



# BANDA ACEH

Recommendations to improve walking and cycling



 IMT-gT



Draft Report  
October 2019

## **Banda Aceh NMT Improvements Project**

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## 1.1 Background

Institute for Transportation and Development Policy (ITDP) is commissioned by the Asian Development Bank (ADB) to bring about new ideas and approach to urban transport improvement in few cities as part of the Indonesia Malaysia Thailand Growth Triangle or IMT-GT.

ITDP provides technical assistance under the contract to work in multiple cities starting from meetings with stakeholders to field data collection.

The field work in Banda Aceh started in August 2019. ITDP alongside with Willem Bouwer, hired also by ADB, as a parking specialist. The team collected data and directly experienced the situation to have better understanding of the problems and come up with potential improvements.

The team also attended several meetings with Banda Aceh city government such as the planning agency, transport agency and public works agency. The city government has initiated non-motorized transport improvement but there is lack of support in terms of relevant study and finance to implement the plan.

## 1.2 Work Objective and Scope

The objective of this report is to produce guidance and direction of improvements to achieve green transport and low-carbon mobility in Banda Aceh. In order to move forward more efficient mobility, the city should put effort and prioritize the choice of more sustainable and eco-friendly transport for the local residents.

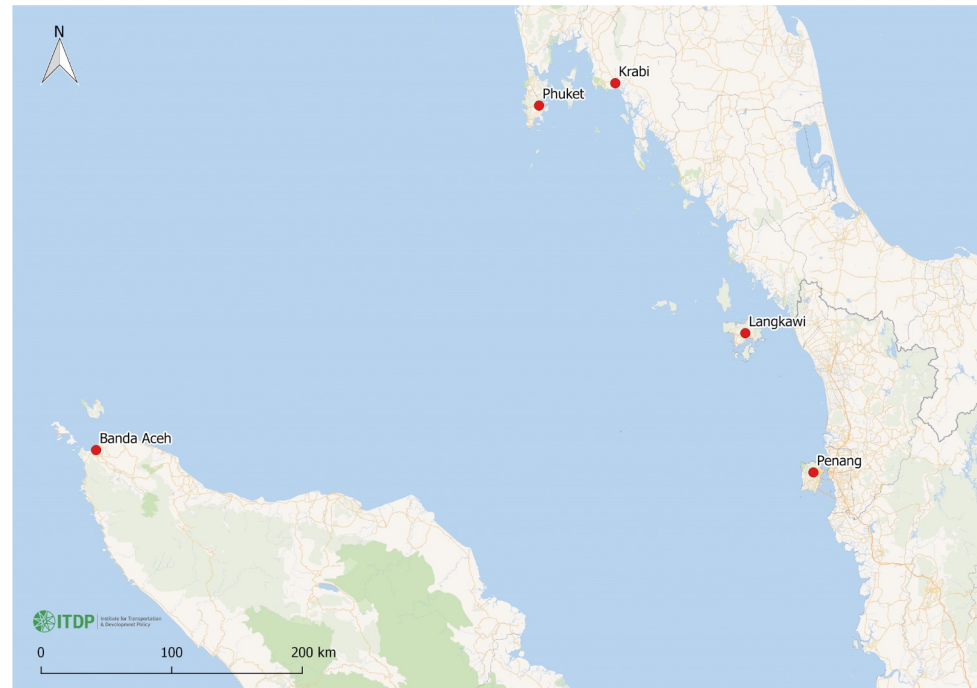
In this assignment ITDP will focus on non-motorized transport improvement in the city centre of Banda Aceh. This report provides the urgency of rapid enhancement for pedestrians and cycling infrastructure. Initial designs of each initiative are explained and visualized for stakeholders to understand the ideas. Furthermore, more detail study for the interventions should be undertaken in the future in order to finalize and implement the design.

## 1.3 City Overview

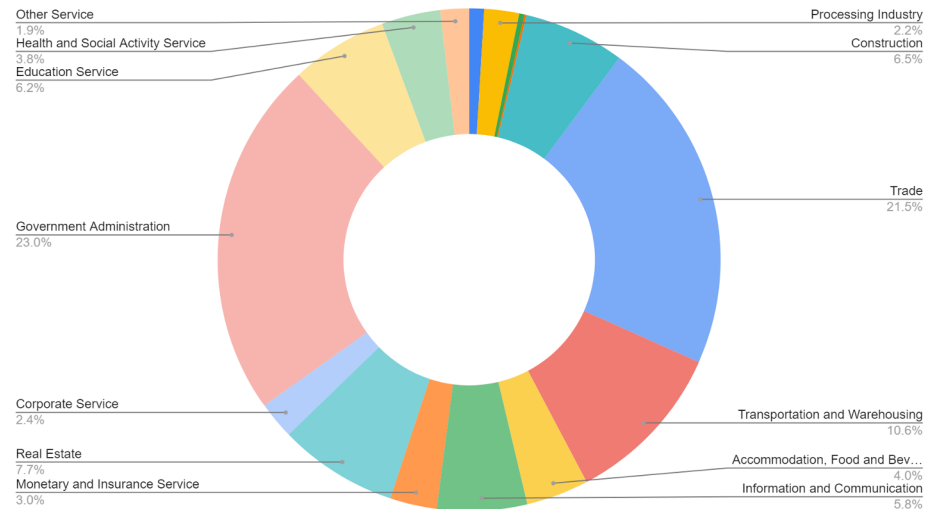
Banda Aceh is the capital city of Aceh, the most west province in Indonesia and located on Sumatra Island. According to the National Statistics Bureau, Banda Aceh has 259,913 inhabitants in 2017 with 1.96% growth and projected to be 482,131 in 2029. The city covers 61.36 km<sup>2</sup> and consists of 9 districts including Meuraxa, Jaya Baru, Banda Raya, Baiturrahman, Lueng Bata, Kuta Alam, Kuta Raja, Syiah Kuala, Ulee Kareng.

The economy in Banda Aceh is generally dominated by government administrative, trade, service activity and tourism, aside from fishery. In 2017 there are 288,353 total annual tourists in Banda Aceh which consists of 272,079 local tourists and 16,274 foreign tourists.

Based on the spatial planning document, the city of Banda Aceh is developing to Islamic tourism covering natural, cultural, tsunami, culinary and education tourism. The city also has the “Waterfront City” program to maintain the sustainability and the beauty of the river.



Banda Aceh Gross Regional Domestic Product (2017)





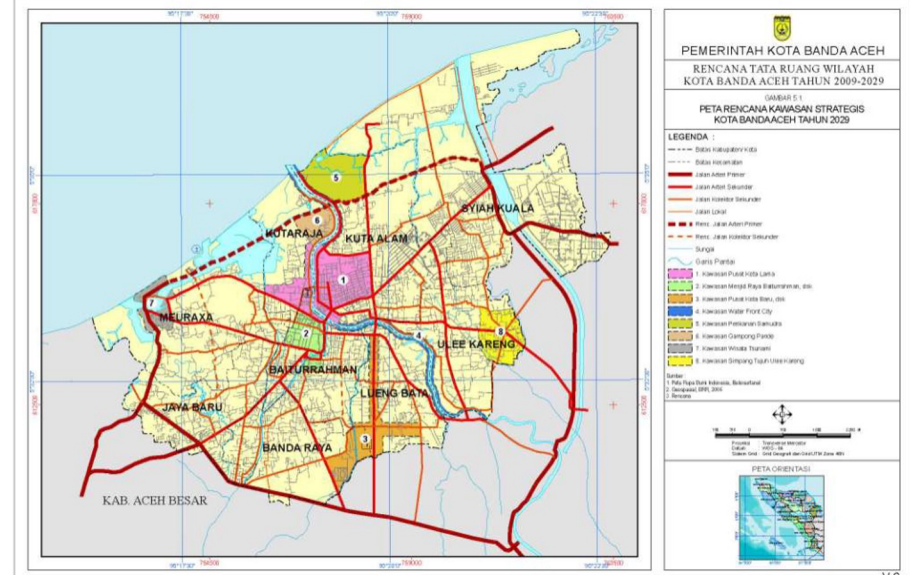
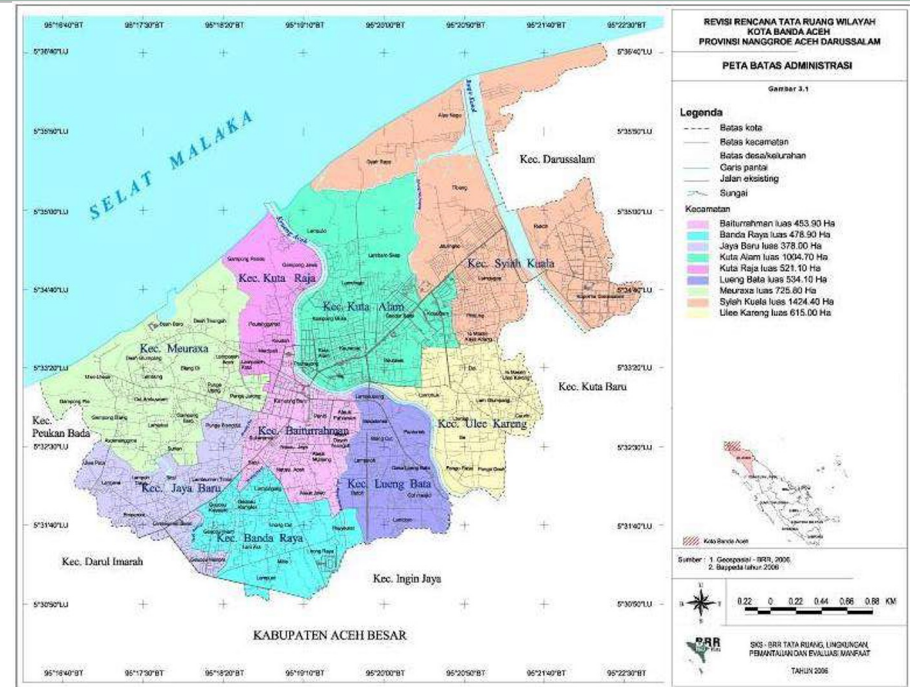
## Strategic Zones

The objective of city planning in Banda Aceh is to be a service city with the value of islamic, civilized, modern and based on disaster mitigation. There are 8 strategic zones to support the economic growth of Banda Aceh:

