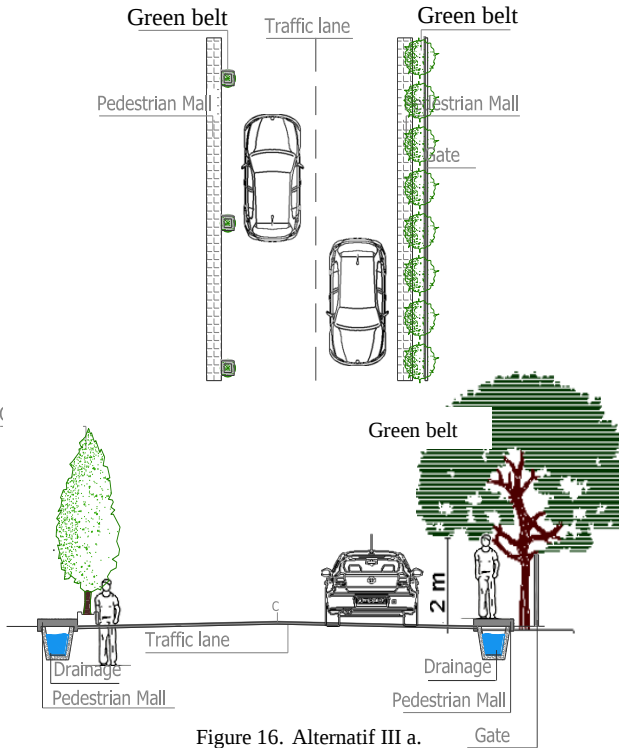


Figure 16. Alternatif III a.

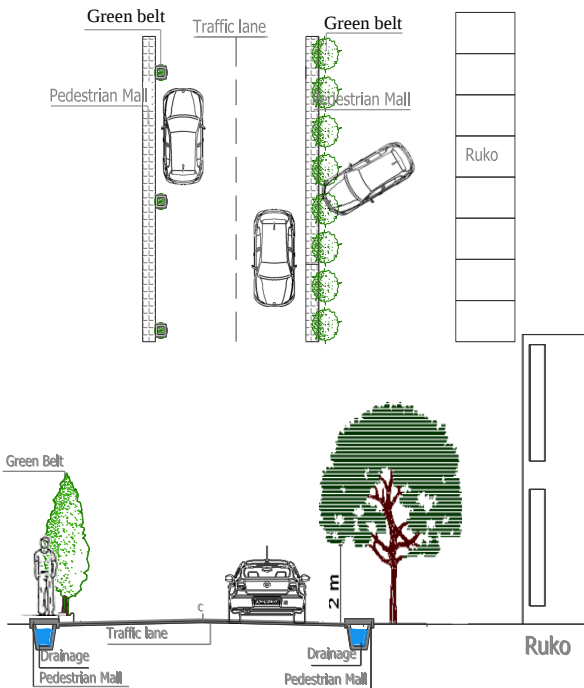


Figure 17. Alternatif III b.

Selection of the road side to be planted depends on the availability of space on the drainage rim, whereas the selection of plant follows both of the above alternatives. Road segment that is utilized for shophouses should use alternative II, so that will form an imaginary fence that serves as a barrier. In addition, the plant can also be used as a shade for vehicles parked in the yard shop.

Based on the discussion presented above, then every development must be through a good planning and attention to existing standards. Comprehensive planning of all related aspects, in this case related to roads and facilities, will result in facilities that can be enjoyed by all those in need.

IV. CONCLUSION

The conclusions that can be drawn from this writing are:

- 1) *The improvement of Lilawangsa road Langsa city has not met the standards as a collector road. There are still parts of the road that are not available and not in accordance with the applicable standards such as the unavailability of roadside and pedestrian path, the availability of limited parking facilities, and the standard size rumija <15 meters.*
- 2) *The facilities arrangement of pedestrians and greenways, using Alternative III. In addition to the complete facility, the plan is also have to pay attention to the space for available road sections.*

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