

Towards Green Transport Langkawi

Measures to improve public transport,
walking and cycling in Langkawi Island



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1.1. Background

The Institute for Transportation & Development Policy (ITDP) is commissioned by The Asian Development Bank under The Asian Development Bank under R-RDTA 9017: Unlocking Innovation for Development, Scaling-up Innovative in Urban Transport Operations contract, which covers multiple cities, including Langkawi. Under the contract, ITDP is expected to bring new ideas and concept that can be introduced in urban transport, specifically in the cities which are targeted under this Technical Assistance.

The work in Langkawi started in January 2019, which began with Kick-off meeting with the stakeholders from Kedah State government, Invest Kedah, LADA and Langkawi municipal government.

To collect the relevant data and understand the problems better, the following ITDP team members conducted site visits in January and March 2019:

- Yoga Adiwirto (Co-Team Leader)
- Ria Roida (Urban Planning Specialist)
- Udayalaksamankartiyasa (NMT and Parking Specialist)

For this project, ITDP works with other consultants hired by the ADB, Guido Bruggeman, and Willem Brouwer, who are the team leader for the whole project and parking specialist, respectively.

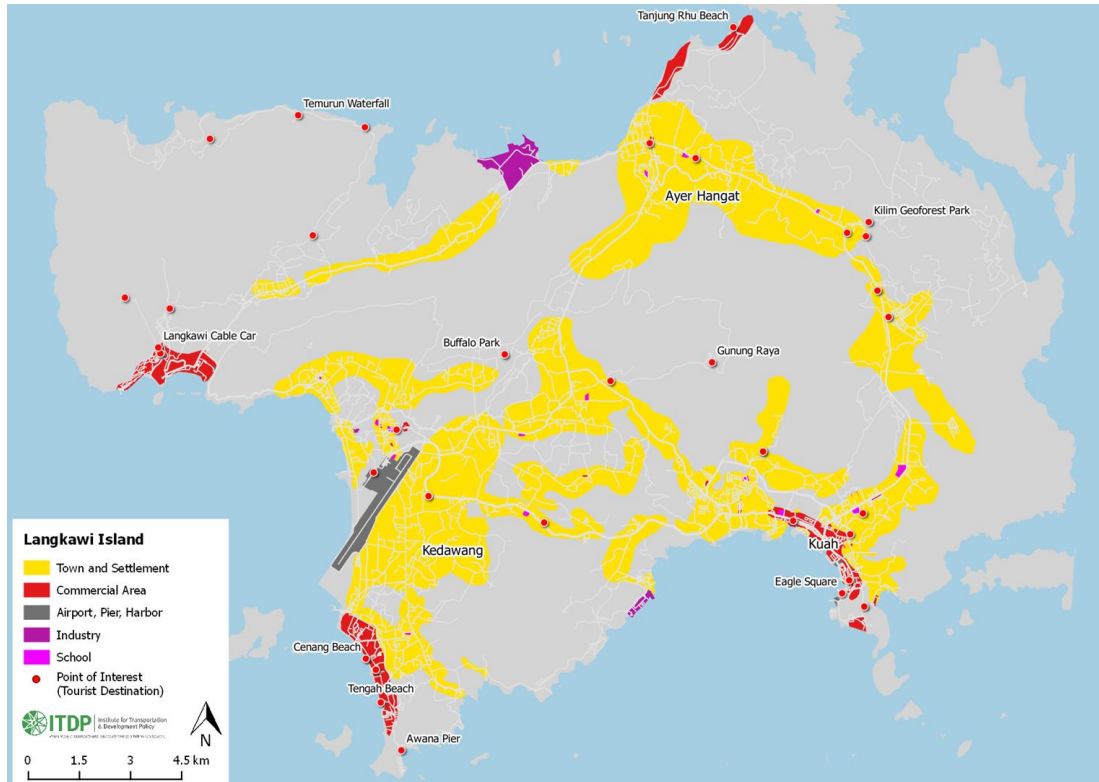
1.2 Work Objective and Scope

Together with other consultants, the objective of the report is to provide guidance and bring ideas to improve urban transport for the city of Langkawi. This includes the improvement of public transport, walking, cycling, and parking.

In this assignment, ITDP will focus only on public transport and Non-Motorized Transport (NMT), with some aspects of parking to support the NMT improvement.

2.1. Overview

The island of Langkawi is located 30 km off the mainland coast of north-western Malaysia and part of the state of Kedah. It has a population of around 95,000. Tourism is the main source of income with around 3.6 million visitors annually. 85% of the visitors are domestic, while Langkawi is a duty-free island, making it very attractive for Malaysian holidaymakers. Visitors arrive by ferry at the Kuah terminal or at the recently modernized airport. On 1 June 2007, Langkawi Island was given a World Geopark status by UNESCO.



The map beside shows the existing land use of Langkawi Island. Town and settlement are developed along the main road. Most of the settlement are scattered but nearby the main road. The commercial area which also the tourist destination are located far apart from tourist origin. Most of the tourists are stayed in Cenang Beach area, Kuah, and Tanjung Rhu Beach.

Public transport does not exist in Langkawi. This situation makes the destination locations in Langkawi are not accessible. Langkawi needs public transport improvement urgently. The initial plan of public transport is the first step to be done by the government. Meanwhile, at the same time, the government can start to create a pedestrian-friendly environment especially in the area which is the famous tourist destination such as Cenang Beach to improve tourists walking experience and get more visitors.

2.2. Green City Action Plan

The Government of Kedah State and the Langkawi Development Authority (LADA) have an interest in making the island “greener” (environmentally friendly) and promoting sustainable transport and tourism. Such intentions are also reflected in the Langkawi Development Plan 2030. Also at the National level, there is interest to make Langkawi a carbon neutral island.

Reducing the carbon footprint of transport in Langkawi will be extremely challenging for the following reasons:

- Private cars can be bought tax-free on Langkawi and access to financing of cars is also very easy.
- Just as elsewhere in Malaysia, car ownership on Langkawi is high with nearly 1 car per household (Malaysia has the third highest ratio of cars per household in the world).
- Petrol prices are low with only USD 0.56 per liter.
- Langkawi does not have any public transport services.
- options for rental cars on the island are abundant as not only rental companies offer cars for a rental by also local car owners (for less than USD 20).

- Motorcycle rental is also popular with low-budget travelers. There is no bicycle rental scheme on Langkawi and no cycling facilities are in place.
- Ride-hail services like GRAB and My Car became rapidly very popular on Langkawi.
- As widely can be observed in Malaysia, Malaysians avoid walking and want to park their car as close as possible to their destination.

The main strategies for promotion of green transportation on Langkawi are:

1. A shift from private car use to green transport modes like walking, cycling, and public transport
2. A shift from fossil-fuel cars to electric cars (electrification vehicle fleet)
3. Reduction of emissions and noise from tourist boats

2.3. The Goal of The Report

This report provides guidance and more detail plans to improve public transport, by creating a series of measures to shift towards environmentally friendly transport modes, such as:

- Reintroduction of public transport to the extent financially viable for local residents, students, and tourists.
- Improved facilities for walking and cycling, and connectivity to public transport.
- Introduction of a bicycle sharing scheme in tourist areas.
- Improved parking management.
- Further improvement of the public space, in particular for the Cenang Walk.

The reintroduction of public transport is urgently needed. Public transport should cover the whole oriented-destination of the residents and tourists. The not existences of public transport in Langkawi make people using a private vehicle and increase pollution.

On the other hand, to improve walking and cycling in Langkawi, this report puts a package of a proposal to create better and safer walking and cycling facility, especially in Cenang Walk, so that more people will be attracted to walk and cycle, and eventually leave their private vehicle and rented vehicle behind.