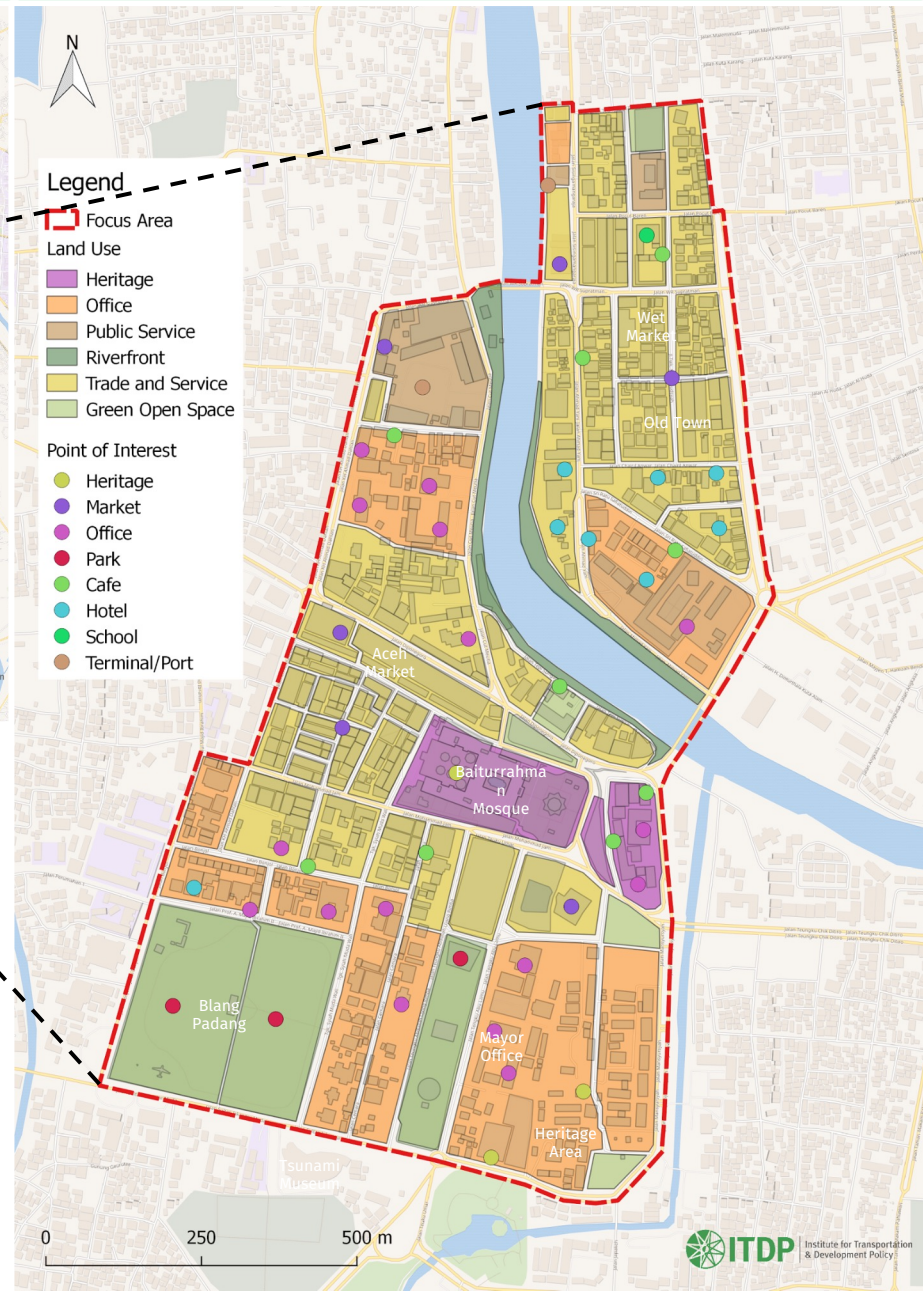
- Zone 1: Old Town (Aceh Market, Peunayong)
- Zone 2: Baiturrahman Mosque
- Zone 3: New City Center Development
- Zone 4: Waterfront City (Krueng Aceh)
- Zone 5: Fishery (Perikanan Samudera in Lampulo)
- Zone 6: Heritage (Gampong Pande, Peunayong and Neusu)
- Zone 7: Tsunami Tourism
- Zone 8: Simpang Tujuh Ulee Kareng

Old town revitalization, waterfront city and new city center development are the prioritized package and the government opens the possibility for the investors to inject the capital or donor agency to develop the locations.

The maps on the right show the district boundary (above) and the planning of strategic zones in Banda Aceh (below).



# 2. NMT Scope and Objective



## 2.1 Focus Area

The scope for the study is directly at the city centre where the activities of the people are concentrated. The focus boundary area covers some strategic zones as explained in the city master plan.

The activity centres within the boundary consist of Baiturrahman Mosque, Aceh Market, old town, government offices and the waterfront.



### General Situation

- The focus area in Banda Aceh city centre is around 1.1 km<sup>2</sup>. The area is reachable within walking and cycling distance. However, the people is faced with unfriendly walking environment. It is common to experience narrow and fragmented sidewalks. Obstacles along the sidewalks are also often blocking the way for pedestrians to walk.
- There are only few street segments that has been improved by the city government. The sidewalk is wide, shaded with trees and provided with adequate lighting. This good example is located in front of the mayor office.
- On-street parking is one major issue in the city. It occupies plenty amount of street space particularly angled car parking. Based on the observation, there is still no firm policy for parking. Therefore, parking space for motorized vehicles is abundant and provided on almost on every streets.
- The activities of people is centralized in central market, wet market and the old town area. It is the economic activities such as trade that generate attraction in the city.
- The city is lack of bicycle infrastructure. On the other side, Banda Aceh is considerably flat with compact city centre. Therefore, daily cycling activities is not popular. It is possible to boost the number of people on bike with proper cycling infrastructure.





### Jalan Pangeran Diponegoro



Jalan Pangeran Diponegoro is the street in front of Pasar Aceh with approximately 17.1 meter wide from wall to wall. This is the typical of street in Banda Aceh city centre where the space is still heavily designed for motorized vehicles.



## 2.2 Current Situation

Jalan Pangeran Diponegoro



**86.7%** of the road space is used for motorized vehicle.



## Sidewalk and Crossing Conditions

- Sidewalks are built in fragment and often interrupted by driveways for cars and motorcycles entering and exiting the buildings.
- Main streets in Banda Aceh are mostly designed for motorized vehicle, shown by poor sidewalk quality with less than 2.5 meter wide.
- Instead giving space for pedestrians, the streets are also dominantly occupied by on-street parking.
- Number of crossings are limited and only located at the intersections. People have to cross carefully to ensure the vehicles are giving the way.
- Some potential locations for crossing do not provide the facility while many of the existing (zebra) crossings are fading away.





### Cycling Conditions

- Cycling is part of green transport with health benefit and zero pollution. Banda Aceh has the potential to be developed as a cycle-friendly city.
- People on bike with various ages, gender and occasions are occasionally seen on the street even though with limited cycling infrastructure.
- In order to boost the number of people on bike, the city government needs to put more attention to cycling infrastructure such as bike lane and bike-share.
- It is important to design dedicated, continuous, and connected network of bike lane in the city centre as pilot project.





### Riverfront Conditions

- The riverfront is an ideal place in the city centre for people to gather and have communal activity.
- The total length of the riverfront is approximately 835 m. However, the existing enhancement is only done in the middle section along 190 m.
- The rest of the segment are still in soil condition and needs to be paved.
- There is significant difference in elevation with the road. Therefore, it is important to have inclusive access. The provided access is stairs with steep slope.



### List of issues, objectives and measures for Banda Aceh

Issues	Objective	Measures
<b>Walking</b>		
<ul style="list-style-type: none"> <li>• Less priority for the pedestrians, shown by the street allocation</li> <li>• Lack of adequate and proper sidewalk infrastructure for pedestrians as connection between point of interests</li> </ul>	<ul style="list-style-type: none"> <li>• To have more people walking in the city centre especially for short-distance</li> </ul>	<ul style="list-style-type: none"> <li>• Street redesign and sidewalk revitalization</li> </ul>
<ul style="list-style-type: none"> <li>• Lack of pedestrian crossings in town which makes people in danger to cross the street</li> </ul>	<ul style="list-style-type: none"> <li>• To create safer crossing experience</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of crossing facility placed on consistent and fit location where people get used to cross</li> </ul>
<ul style="list-style-type: none"> <li>• Discontinued existing waterfront with limited access</li> </ul>	<ul style="list-style-type: none"> <li>• To implement continuous, inclusive and enjoyable walking experience along the waterfront</li> </ul>	<ul style="list-style-type: none"> <li>• Waterfront enhancement as a public space in the city center</li> </ul>
<b>Cycling</b>		
<ul style="list-style-type: none"> <li>• No cycling facilities to get around and explore the city with a bicycle</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce the use of cars and motorcycles trip</li> <li>• Promote cycling as one of the main transport modes</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of safe cycling facilities including bike lane and potentially bike-share</li> </ul>

## 2.4 Focus of Improvements



### Connectivity improvement

The improvement on connectivity is focusing on space reallocation and design prioritization for pedestrians and cyclists over cars and motorcycles especially on the area where the pedestrian volume is high. Safety is also another issue due to poor sidewalk quality and lack of crossings especially at the junctions. Walking experience can be improved with the following measures:

- Street redesign, prioritizing the space for pedestrians and cyclists
- Provision of crossings at every junction legs and precise places where people naturally cross the street
- Continuous and enhanced riverfront



### Cycling facility improvement

Although there are not many cyclists in Banda Aceh, the city centre is an ideal area for cycling. The city contour is considerably flat and there are various center of activities within the focus area including the grand mosque, markets, old town, riverfront and government offices.

The existing condition is not ideal for cycling not only from convenience but also from safety issue. There are no dedicated lanes so people have to mix with other speedy motorized vehicles. In addition, the bike-share can be introduced for short-distance journey to induce more cyclists. In order to move forward as a cycling-friendly city, these are the measures that shall be introduced:

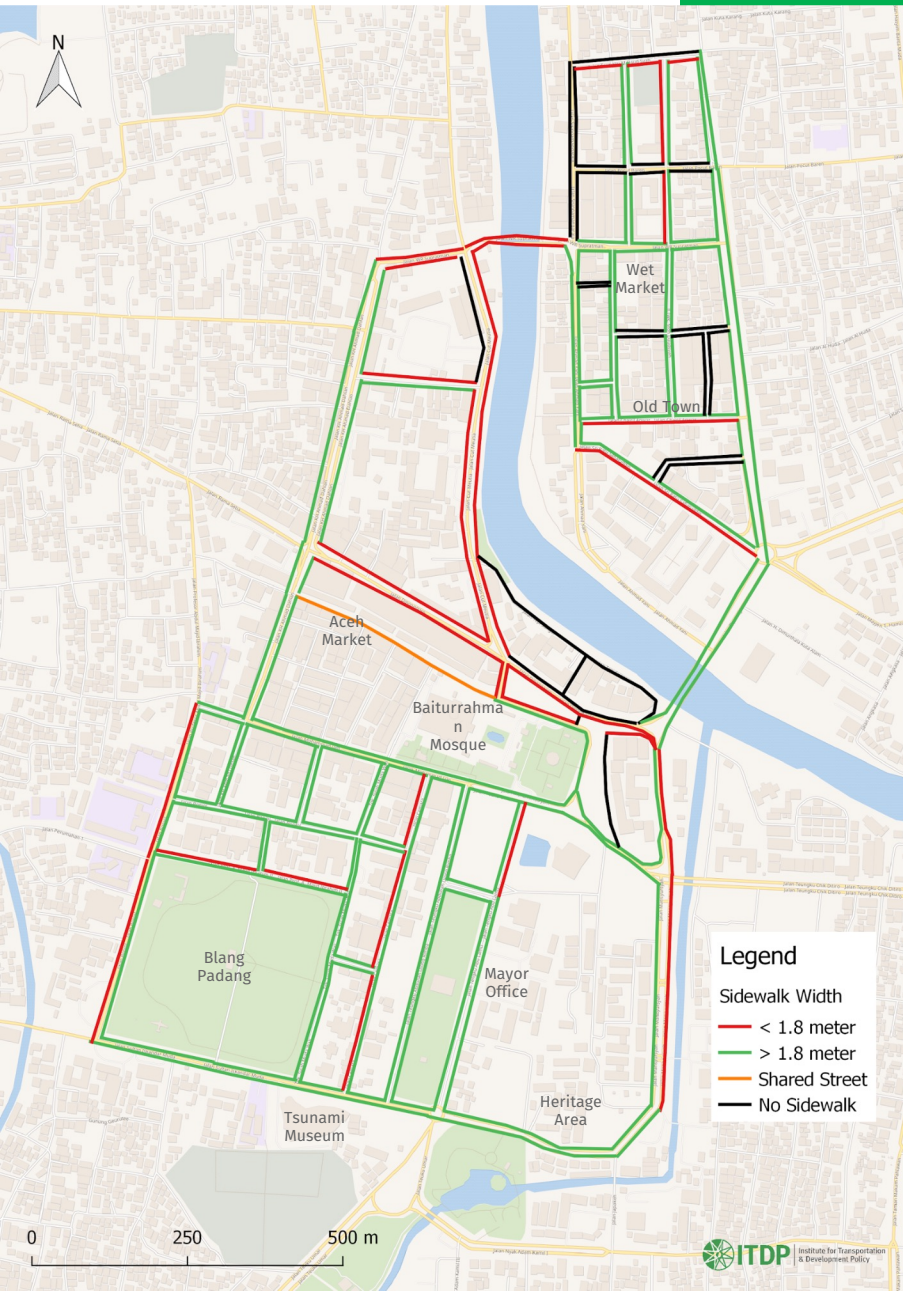
- Safe cycling network and infrastructure
- Bike-share implementation