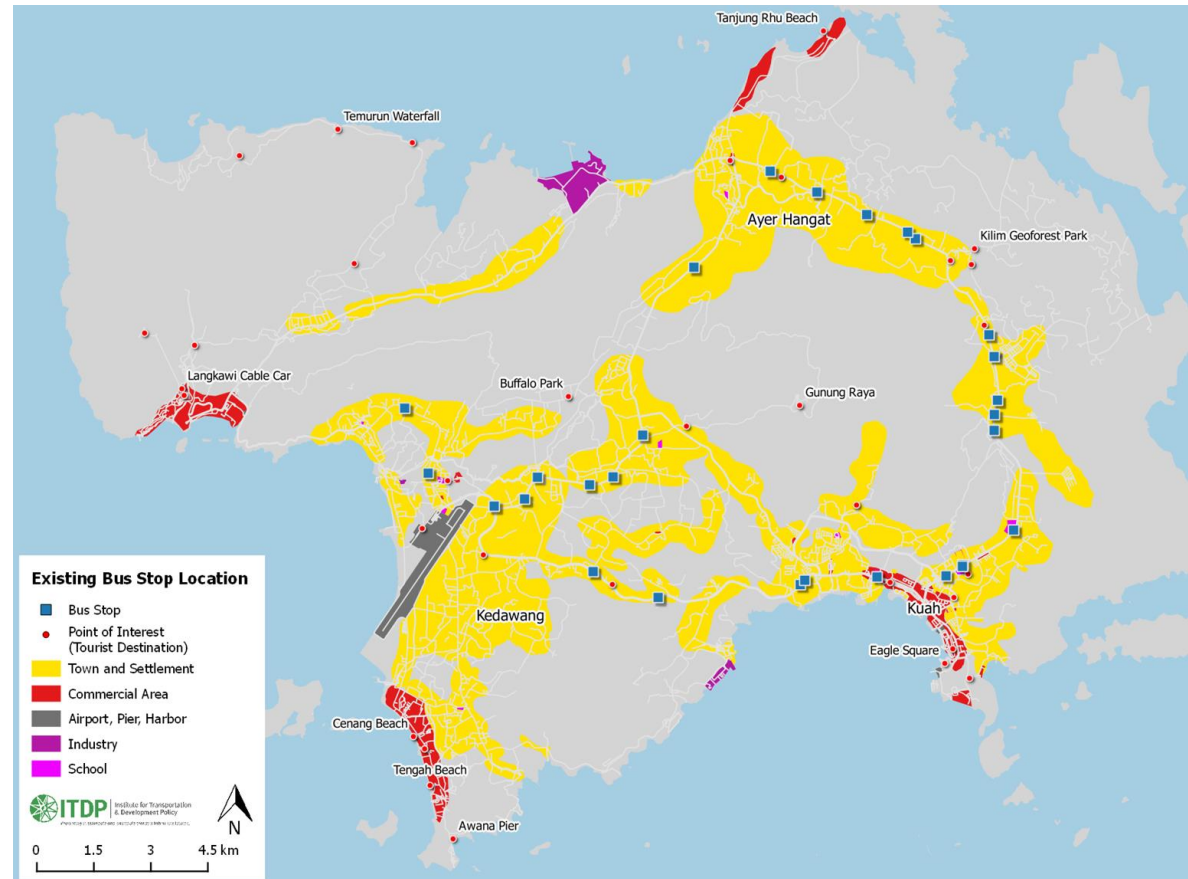
While some of the plans are presented in detail, it is meant only as guidance, and more detailed planning and design work shall be undertaken before implementing the plan.



3. Public Transport Improvement

3.1 Current Conditions

- There is no public bus service in Langkawi. Only school buses are operated to pick the students from their home to school.
- Some bus stops exist in Langkawi. Most of the bus stop locations are in front of schools and residential area.
- Most local residents use private vehicles, and tourists normally use rented cars or motorcycle and taxi.
- To support green transport plan and reduce the greenhouse gas emission from transport sector, reduction of private vehicle use is needed.
- The figure on the right shows land use and Point of Interest (POI) such as beaches, hotels, tourist attractions across the Langkawi island. Currently to go to these places, only private cars, motorcycle, taxi or chartered minibus are available.



Typical bus stops in Langkawi are lack of comfort, convenience and accessibility, it only uses simple shelters and located only in front of schools and some residential area with long distances between the bus stops.

3.1 Current Conditions

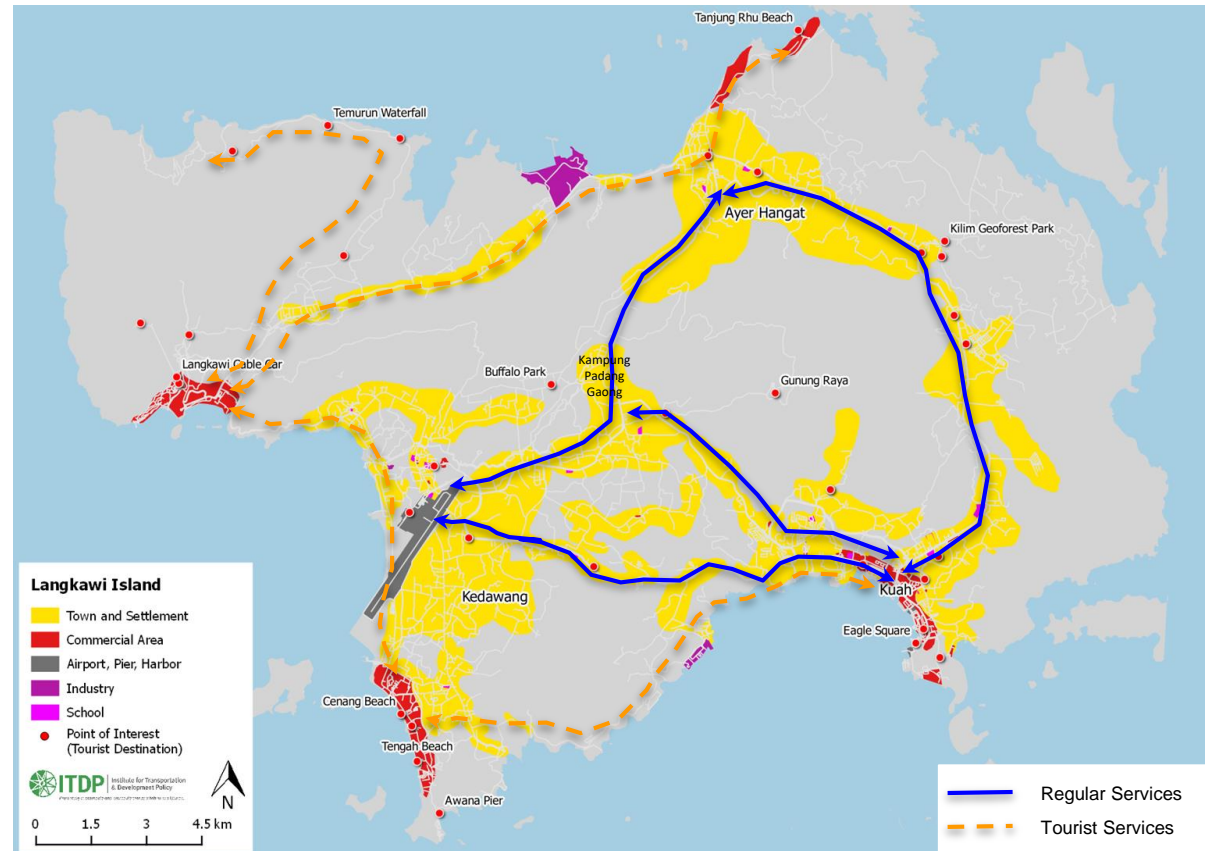
- Most tourists rent a car or motorbike to move around the island.
- Car and motorbike rentals are easily accessible and can be easily found in Kuah Jetty and airport.
- In Cenang, the most vibrant tourist area, car and motorbike rentals also can be found easily, with very cheap rate.
- A car only costs between 100 MYR and 200 MYR per day and the motorbike costs between 35 MYR and 50 MYR per day, depending on the vehicle type.
- The tourists have no option to use public transport, as it is not available. The only non self-driven vehicle options are using taxi or Grab.



The Eagle Square parking area near the Kuah Jetty is full of cars to be rented. It is hard to look for a free space.

3.2 Bus Routes Plan

- As a first step to provide good quality public transport, several new public transport routes need to be provided with the following principles:
 - Connect different town and districts where people work and live
 - Connect different transport hubs (airport, jetty, port) with tourist destinations
 - Provide better access to public transport from where people live and work
- The proposal to public transport services in Langkawi Island with two different type of services (regular service and tourism service) are drawn from land use and Point of Interests.



Proposed public transport service type:

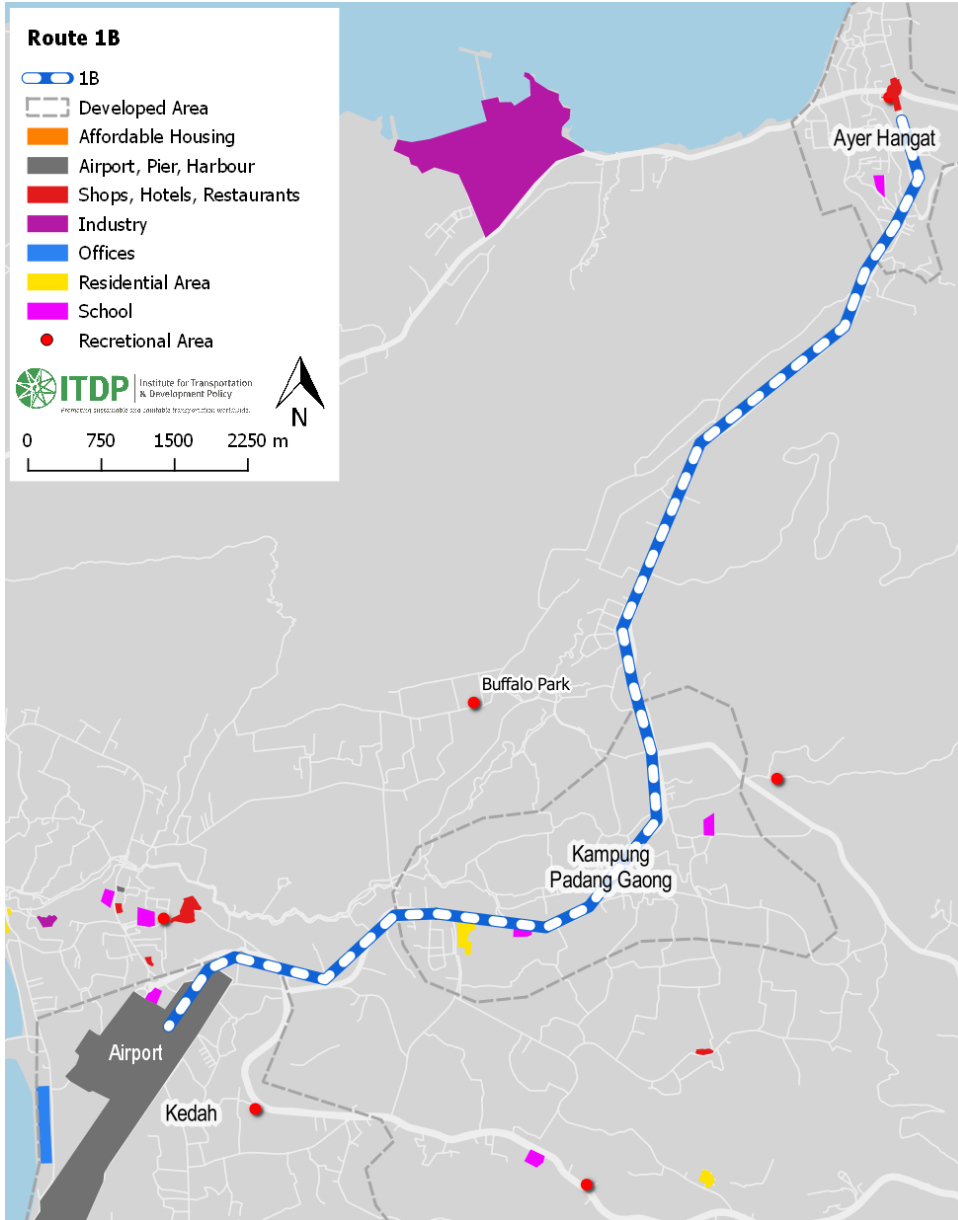
- **Regular services** (frequency every 10 – 20 minutes) to serve residential, schools, market, offices.
- **Tourism services** (frequency every 20 - 30 minutes) to serve Kuah Jetty, pass hotels and tourist places (Oriental Village, Tanjung Rhu and Cenang)



Route	: 1A
Type	: Regular Service
Length	: 18 Km
Headway	: (peak hour) 10 min (off peak hour) 20 min
Cycle Time	: (peak hour) 1 hour 55 min (off peak hour) 1 hour 65 min
Speed Average	: 22 Km/hour

- Route 1A connects the downtown area in Kuah to the airport.
- The route will start from Eagle Square area to the airport.
- The route goes from Eagle Square, Persiaran Putera Road, Padang Marsirat Road and finishes at the airport.
- The commercial and residential area along Persiaran Putera Road and Padang Marsirat can be served by this route.

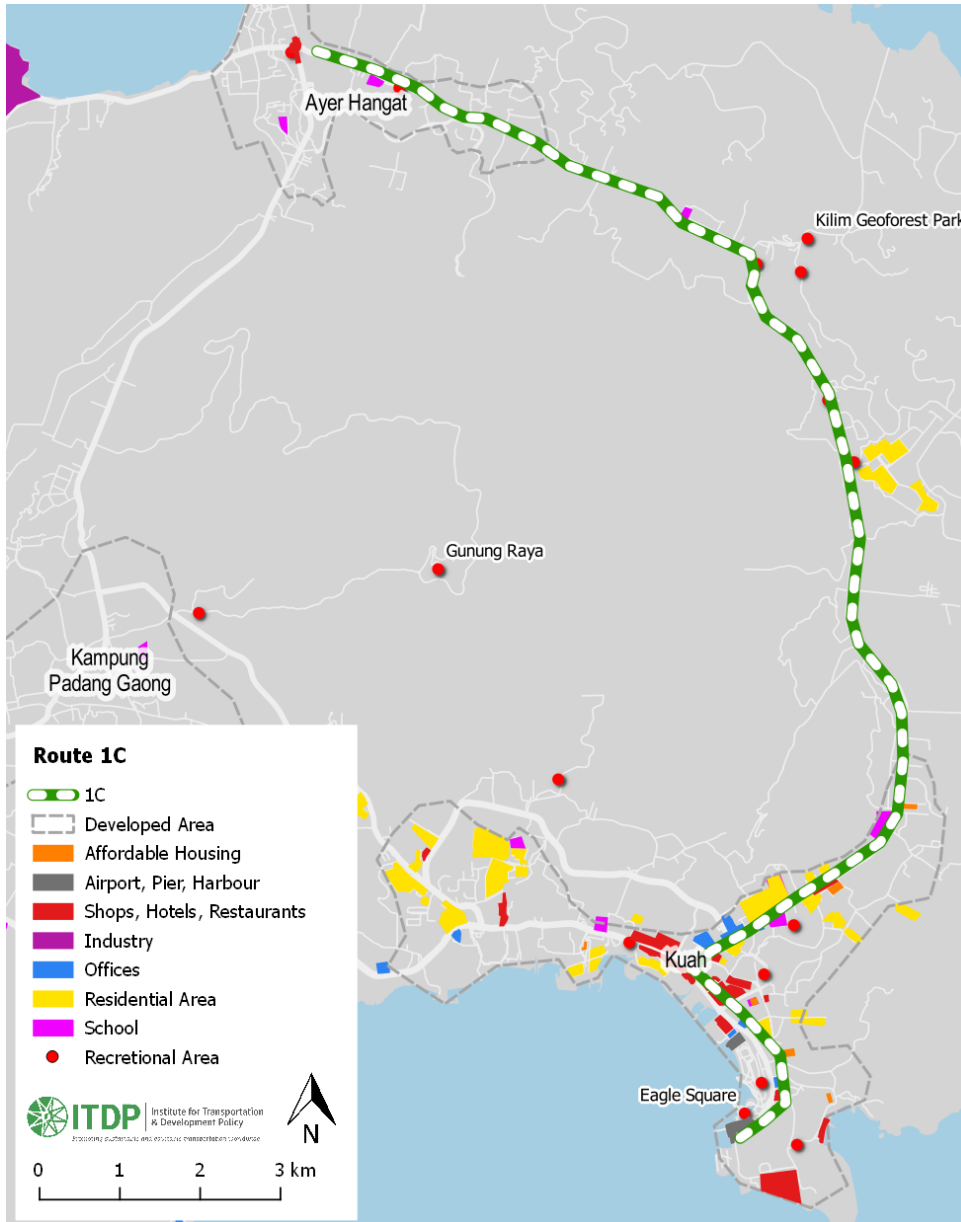
3.2 Bus Routes Plan



Route	: 1B
Type	: Regular Service
Length	: 14.4 Km
Headway	: (peak hour) 10 min (off peak hour) 20 min
Cycle Time	: (peak hour) 1 hour 35 min (off peak hour) 1 hour 45 min
Speed Average	: 22 Km/hour