## 2.5 Surveys and Findings

Survey Activity		Objective	Methodology	Outcome
Traffic	Peak-hour pedestrian volume	To identify high-priority streets for pedestrian improvements.	Walking and counting the number of pedestrian passing by on every street within the scope area, during the peak hour.	Map of pedestrian volume on every street within the scope area.
	Pedestrian crossing movement	To identify the potential crossings to be improved and/or added.	Marking the locations where pedestrian crossing activities occur, on a map.	Map of pedestrian crossing locations within the scope area.
	Motorized traffic count	To identify motorized traffic volumes for potential reorganization of traffic lanes (number of lanes and directions).	Recording several videos of the traffic condition on selected intersections, where the traffic reorganization is preferable.	Map of motorized traffic volume on the selected streets.
Infrastructure	Sidewalk	To identify the width of the sidewalks in the selected scoping area.	Documentation of the existing width of the sidewalks in the scope area, on a map.	Map of the sidewalk width improvements and recommendations, including the cross section designs of the corresponding streets.
	Active frontage	To identify the roads which have active frontage.	Marking the active and no active frontage on GPS by walking stroll the focus area.	Maps of active frontage on every street within the scope area.
Activities	Public Space	To reactivate public space to get more visitors.	Marking the public space location which need some improvements.	Plan of activities on the public space which need activation improvement.

# 2.5.1 Findings: Sidewalk Width



### Survey Methodology

Conduct the survey for cross section documentation and measure the width of the sidewalks with specific tool such as laser meter.

### Findings

The sidewalk quality in city centre varies. Based on the mapping, some segments are wide enough mostly around government offices. The issue is on walking obstruction from parking, vendors or utilities. On the segments in red, sidewalk should be widened to at least 1.8 meter especially in front of the market (Jalan Diponegoro). There are still segments in black that should be provided with dedicated sidewalk to ensure safety and comfort for pedestrians. 1.8 meter is used as the standard to accommodate two wheelchair users passing by.

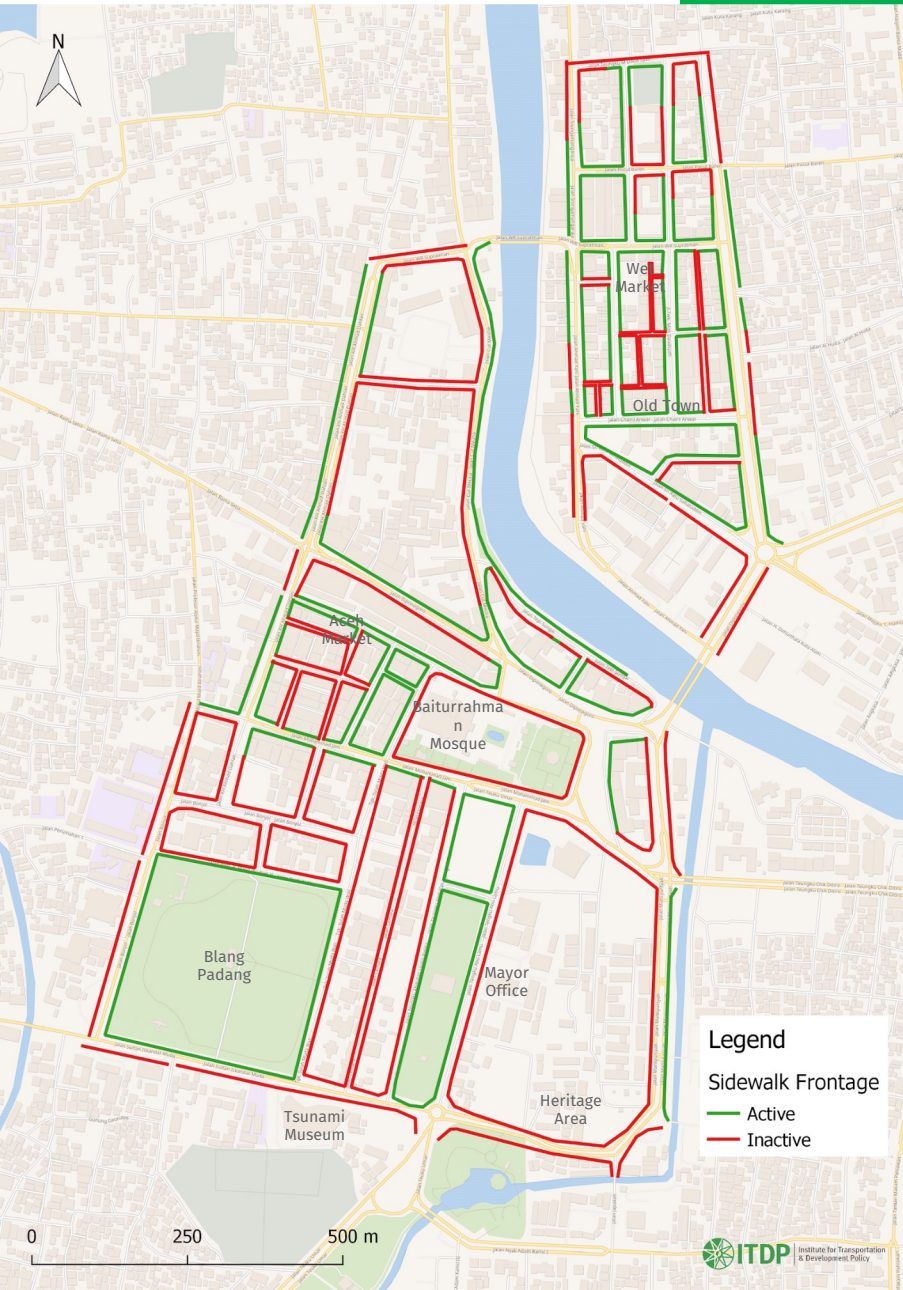


Typical of walking obstruction around the old town



Some streets have no sidewalk at all, forcing pedestrians to be mixed with cars





### Survey Methodology

GPS marking to map different frontage activity along the walk.

### Findings

Streets on market and heritage area are generally have active frontage that consists of shop fronts, glass window, open-air seating or cafe that makes walking more attractive and enjoyable. On the other hand, streets on government offices are considered as inactive due to fences and walls from the buildings.



Active frontage around the old town



Inactive frontage in front of Baiturrahman mosque



## 2.5.3 Findings: Pedestrian Volume

### Survey Methodology

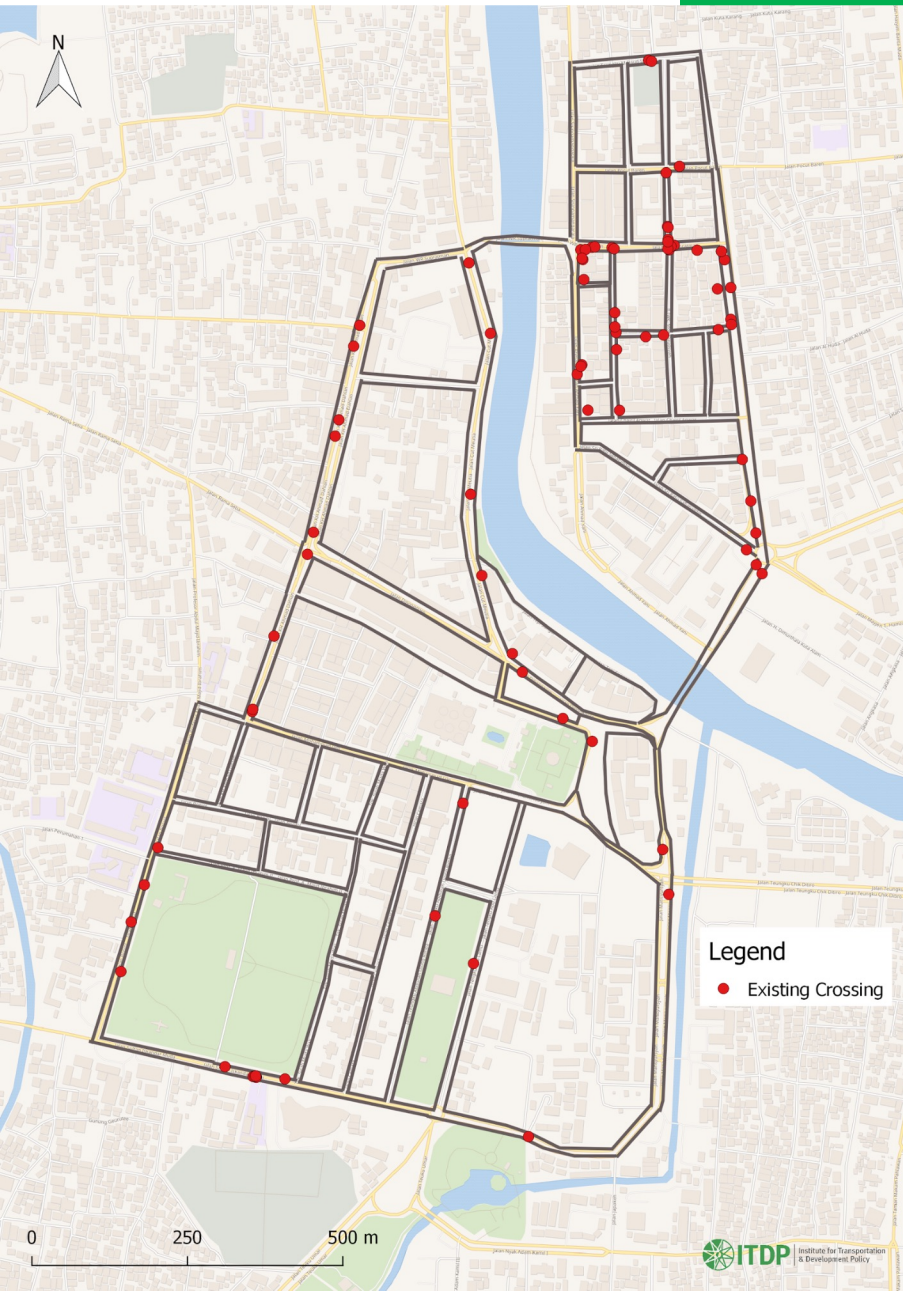
Pedestrian movement counting by walking along the streets. This survey was done during the evening.

### Findings

Pedestrians are concentrated on Jalan Diponegoro in front of the market where the entrance and active shops located on the left side. Jalan Tengku Chik Pante Kulu is also the activity centre where the street is mostly covered by tarp as shades and vendors use the street to sell their stuffs.



## 2.5.4 Findings: Crossing Locations



### Survey Methodology

Marking the existing crossing facility with GPS device.

### Findings

Pedestrian level crossings are mostly located on the intersections. However, not all intersections are provided with crossings.