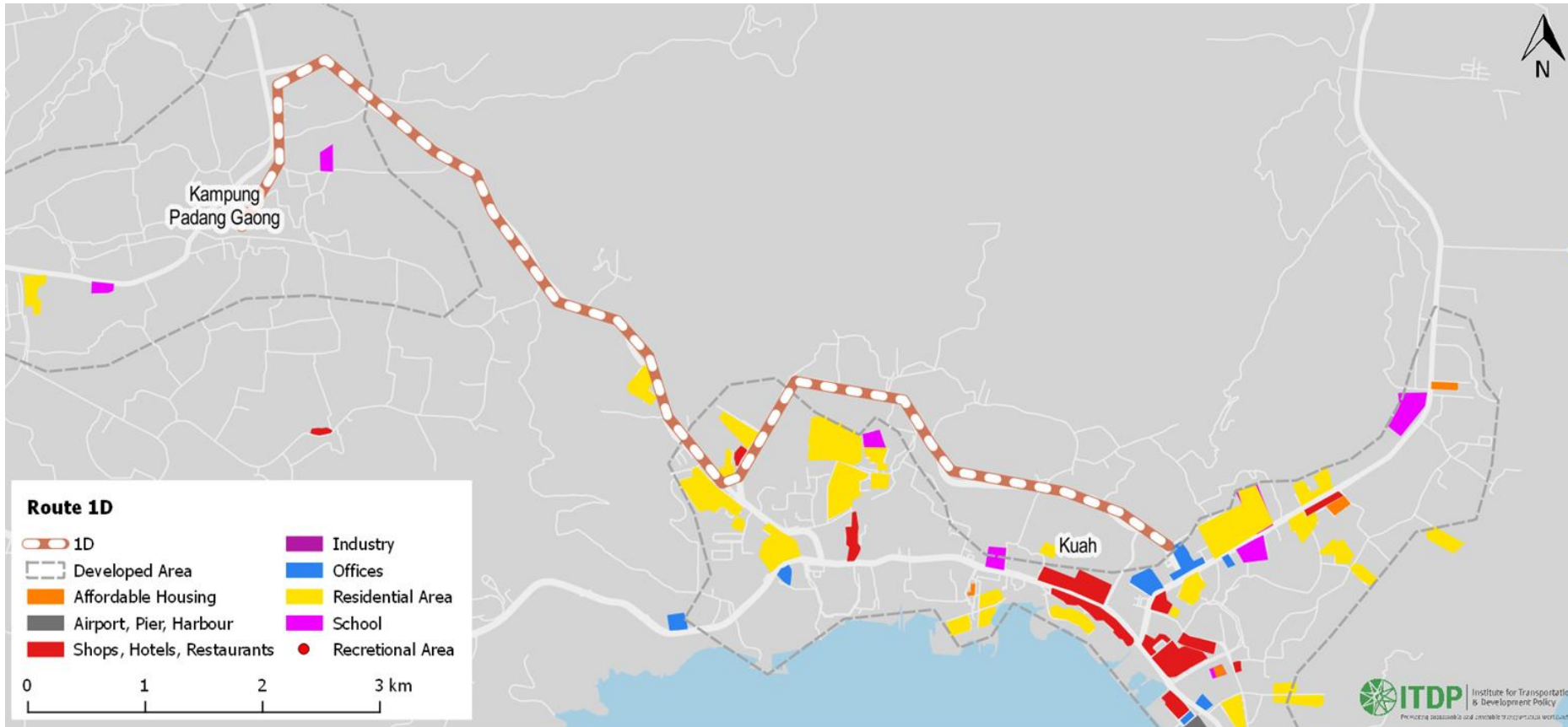
- Route 1B connects Ayer Hangat, Kampung Padang Gaong, and the airport.
- There are some scattered housing in Ayer Hangat and Kampung Padang Gaong which will need the service of public buses.
- The bus will go from Ayer Hangat to Kampung Padang Gaong and end the route in the airport.
- This route can also accommodate tourists to go to Tanjung Rhu Beach (east part from Ayer Hangat area) and mangrove (on the west part of Ayer Hangat area)

3.2 Bus Routes Plan



Route	: 1C
Type	: Regular Service
Length	: 19.6 Km
Headway	: (peak hour) 10 min (off peak hour) 20 min
Cycle Time	: (peak hour) 2 hour 4 min (off peak hour) 2 hour 14 min
Speed Average	: 22 Km/hour

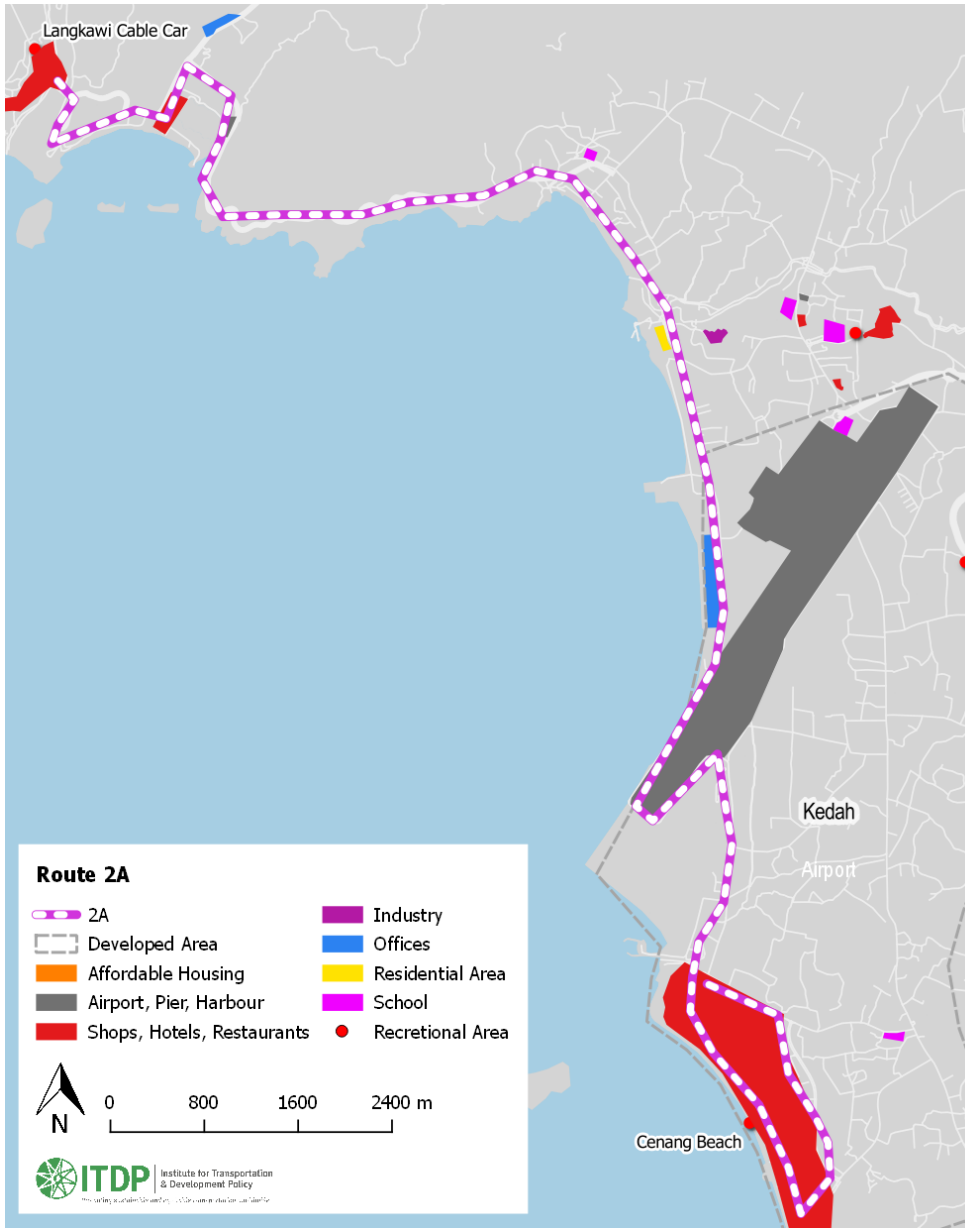
- Route 1C will connect Kuah and Ayer Hangat area.
- The routes will start from Eagle Square, serve the commercial and residential area in the downtown of Kuah, and goes straightly to Ayer Hangat through Ayer Hangat Road.
- There are some residential area and recreational area along Ayer Hangat Road so this route also can facilitate the local residents along the routes and also the tourists.
- The passengers can transfer in Ayer Hangat if they want to go to Tanjung Rhu Beach (east part from Ayer Hangat area) and mangrove (on the west part of Ayer Hangat area).