The mid-block crossing, which can help to reduce distances between crossing locations, are only available on few street segments. It should be placed every 200-300 m.



# 2.5.5 Findings: Traffic Volume



## 3. Connectivity Improvement

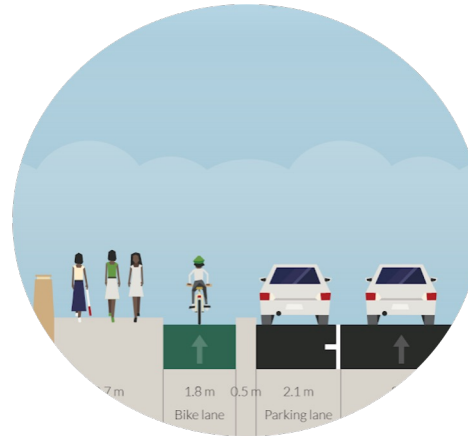
### Goal of Improvement

The goal of connectivity improvement is to prioritize pedestrian and people on bike by creating accessible walking facility, safer crossing and biking experience.

### List of Improvement Projects

The projects that can be immediately implemented to support green transport in Banda Aceh are as follows:

- Street reconfiguration and sidewalk enhancement to prioritize the movement of the pedestrians
- Provision of bike lane network
- Riverfront activation as attractive public space



Street reconfiguration



Wide and attractive sidewalk



Dedicated bike lane



Riverfront activation



# Existing Street Condition



Most streets have wide traffic lanes, narrow sidewalks and abundant on-street parking. The city should rethink the way of redesigning the street for people.



# 3.1 Sidewalk Enhancement



Prioritization for pedestrians in Rio de Janeiro



Clear, continuous and active sidewalk in Nairobi

## The Principles

### 1. Obstruction-free

Walkways need to be clear from any obstructions. Electrical pole, sign post, street lights, bench, hydrant, trees, pots, parking meter are all important but they all have to be aligned on specific space to give exclusivity for pedestrians to walk.

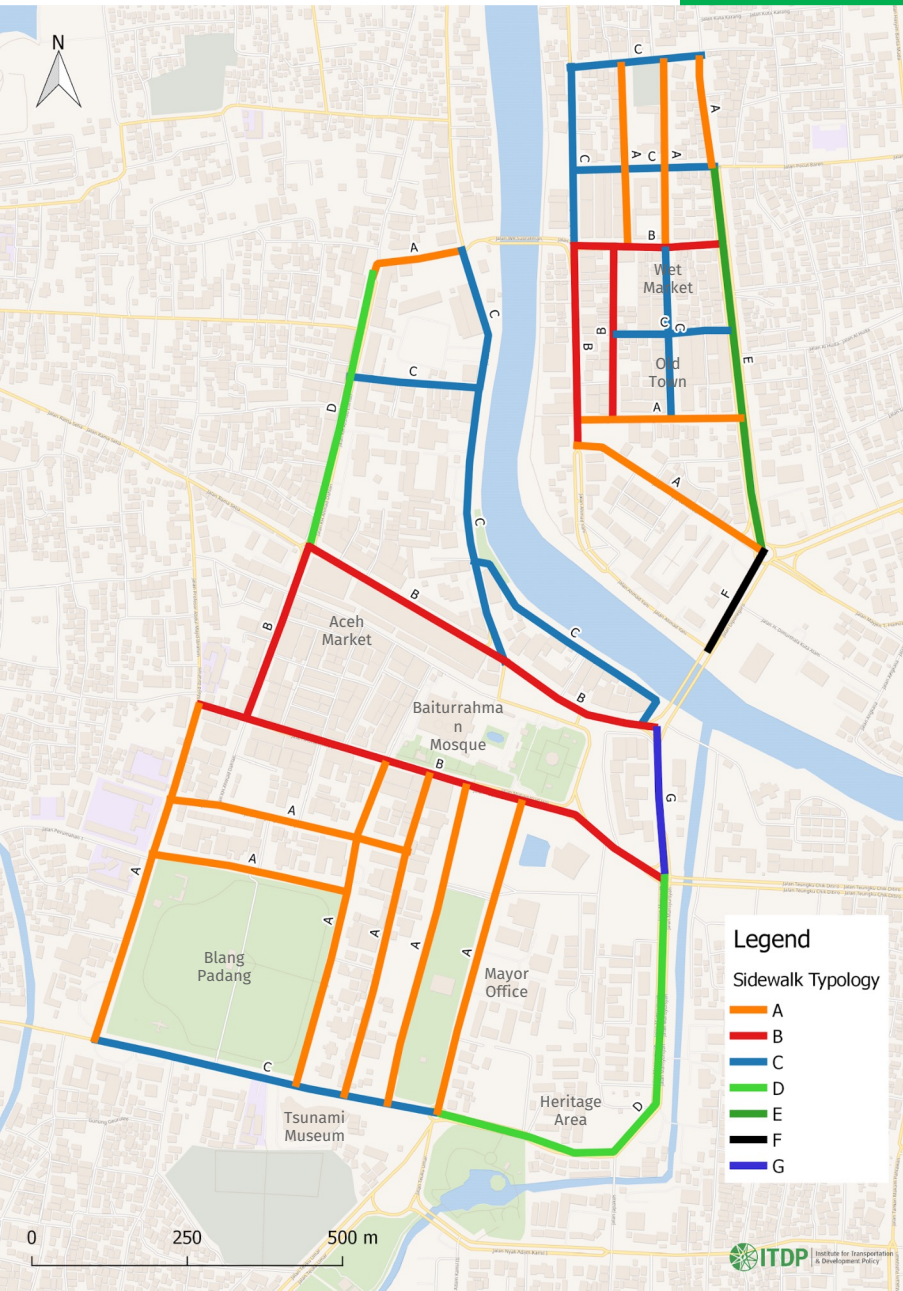
### 2. Separation from motorized vehicle (bollards/buffer zone)

On an exclusive sidewalk next to high volume motor vehicle streets, the safety of pedestrian is ensured by providing a clear separation between pedestrian and motorized vehicles. This can be done by lining up street furniture and utilities on the outer side of the sidewalk or using bollards to protect pedestrians from the vehicle. Bollards are also great tools to prevent the encroachment of sidewalk from cars and motorcycles parking.

### 3. Continuity over driveways and intersections

Giving priorities to the pedestrian can be done by raising walkways over intersections and driveways. Pedestrians need a continuous and leveled walkways more than cars and motorcycles need on the traffic lane. By raising the walkways, motorized vehicles are also forced to slow down their speed, which makes the pedestrian safer to cross the road.

# 3.1.1 Street Design Template



Cross section survey was conducted in Banda Aceh to see the typical street dimension and adjust the existing right of way to prioritize pedestrians and people on bike.

- There are 7 street typologies. Each typology detail is explained on the next pages.
- The typology is based on traffic direction, number of lane and the width of the street wall-to-wall
- The existing one traffic lane is considerably too wide with the range from 3.2 m to more than 4 m.
- Most of the streets are available for on-street parking for cars and motorcycles. The existing width of on-street parking space can be more than 3 m.

## Recommendations

- Reduce the width of one mixed-traffic lane to 3 m.
- Parallel parking is much preferred over angled on-street parking.
- The width reduction of mixed-traffic and on-street parking is converted to more space for sidewalk.
- Provision of sidewalk when the existing is unavailable and prioritization over on-street parking.
- Add trees or canopy for shading to make walking more convenient.



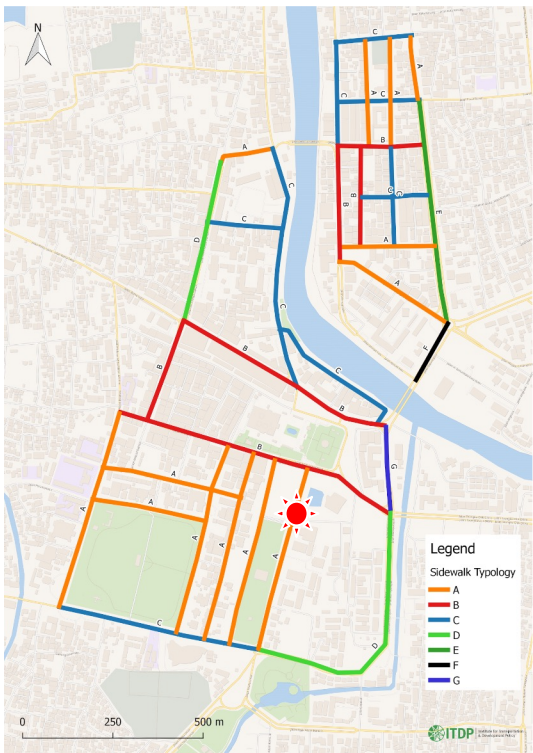
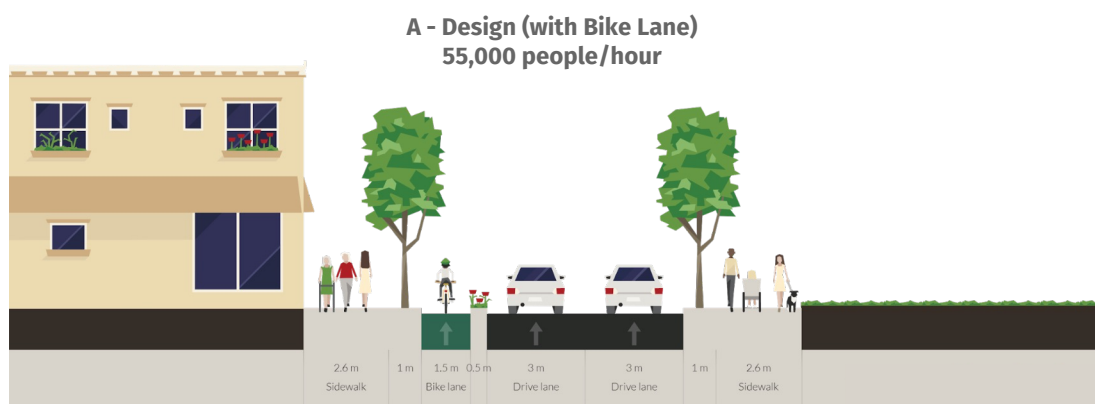
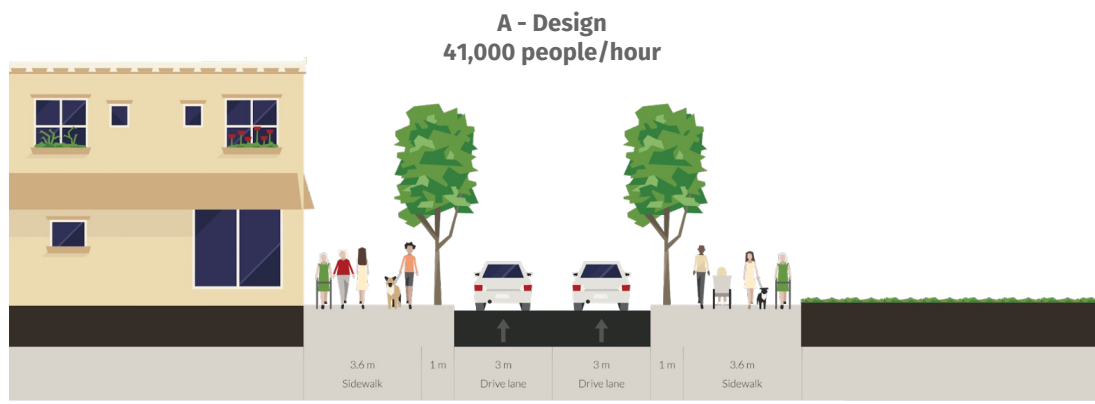
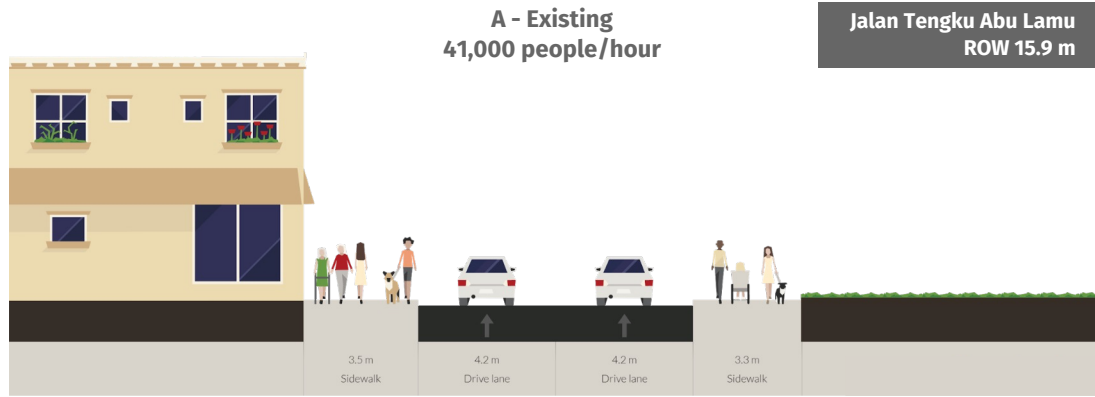
# 3.1.1 Street Design Template (A)