Route	: 1D
Type	: Regular Service
Length	: 13.5 Km
Headway	: (peak hour) 10 min (off peak hour) 20 min
Cycle Time	: (peak hour) 1 hour 30 min (off peak hour) 1 hour 40 min
Speed Average	: 22 Km/hour

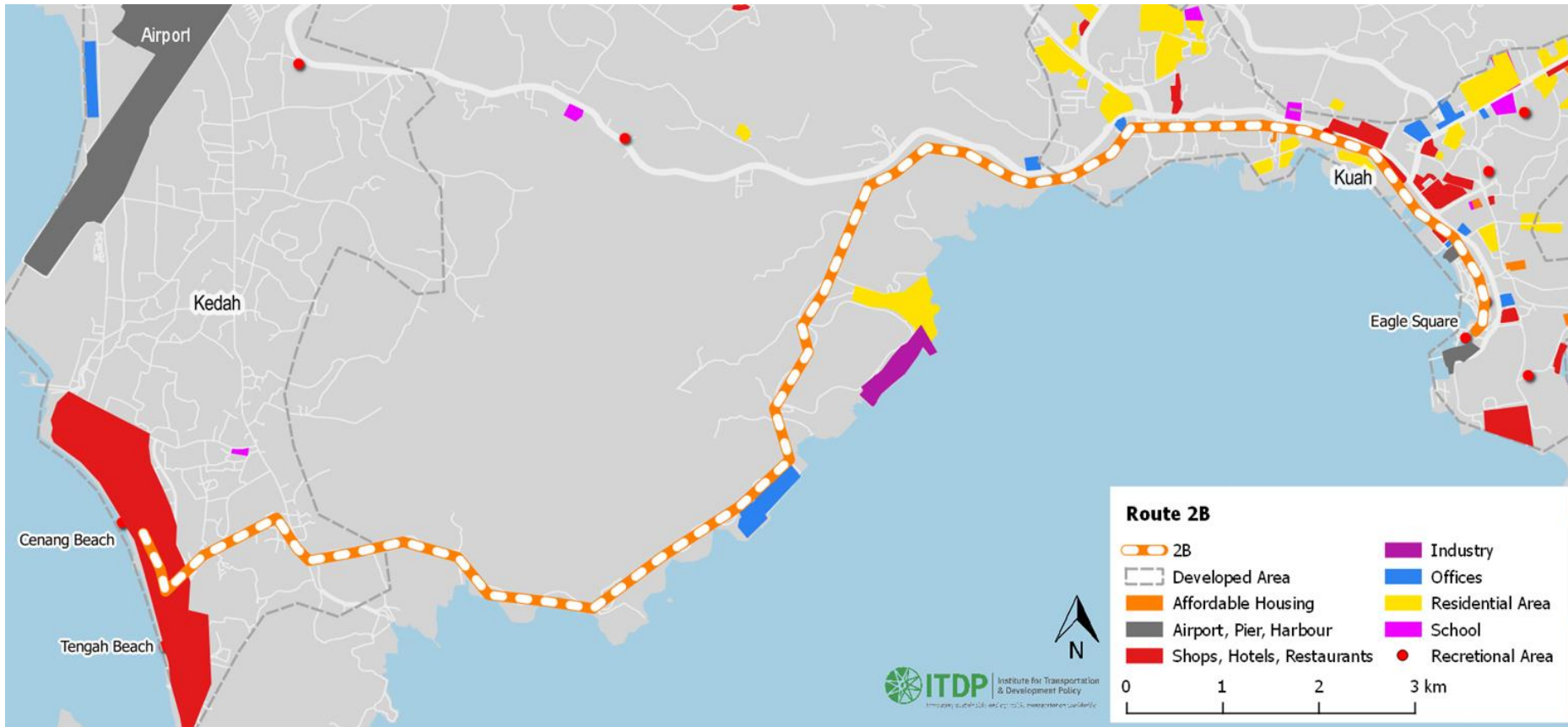
- Route 1D connects Kuah and Kampung Padang Gaong.
- The residents who live in Kampung Padang Gaong and along Padang Gaong Road will be served by this route to access the downtown of Kuah.
- The passengers of this route mostly local residents because there is no tourist destination along this route even in Kampung Padang Gaong.

3.2 Bus Routes Plan



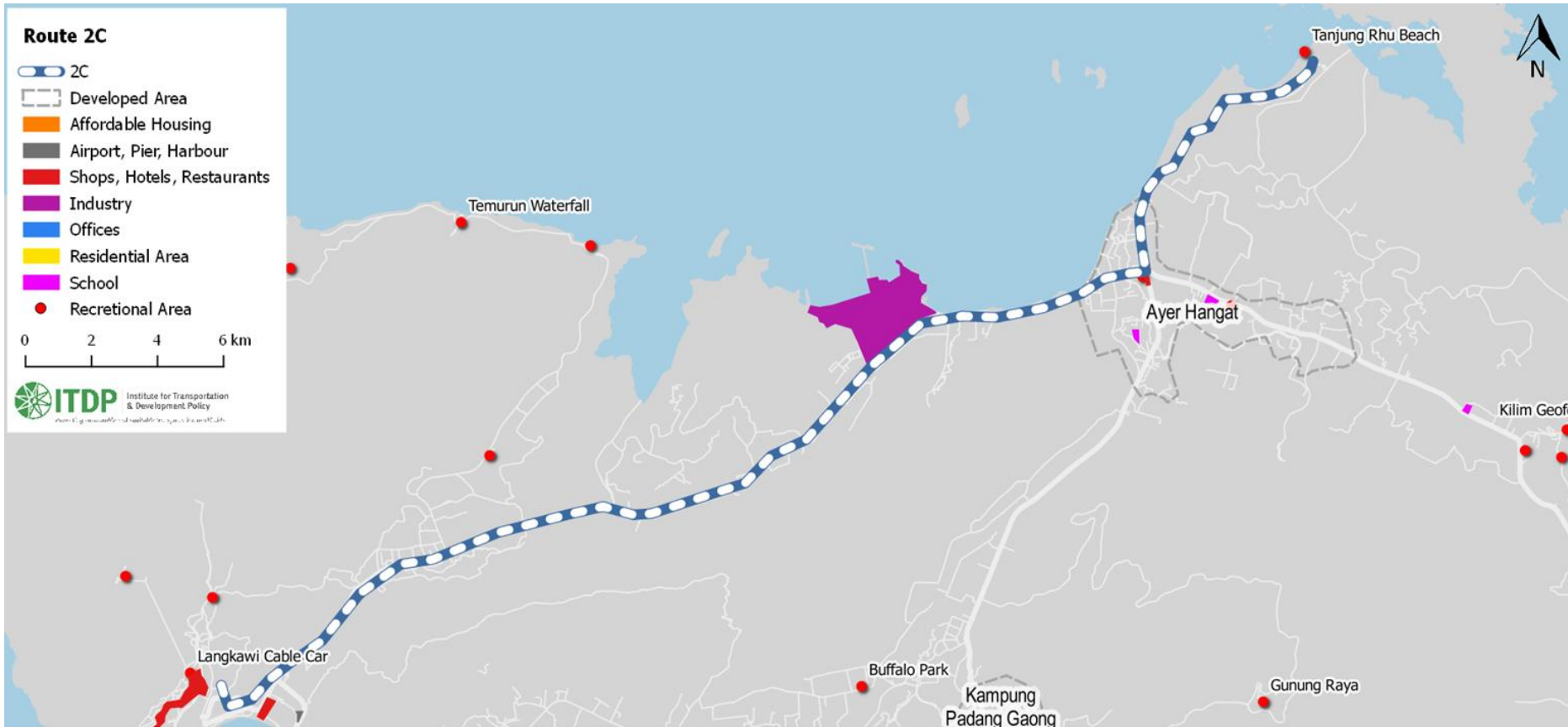
Route	: 2A
Type	: Tourism Service
Length	: 14.4 Km
Headway	: 15 min
Cycle Time	: (peak hour) 1 hour 58 min (off peak hour) 2 hour 8 min
Speed Average	: 22 Km/hour

- Route 2A is planned to facilitate the tourist from the airport to Oriental Village where the Langkawi Cable Car is located.
- The route starts from the airport and goes along Kuala Muda Road, Pantai Kok Road, Telok Burau Road, then finished in Oriental Village.
- Some tourist in the harbor near Oriental Village also can go with this route to access Oriental Village or airport.
- The passengers could transfer to the airport if they want to go to Cenang Beach or Kuah.



Route	: 2B
Type	: Tourism Service
Length	: 19.5 Km
Headway	: 15 min
Cycle Time	: (peak hour) 2 hour 3 min (off peak hour) 2 hour 13 min
Speed Average	: 22 Km/hour