**Jalan Tengku Abu Lamu**  
ROW 15.9 m

**Typology A (ROW 11.7 - 17.2 m)**  
**1-way 2-lane**

Design features

- Reduce the width of car lane
- Widen sidewalk area
- On-street parking restriction
- Add trees
- Add bike lane

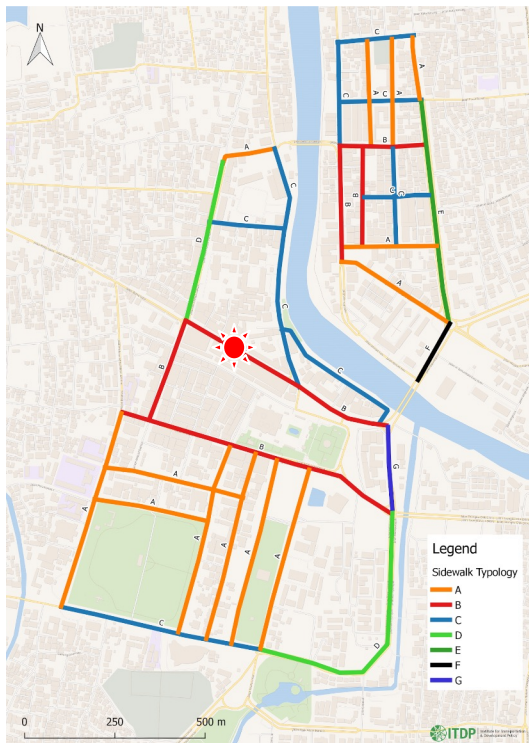


# 3.1.1 Street Design Template (B)

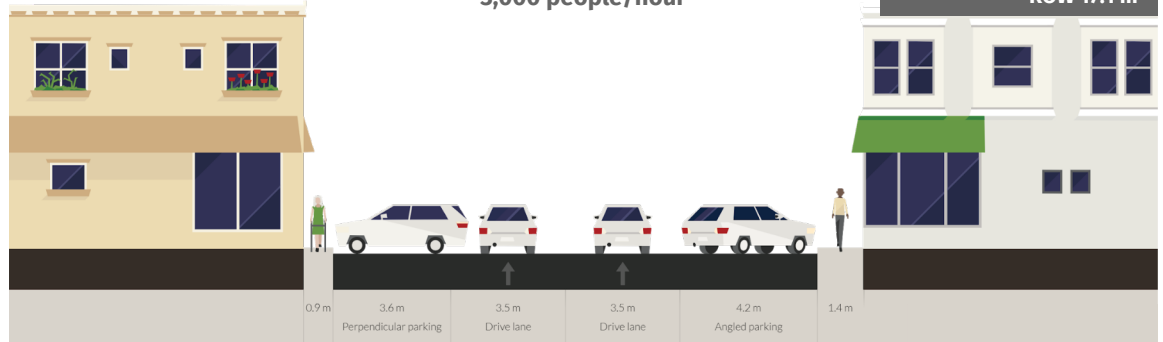
**Typology B (ROW 17.1 - 26.1 m)**  
**1-way 2-lane**

Design features

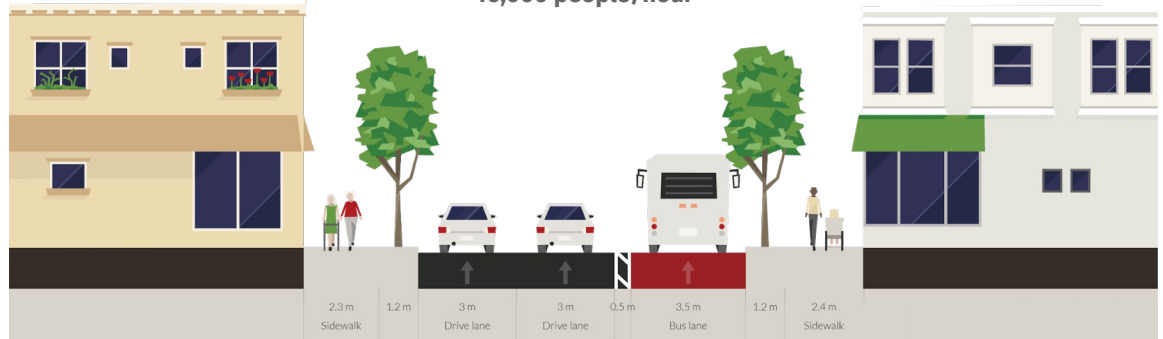
- Reduce the width of car lane
- Widen sidewalk area
- On-street parking restriction
- Add trees
- Add bus lane
- Add bike lane



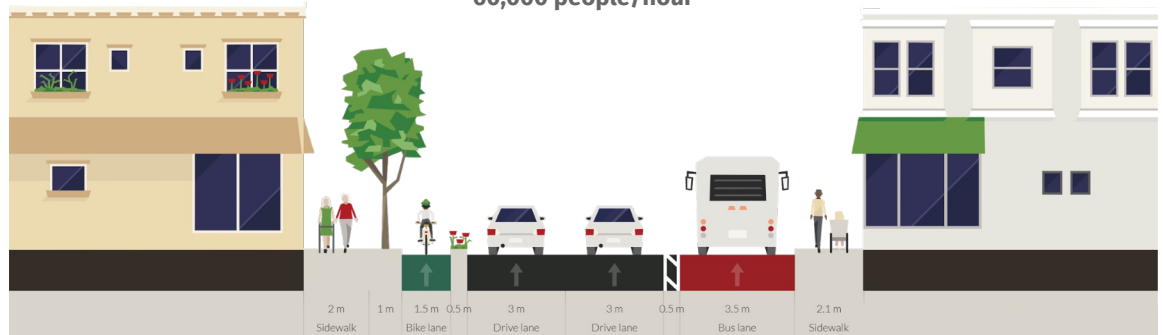
**B - Existing**  
 3,000 people/hour



**B - Design (with Bus Lane)**  
 46,000 people/hour



**B - Design (with Bus and Bike Lane)**  
 60,000 people/hour





# 3.1.1 Street Design Template (C)

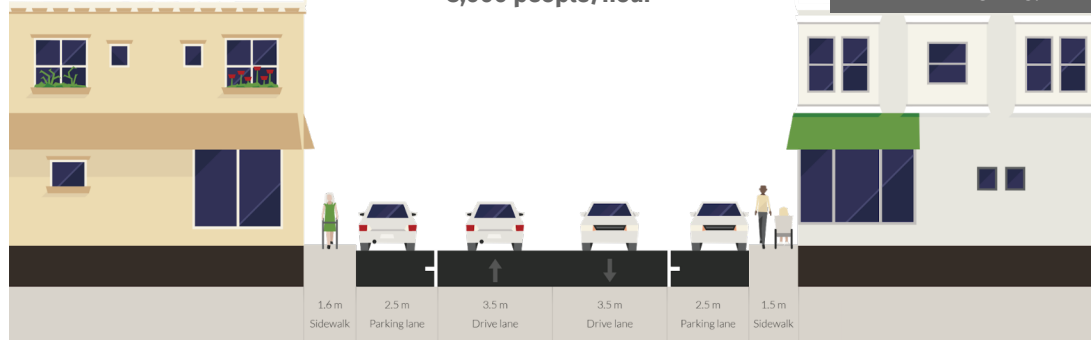
**Typology C (ROW 11.3 - 23.6 m)**  
**2-way 1-lane**

Design features

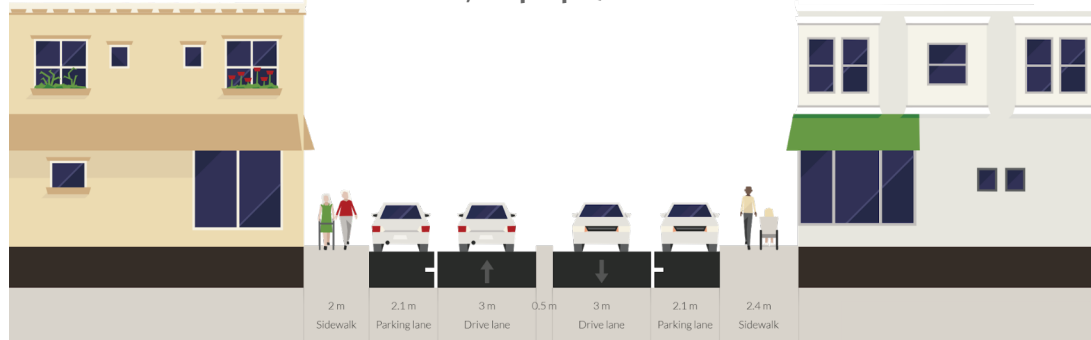
- Reduce the width of car lane
- Widen sidewalk area
- Add separator as road median
- Reduce the width of on-street parking
- Add bike lane on both side



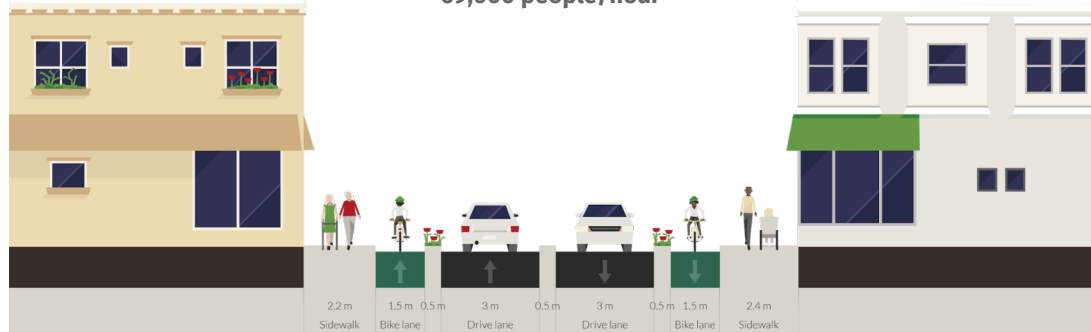
**C - Existing**  
 3,000 people/hour



**C - Design**  
 41,000 people/hour



**C - Design (with Bike Lane)**  
 69,000 people/hour

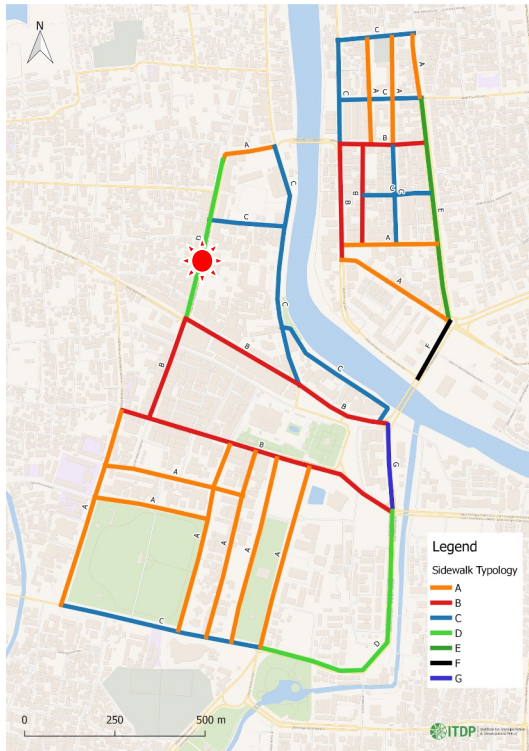


# 3.1.1 Street Design Template (D)

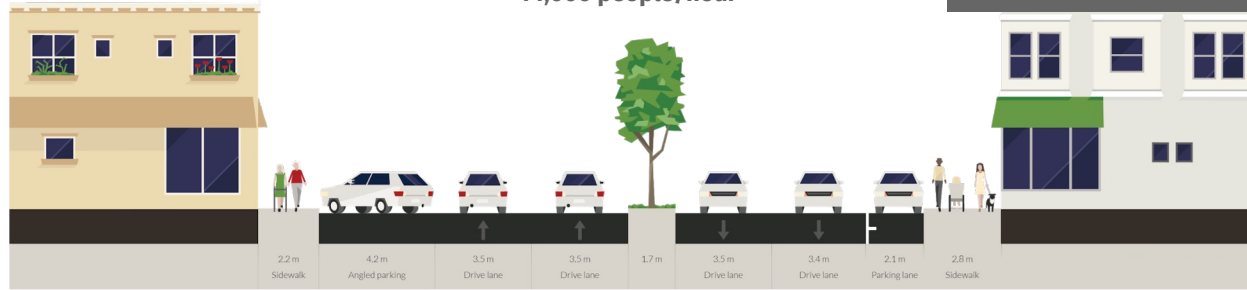
## Typology D (ROW 21.1 - 26.9 m) 2-way 2-lane

### Design features

- Reduce the width of car lane
- Widen sidewalk area
- Only parallel on-street parking is allowed
- Add trees
- Add bike lane on both side

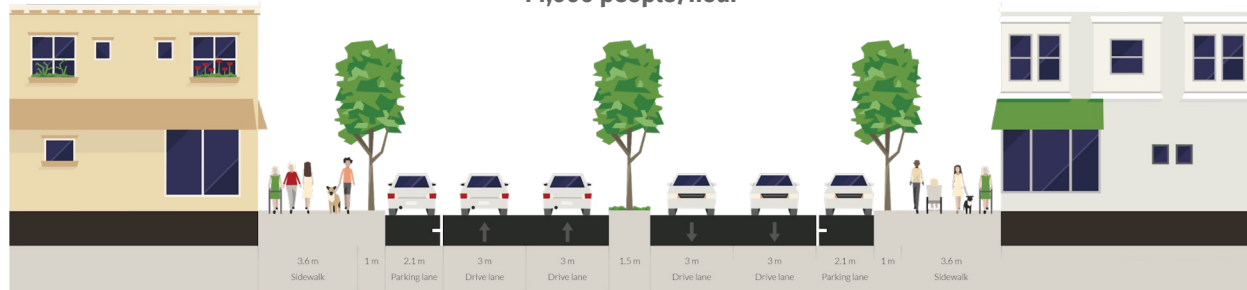


**D - Existing**  
44,000 people/hour



**Jalan KH. Ahmad Dahlan**  
ROW 26.9 m

**D - Design**  
44,000 people/hour



**D - Design (with Bike Lane)**  
72,000 people/hour





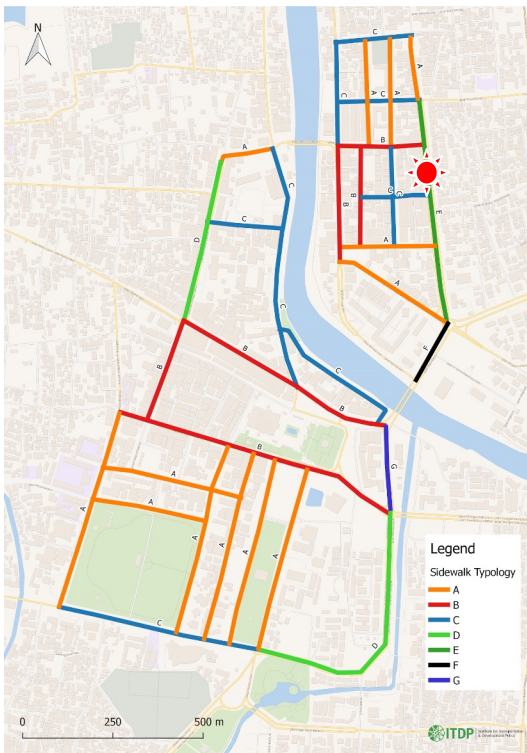
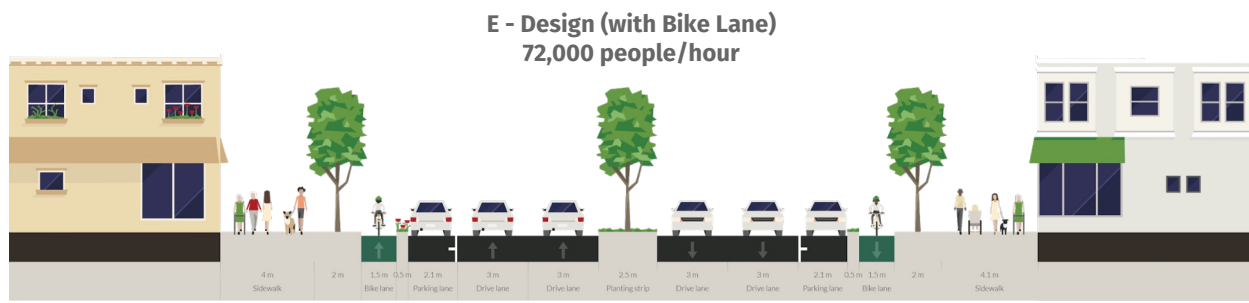
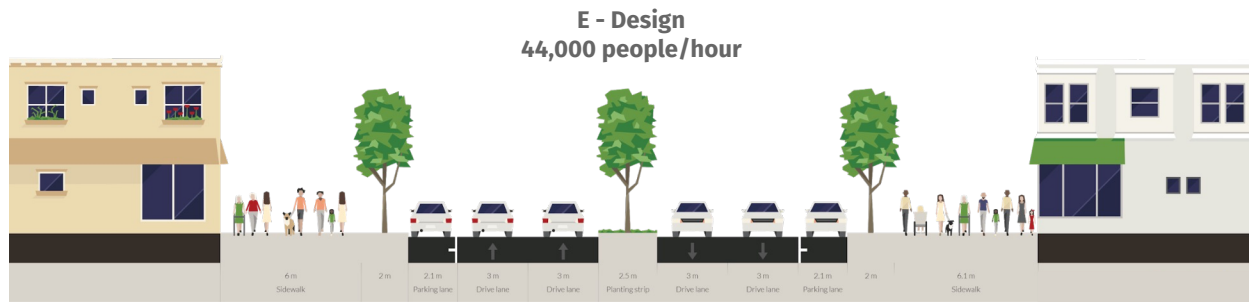
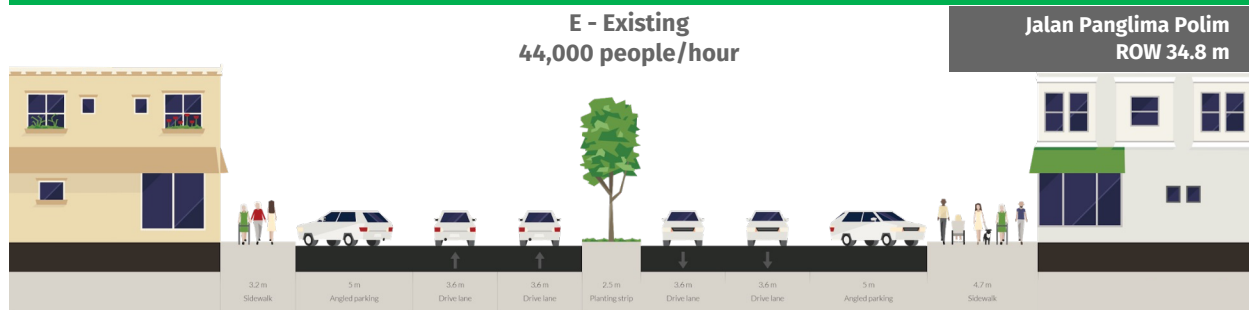
# 3.1.1 Street Design Template (E)

Jalan Panglima Polim  
ROW 34.8 m

**Typology E (ROW 34.8 m)**  
**2-way 2-lane**

Design features

- Reduce the width of car lane
- Widen sidewalk area
- Only parallel on-street parking is allowed
- Add trees
- Add bike lane on both side