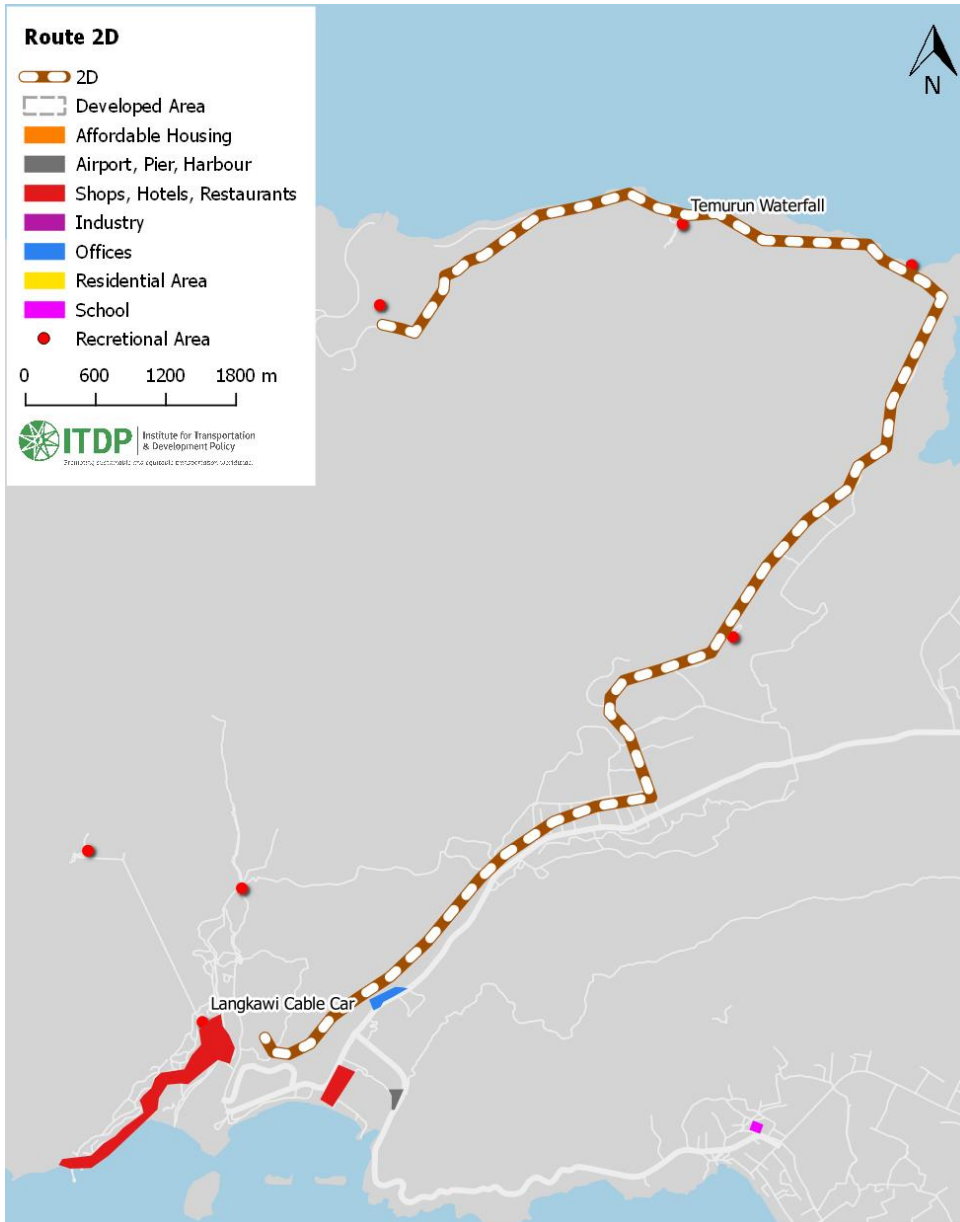
- Route 2B connects Cenang Walk and Kuah.
- Tourists who arrive in Kuah Port can go with this bus route to access Cenang Walk.
- This route will start from Cenang Beach Road, Bukit Malut Road, Padang Masirat Road, Persiaran Putera Road, and finished on Eagle Square area.



Route	: 2C
Type	: Tourism Service
Length	: 19.5 Km
Headway	: 15 min
Cycle Time	: (peak hour) 2 hour 3 min (off peak hour) 2 hour 13 min
Speed Average	: 22 Km/hour

- Route 2C connects Oriental Village to Tanjung Rhu Beach.
- Tourist who from Tanjung Rhu Beach can easily access Langkawi Cable Car in Oriental Village through this route.
- The residents who work in an industrial area in the north part but live outside the 2C route service also can access their work through transfer in Ayer Hangat or Oriental Village.

3.2 Bus Routes Plan



Route	: 2D
Type	: Tourism Service
Length	: 15.3 Km
Headway	: 15 min
Cycle Time	: (peak hour) 1 hour 40 min (off peak hour) 1 hour 50 min
Speed Average	: 22 Km/hour

- Route 2D will accommodate tourist from Oriental Village to Mangrove area.
- The route will start from Oriental Village where Langkawi Cable Car is located and go along Teluk Yu Road, Dalai Road, and finish in Mangrove area.
- There are some restaurants and scattered houses along Dalai Road.
- Crocodile Adventureland Langkawi and Temurun Waterfall also located in Dalai Road so tourists who will go to this location also can go with this route.
- The passenger from Cenang Beach and airport can transfer in Oriental Village area.

4.3.1 Service Plan

Route	Origin	Destination	Length (km)	Service Type	Headway (minutes)	Max Frequency (per hour)	Fleet Required	Daily Service km
1A	Eagle Square	Airport	18	Regular	10 - 20	6	13	216
1B	Ayer Hangat	Airport	14.4	Regular	10 - 20	6	11	202
1C	Ayer Hangat	Eagle Square	19.6	Regular	10 - 20	6	14	196
1D	Kampung Padang Gaong	Kuah	13.5	Regular	10 - 20	6	10	189
2A	Oriental Village	Cenang Beach	18.5	Tourism	15	4	9	222
2B	Cenang Beach	Eagle Square	19.5	Tourism	15	4	10	195
2C	Oriental Village	Tanjung Rhu Beach	19.5	Tourism	15	4	10	195
2D	Oriental Village	Mangrove	15.3	Tourism	15	4	8	214
Total							85	1,629

Operating hours : 06:00 - 20:00

Speed Average : 22 Km/hour

3.3 Bus Type and Service Plan

Electric Bus in Jakarta, operated by Transjakarta



4.3.2 Bus Type

Speed average	: 25 km/hour
Dimension	: (length) 12m, (width) max. 2.5m, (height) max. 2.9m
Capacity	: 85 passengers (seat + standing)

4.3.3 Approach on EV Introduction

- Establish communication and commitment between the government with the EV vendors.
- Slowly introduce the need of using EV which safer and modern transport mode.
- Preparation to provide soft-loan financing facility which partially includes a subsidy for the public transport operators.
- Provide tax reduction and necessary support.

The Benefits

- Improvement of the environment including better local air quality and reduce CO2 emissions globally.
- Better energy consumption by fossil fuel savings.
- Less urban noise.
- The economic benefit for bringing new business opportunities.

3.4 Shelter and Passenger Information Improvement



- Weather protected bus shelter is needed to add passenger’s convenience.
- The shelter should be located every 300 meter to 500 meter, and not more than 300 meter from local access road.
- Shelters can be built in multiple sizes according to passenger volume.. The regular bus shelter size is recommended for 1.5 m wide x 4 m long.
- Shelters should allow a straight unobstructed path of at least 1 m between the shelter and the curb and a minimum clear path of 2 m in width.
- Provision of comfortable shelter and seating can significantly improve the perception of wait time and rider satisfaction.
- Maps, routes, and other wayfinding should be prominent at bus stops, especially high-volume, high-activity, or transfer stops.
- System information may include strip maps of single routes, fixed schedules or frequencies, full system maps, and pertinent transfer maps or schedules.
- Information can be shown on hanging signs or signage integrated into the shelter. Temporary posted information should be protected from weather behind placards.
- Providing route information that is clear, understandable, and accurate makes it easier for passengers to understand their travel options.
- Alerting riders about nearby, transit-accessible destinations enables them to make more informed decisions about their travel options.

4. Cenang Walk

4.1 Project Overview

Cenang Walk



Cenang Beach is the famous beach in Langkawi Island. Along Jalan Pantai Cenang, visitors can find a diverse mix of cafes and restaurants as well as souvenir shops and duty-free outlets. High-end resorts, cottages, and budget also with a view of the sea are easy to be found both along Jalan Pantai Cenang or nearby Jalan Pantai Cenang. Nightlife in Cenang Beach also is the liveliest on Langkawi Island. Many beachfront bars and lounges offer inexpensive drinks and snacks as well as live music and cultural performance until late.

Cenang Beach Road has recently been reconstructed, a remote parking lot has been constructed (advertised as P&R) and at the same time parking on Jalan Pantai Cenang have been removed on the one side only. Unfortunately, because of low enforcement, there are still vehicles parking on both sides of on Jalan Pantai Cenang. This condition makes the pedestrian uncomfortable when walking. It would be better if Cenang Beach as the main tourist destination has more space for walking and cycling than space for private vehicles.

To support the **Langkawi Development Plan 2030** to transform Langkawi to be more modern tourism center and **to accommodate a high volume** of tourist in Cenang Beach, the improvement of pedestrian and cyclist facility is needed. While some improvements to increase the quality of walking infrastructure has recently been undertaken, there is still a need to provide better quality walking and promote cycling activities. The combination of walking, cycling, and public transit is a quick-win solution which can create sustainable transportation and should be prioritized if the region aims to be environmentally responsible and want to raise the number of tourists.

4.1 Project Overview

Overview Cenang Walk current situation (general)

- In 2017, the government made an improvement in Cenang Beach area through creating Cenang Walk with good walking environmentally.
- Park and Ride also built behind the Cenang Mall. This Park and Ride only 250 meter from the beach but there are no visitors come and park in here. Most visitors choose to park their vehicle on the street which also free.
- On March 2019, the government made parking restriction on one side only along Jalan Pantai Cenang but it is not effective. Many visitors still parking on both side, especially on the night.
- Cenang Walk also lacks connection to other roads. The visitors should detour to access Jalan Cenang Boulevard or hotels/guesthouses which located on small streets.



1

Cenang Walk was built in 2017 to create a good walking environmentally for the tourists.



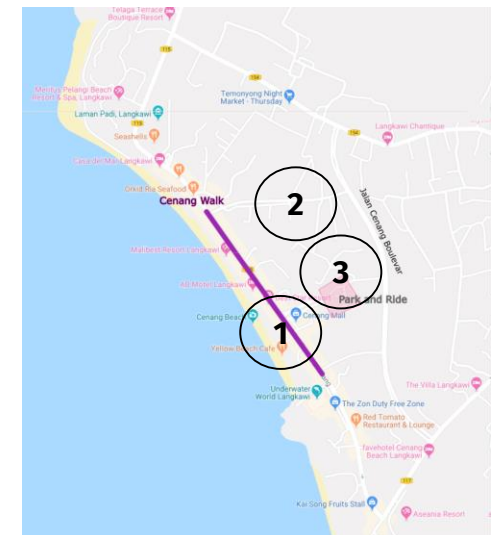
2

Lack of connectivity and continuity to access other roads and alleys from Cenang Walk.



3

Park and Ride have been provided but no one comes to park their vehicle.



4.2 Space Allocation Issue

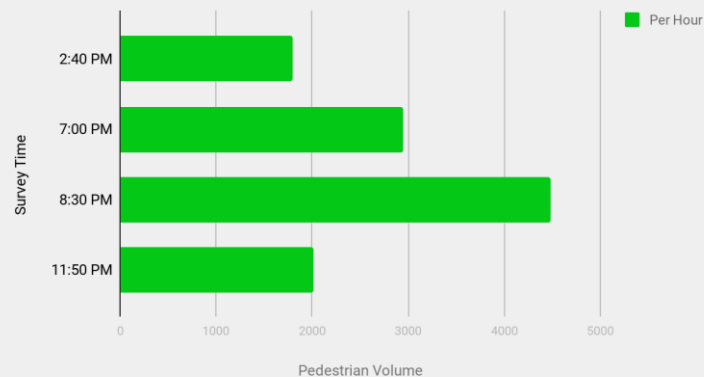
- Currently, the motorized traffic volume on Cenang Walk and around that roads are not so high. So it will be visible to reduce lanes or remove on-street parking to create more space for walking and cycling along this street if needed.
- The highest volume was recorded around lunchtime (2:30 PM) which reaches 728 PCU per hour in one segment which was on the south of Jalan Pantai Cenang.
- Meanwhile, the lowest traffic volume is located on the west road of Jalan Pantai Cenang which connects Jalan Pantai Cenang to Jalan Bohor Tempoyak. The volume is 280 to 424 PCU.



4.2 Space Allocation Issue

- The current situation could not accommodate the number of pedestrian especially on the peak hour because of the limited space of effective sidewalk spaces. .
- During the day, the pedestrians are concentrated on Cenang Beach main entrance where a plaza is located and along a segment where shops and restaurants are located. The peak hour of pedestrian volume is on 8:30 PM which reach 4.842 pedestrians per hour along the road.
- The highest volume is at 8:30 PM. During the peak hours, the pedestrians are concentrated around the main entrance of Cenang Beach (a plaza) near Chenang Mall.

Pedestrian Volume along Chenang Beach Road

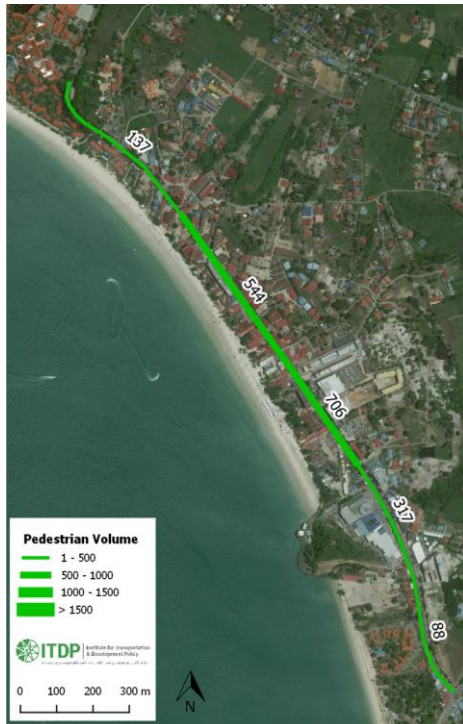


2:40 PM

7:00 PM

8:30 PM

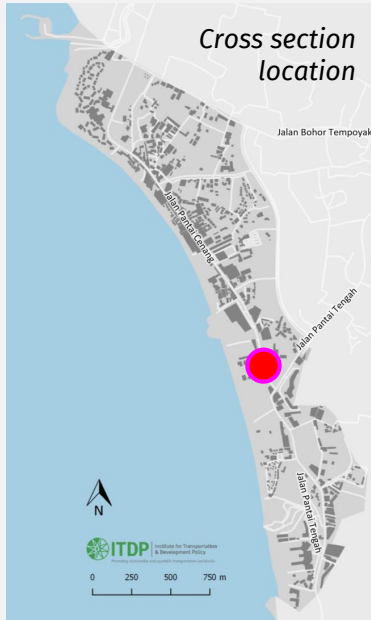
11:50 PM



- These pictures show the different number of pedestrian volume in Jalan Pantai Cenang counted in different time.
- The highest number of pedestrians can be found at the 8.30 pm meanwhile the lowest volume of pedestrians counted during the day (at 2.40 pm).

- The volume is gradually increasing time by time and reaching the peak when it comes to the dinner time when the cafes and bars are already back in the service.
- Number of pedestrian is going down slowly right after the 8.30 pm. At 11.50 pm, pedestrians were counted still higher in total than the volume at 2.40 pm but it is lower than pedestrians at 7.00 pm.

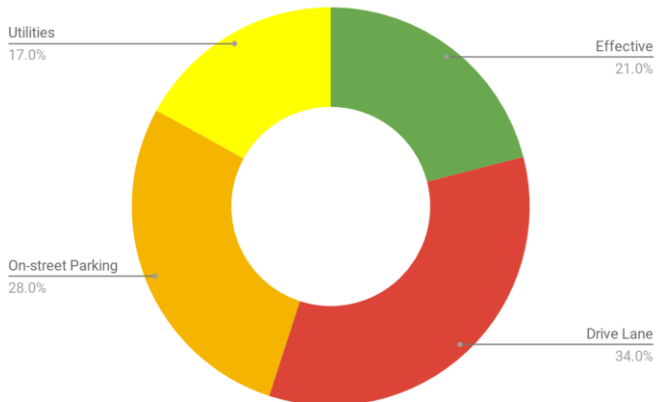
4.2 Space Allocation Issue



- Space allocation along Cenang walk is not consistent with the goal to make the area as pedestrian friendly. Currently, 62% of the street is given to the vehicles, which is mainly used for parking.
- On the other hand, only 38% of space is allocated for non-motorized, which in addition to pedestrians, also include the space for greeneries, utilities, and buffer.
- The sidewalk has 21% space of the street but utilities and trees also put on the sidewalk so the effective space for walking is getting smaller.
- Even worse, within this 21% area, pedestrians still need to fight for reclaiming the space back from the interference of street vendors.