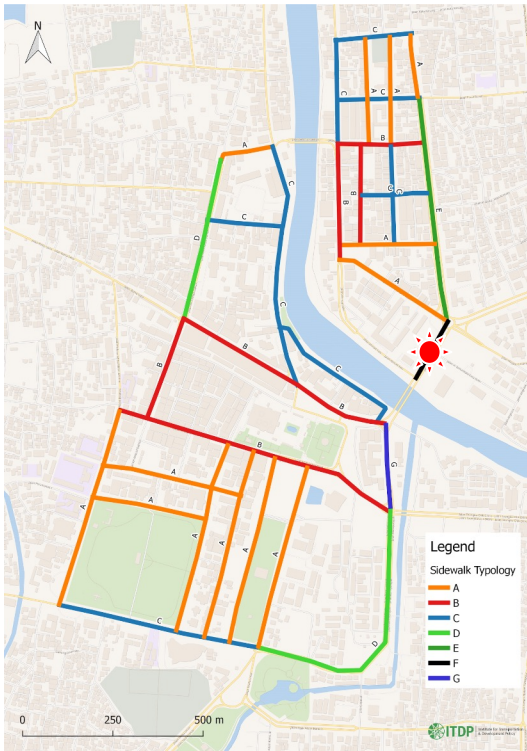
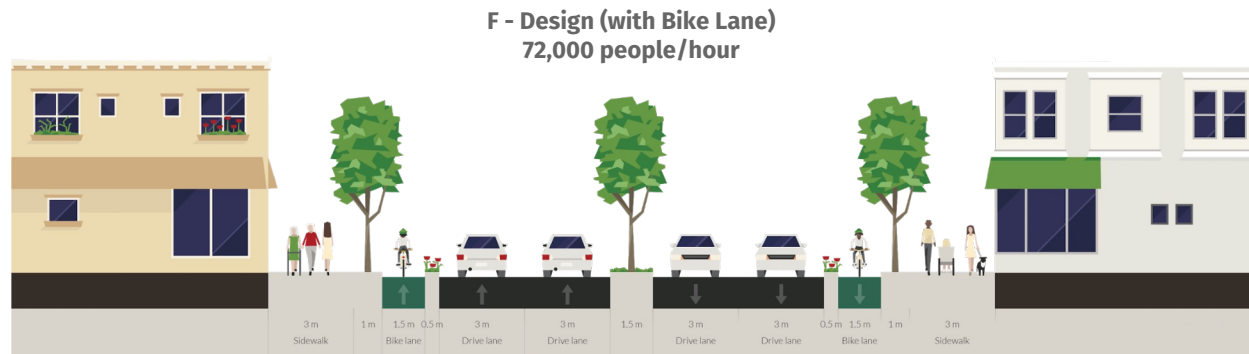
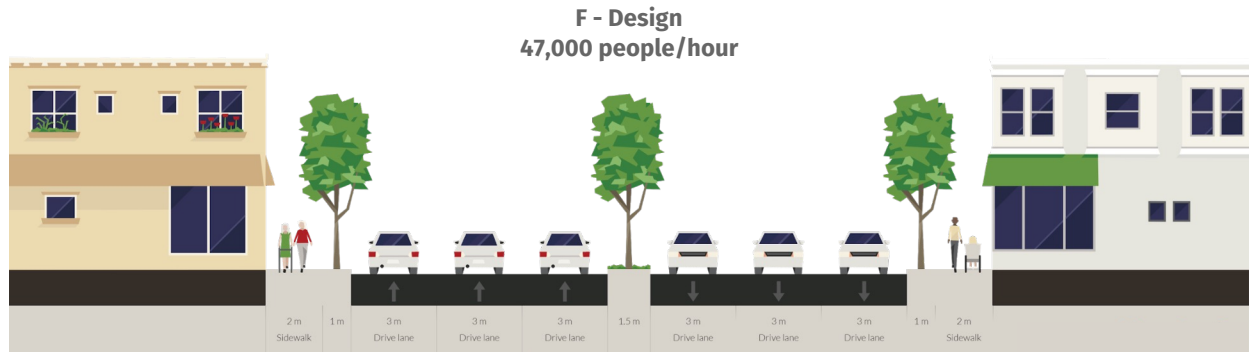
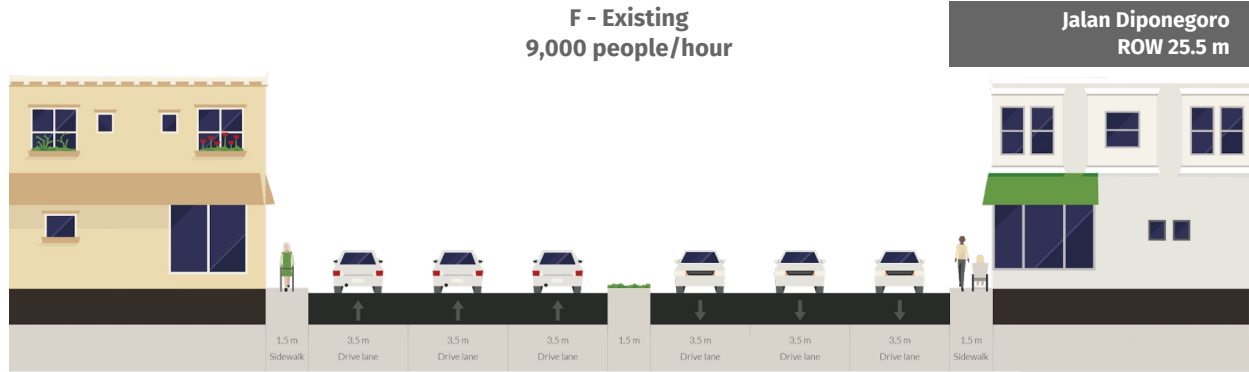
# 3.1.1 Street Design Template (F)

Jalan Diponegoro  
ROW 25.5 m

**Typology F (ROW 25.5 m)**  
**2-way 3-lane**

Design features

- Reduce the width of car lane
- Widen sidewalk area
- Add trees
- Add bike lane on both side



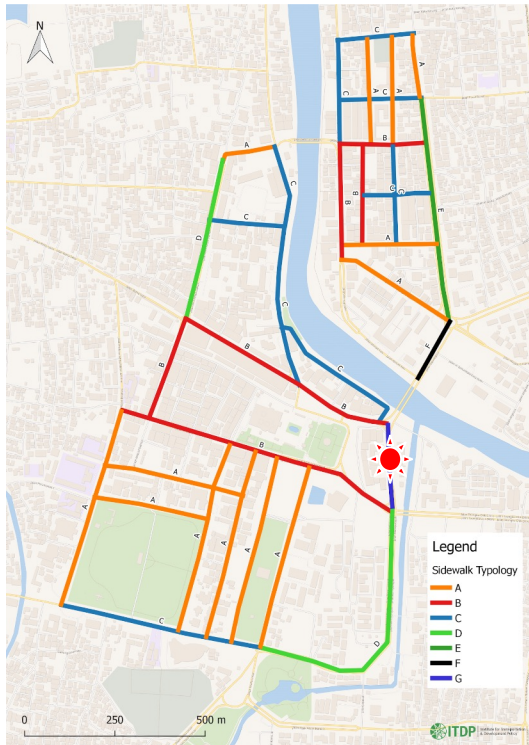


# 3.1.1 Street Design Template (G)

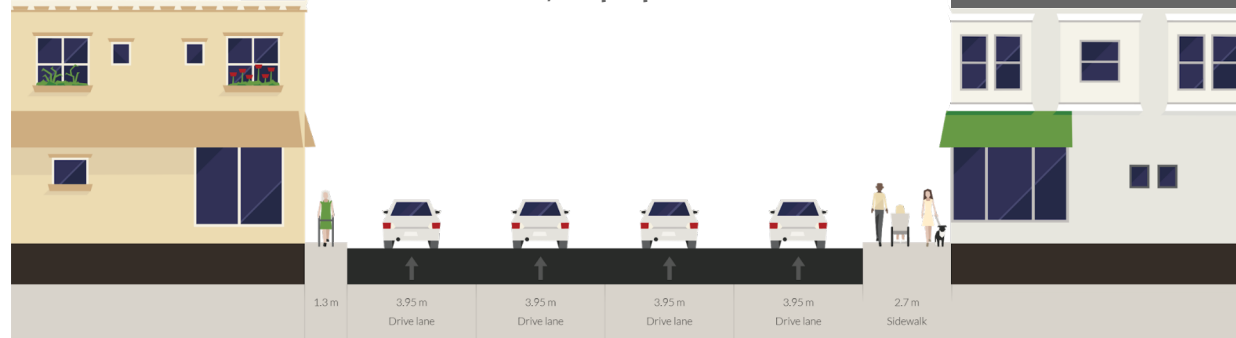
## Typology G (ROW 19.8 m) 1-way 4-lane

### Design features

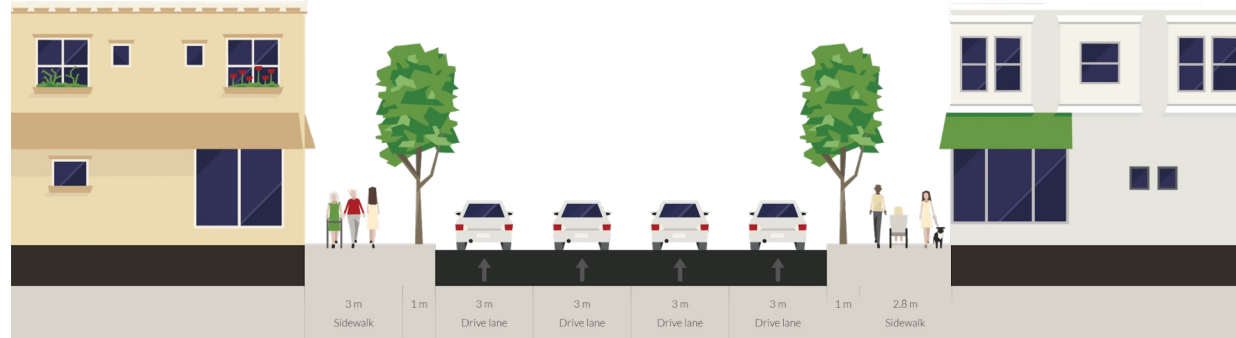
- Reduce the width of car lane
- Widen sidewalk area
- Add trees
- Add bike lane on one side



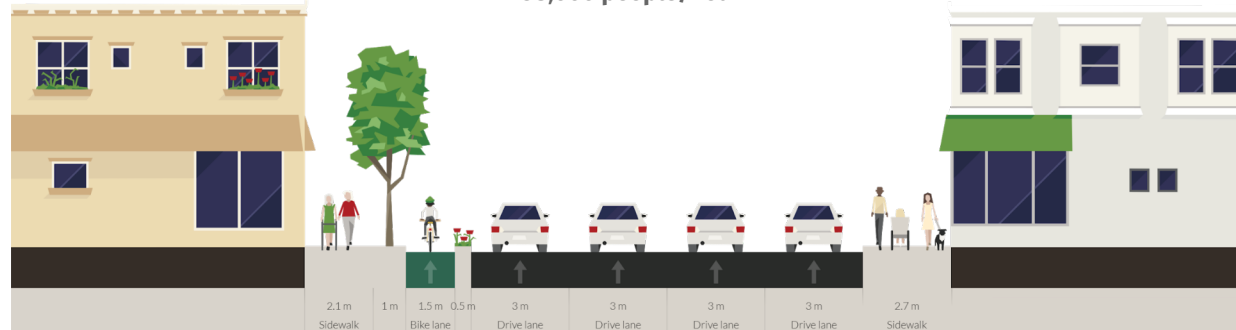
**G - Existing**  
25,000 people/hour



**G - Design**  
44,000 people/hour



**G - Design (with Bike Lane)**  
58,000 people/hour



# Jalan Diponegoro - Before

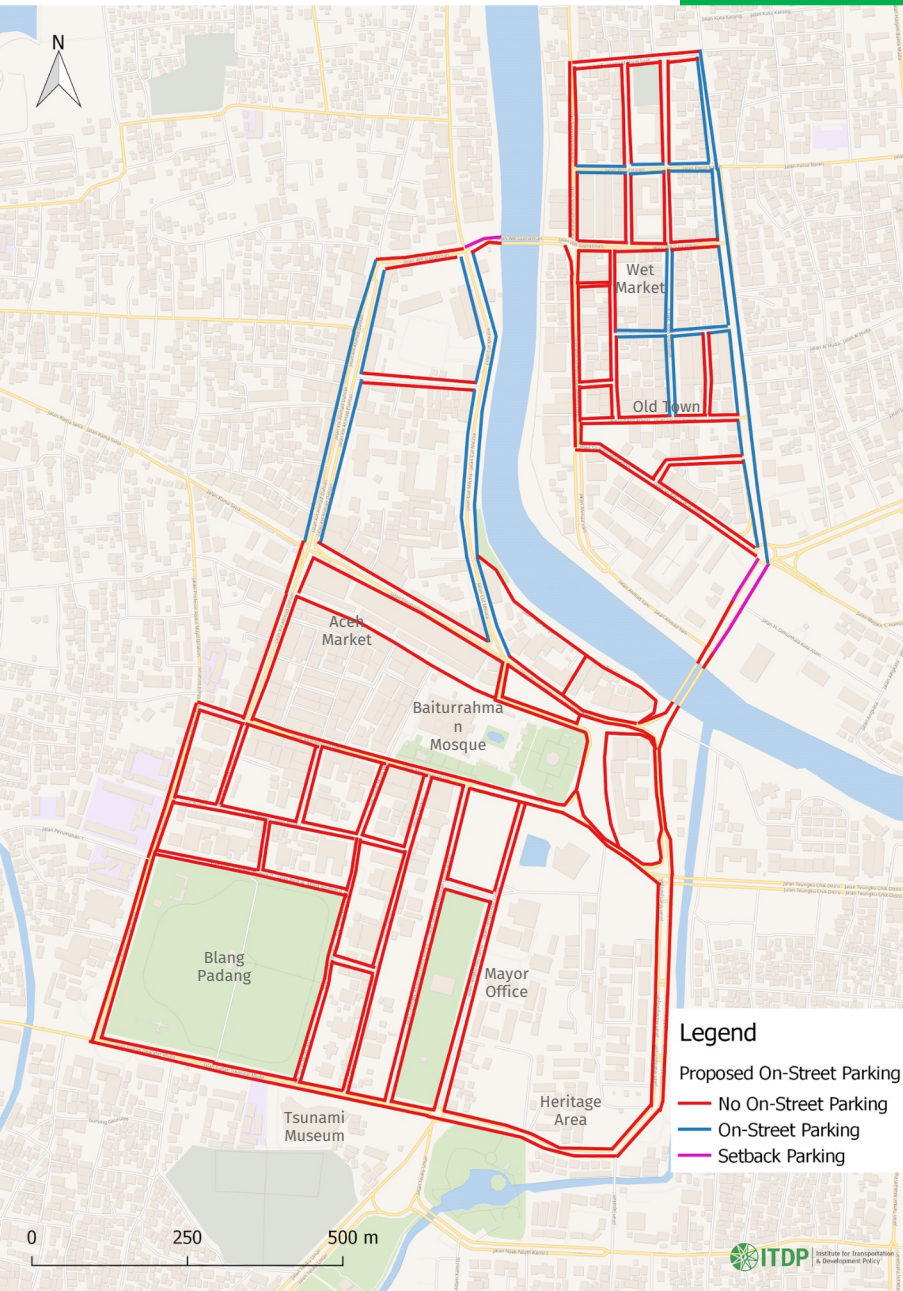








## 3.1.2 Proposed On-Street Parking



Based on the street design template, most of the on-street parking in the city centre are converted to pedestrian walkways and bike lane. Therefore, only few street segments that are allowed on-street parking as seen as the blue line on the map and the list are as follow:

- Jalan Tentara Pelajar
- Jalan Cut Meutia
- Jalan T. Panglima Polem
- Jalan Pocut Baren
- Jalan Twk Daudsyah
- Jalan Jambi
- Jalan Pembangunan

When on-street parking is allowed, parallel parking is much preferred to angled parking in order to save up more space for sidewalk and/or bike lane.

Parallel parking occupies around 2.1 - 2.4 m of the road space, while 60-degree parking can take up to 6 m perpendicular to the curb. In other words, the space that can be saved is around 2.5 to 3 times for more efficient mobility.

With this proposal, from the parking supply survey, around 1,350 parking spaces are removed to provide more space for the non-motorized vehicle.

The parking study, produced separately by ADB individual consultant, discuss the parking management in more detail.



# 3.2 Bike Lane Network



## The Need of Bike Lane

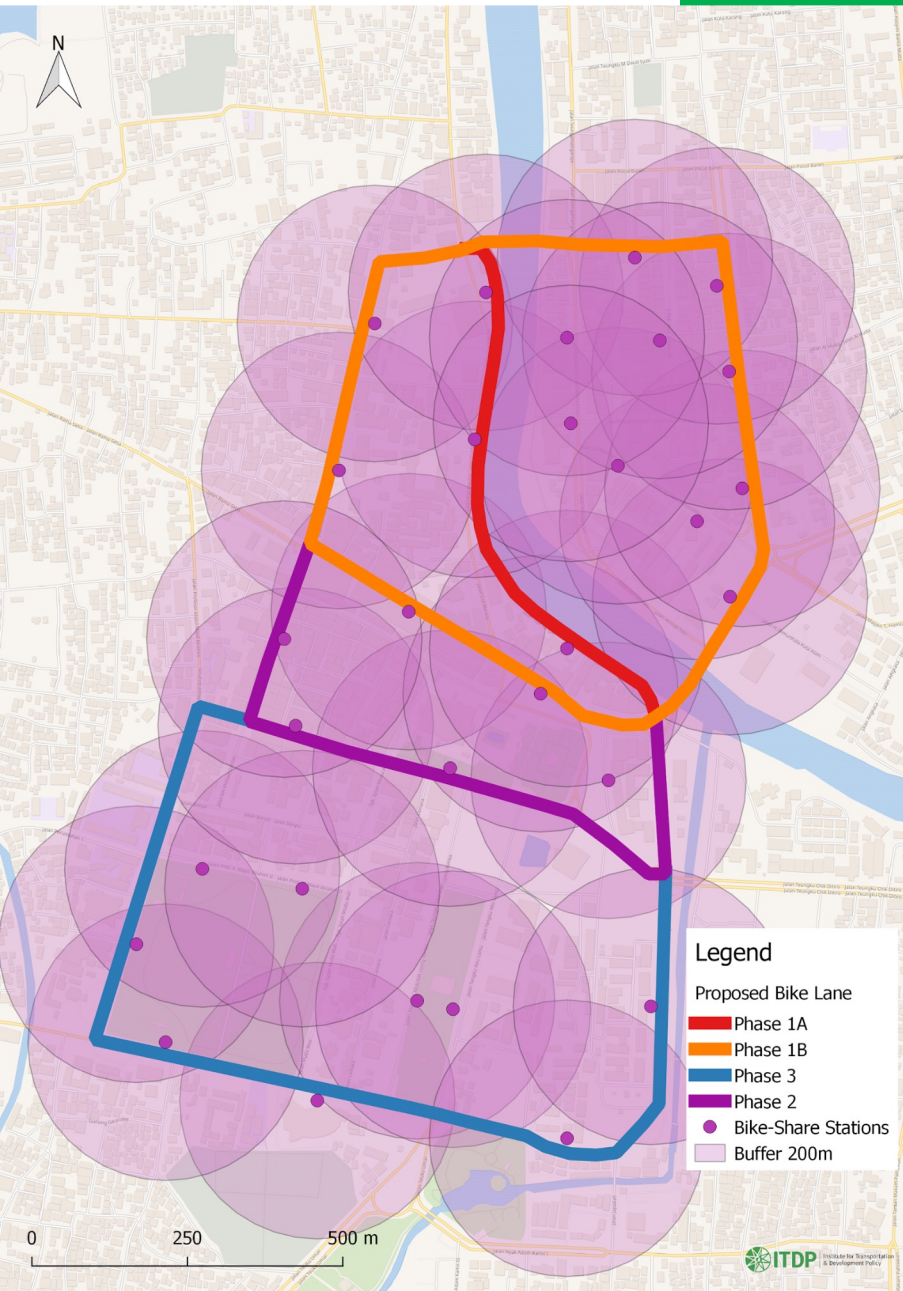
- Few people are encountered using bicycle in the city centre during the field survey. There is potential demand for cycling.
- Cycling is another sustainable tool to extend the explore range for local short trips within Banda Aceh city centre.
- In order to promote cycling, the facility should ensure safety and comfort for people on bike.
- Bike lane as the dedicated place for cycling should come in first hand.
- In terms of design, protected and continuous bike lane is compulsory on the main road.
- ITDP recommends a network of bike lane that can be implemented gradually into three phases.

Phase	Length (m)
1A	900
1B	2,490
2	1,275
3	1,980

## Phasing

- The entire length of the network is 6.6 km.
- Phase 1A is built alongside with the riverfront revitalization
- The proposed bike lane is located on the main road and create a network that connects the whole city centre.
- The implementation of bike lane is part of reclaiming the street for more sustainable mode.

## 3.2.1 Bike-Share Initiative



### Combine Bike Lane with Bike-Share

- Bike-share system is a type of ride sharing service using shared bicycles that are made available for short-term basis.
- One of the challenges to promote cycling is the availability of the bikes.
- With bike-share, people don't have to own the bike, they can just grab the available bike, pay within the apps and start cycling.
- This system allows people to lend and use the bike to get around. People can grab and return the bike at different stations and locations.
- It creates a new way of travel, particularly for short trips.
- The addition of bike lane combined with bike-share will create safer and more enjoyable cycling environment in Banda Aceh.

**Stations are placed in close proximity to demand such as markets, parks, grand mosque, offices, museums and tourist attractions.**

**It is estimated the need of 30 stations with each 5-10 dockless bike-share.**



# 3.2.1 Station Location Arrangements

## Configuration 1 Combine with sidewalk

*Example: Mexico City, Mexico*



## Configuration 2 Combine with on-street parking space

*Example: Barcelona, Spain*

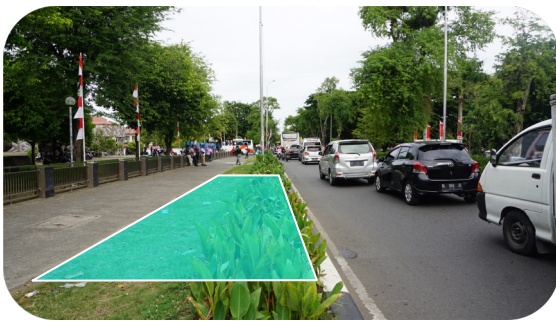


## Configuration 3 Specific field condition

*Example: Shanghai, China*



## Implementation in Banda Aceh



Proposed bike-share station on the sidewalk on Jalan Sultan Iskanda Muda, near Tsunami Museum.



Proposed bike-share station to replace on-street parking on Jalan Tentara Pelajar.



Proposed bike-share station on alleyway in the old town area.



## Existing Condition

- The total length of the riverfront is 835 m. Only the middle segment (190 m) that has been improved by the government.
- It is recommended to extend the improvement along the riverside to the northern and southern part through the length of 400 m and 245 m respectively.

## Proposed Improvement

- There is approximately 1.5 m of elevation difference between the street and the riverfront. Inclusive access should be part of the design to ensure everyone can enter with less effort.
- The riverfront width varies between 7-15 meter. Unlike the existing riverfront walkways, the future walkways should be wide enough to anticipate more people.
- Activation on the riverfront can be made with outdoor public space, playground for kids and food vendor arrangement.
- Bike lane is possible to be integrated with the riverfront to make cycling more enjoyable with pleasant environment.

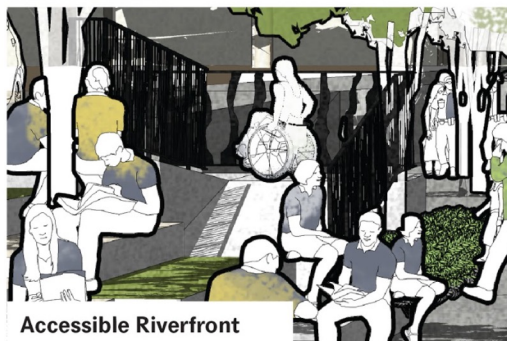


# 3.3 Riverfront Activation

**Proposed**



**Existing**



**Accessible Riverfront**



**Street Vendors**



**Riverfront Activity Space**



# 4. Project Cost Estimation

Item	Quantity	Unit Price (USD)	Total (USD)
<b>Banda Aceh</b>			
Sidewalk Enhancement	81,786 m <sup>2</sup> (two sides)	250	20,446,500
Bike Lane	6,6 km	78,000	514,800
Dockless Electric Bike-share	300 E-Bikes	1,000	300,000
Riverfront Activation	835 m	13,300	11,105,500
<b>Total</b>			<b>32,366,800</b>