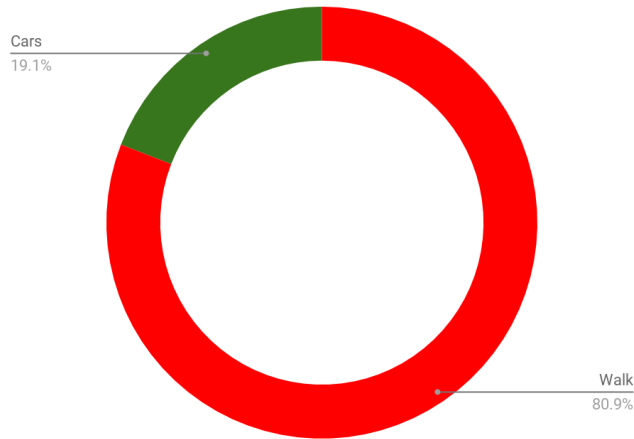


Street allocation on Cenang Walk

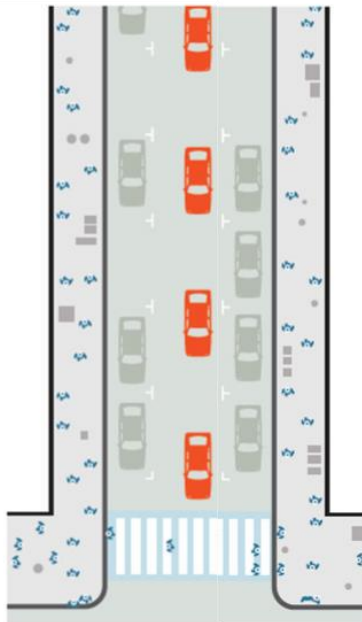


4.2 Space Allocation Issue

How People move around in Cenang Walk



- 80.9% of people in Cenang are pedestrians, and remaining 19.1% use cars. Yet, the space allocated for pedestrians is only 21% out of the total space in Cenang walk.
- This conditions need to be reversed. More space should be allocated for pedestrians to reflect the equality of space allocation.
- To do this, first, pedestrian space need to have width of clear sidewalk between 1.8 and 3 meters. 1.8 meters should be the minimum space to accommodate 3 people side by side, and meet the minimum space for wheelchairs to move and rotate.
- Space allocation for bike comes next. On one way streets, 1 side bike lane with 2 directions for cyclists can be provided. and for 2-way streets, bike lane can be provided on each sides.
- Redesigning the street to support multimode will allow more people to pass the corridor, as shown by the NACTO guidelines



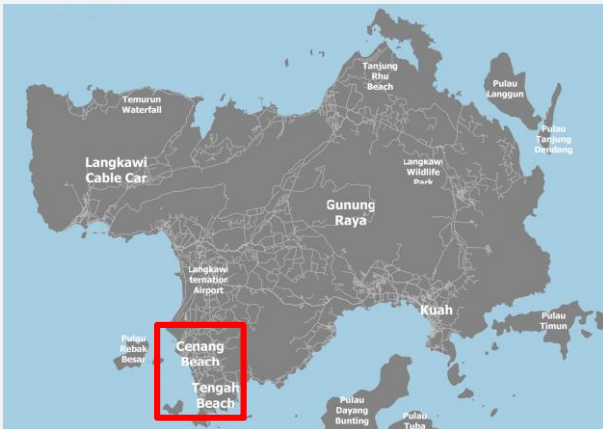
Hourly Capacity in Cenang Walk

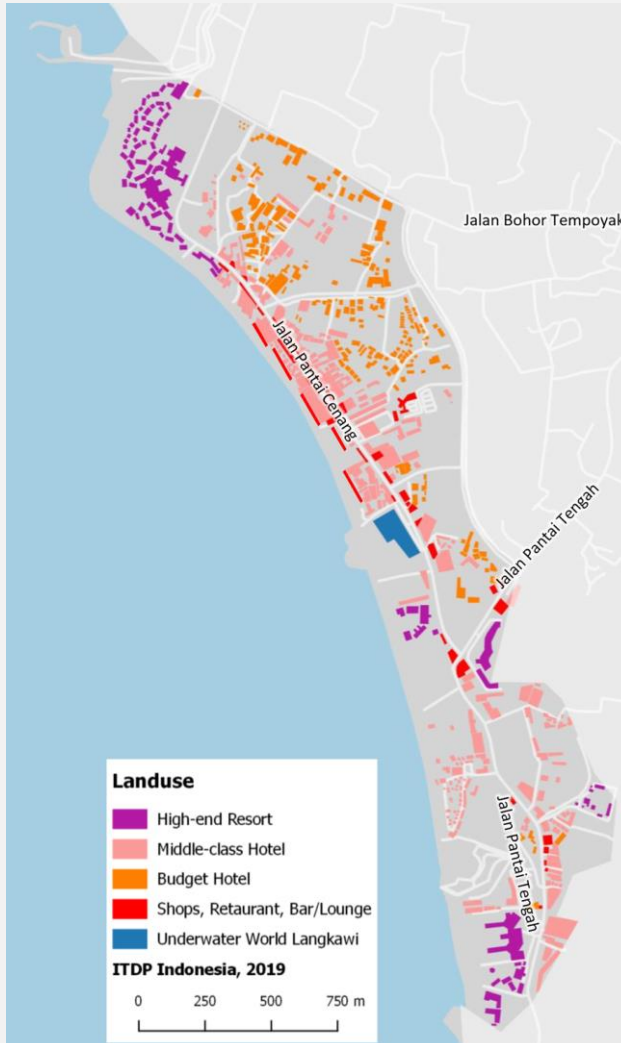


4.3.1 Focus Area

The scope area of this study is located at the famous area in Langkawi Island with the highest volume of pedestrians, Cenang Walk. Most of the people visiting this area are tourists, both domestic and foreign. It is quite common for tourists to rent a car to go around the island or just walking from their hotel to the beach or shops along Cenang Beach Road.

The main road inside this area will be studied and redesign to accommodate better pedestrian facilities for tourists.

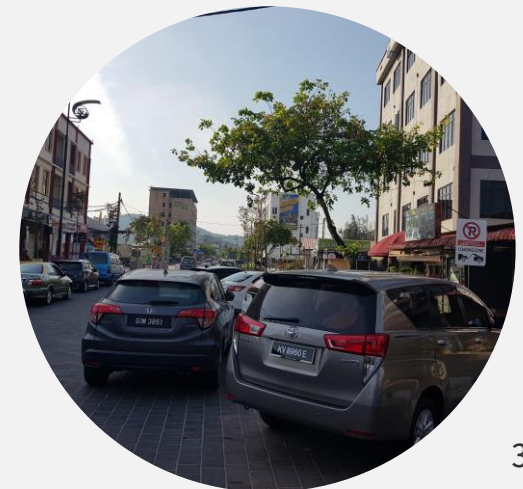




4.3.2 NMT Objectives

With the relatively short walking distance between different destinations for tourists (hotel, beach, restaurants, seaworld etc), Cenang is really accessible by walking and cycling. However, private cars, such as rental cars, taxi and grab taxi are common to be found on these streets.

Non-motorized facilities for pedestrians and cyclists should be improved in this area to create a better walking environment for visitors. Pedestrians and cyclists should get more priority, which means providing bigger space in this area, so tourists can feel safer and more comfortable walking in this area.



NMT Objectives

Issues	Objective	Target
Walking		
<ul style="list-style-type: none"> High pedestrian volume in Cenang Walk, dominated by tourist, but Cenang Walk have a bad quality of sidewalk (sidewalk width, sidewalk occupy by shops, etc) 	<ul style="list-style-type: none"> To facilitate tourist with good facilities of walking by giving priority and space for pedestrian 	<ul style="list-style-type: none"> More convenient walking improvement around Cenang Walk
<ul style="list-style-type: none"> Lack of pedestrian crossing in and nearby Jalan Pantai Cenang, making pedestrian not safe when crossing the road 	<ul style="list-style-type: none"> Create safer walking and crossing environment for pedestrians in Cenang Walk 	<ul style="list-style-type: none"> Safer crossing facility is provided in and nearby Jalan Pantai Cenang
<ul style="list-style-type: none"> Lack of connectivity from Cenang Walk to other area surrounds 	<ul style="list-style-type: none"> Improve the connectivity from Cenang Walk to Pantai Tengah 	<ul style="list-style-type: none"> Continuous sidewalk and the amenities
Cycling		
<ul style="list-style-type: none"> Cycling facilities do not exist in Langkawi (bike lane, priority lane at intersections). Only some bike racks are spotted on Jalan Pantai Cenang 	<ul style="list-style-type: none"> Promote cycling as one of the transportation modes in Langkawi with the provision of safe cycling facilities 	<ul style="list-style-type: none"> Safe cycling facilities (bike lane, crossing) are established in Cenang Walk
<ul style="list-style-type: none"> Many tourist rent car or motorbike to move around in Langkawi, even for short trips. Langkawi or Cenang Walk do not have bike sharing system. 	<ul style="list-style-type: none"> Make tourists easy to access their destination especially for their short trip (hotel to the beach, hotel to the restaurant, etc) 	<ul style="list-style-type: none"> Bike sharing system is provided in Cenang Beach

4.4.1 Good Practices from Cenang Walk

- The government already made an improvement in Cenang Beach area through creating Cenang Walk with good walking environmentally.
- Some good practices from sidewalk and crossing facilities are found along Jalan Pantai Cenang. The sidewalk along Jalan Pantai Cenang already continuous even there is a driveway. Some crossing facilities also adopted raised crossing which can make the vehicles to lower their speed.
- Along the sidewalk, the greeneries such as trees are put to make a shade for the pedestrians and make pedestrians are protected for bad weather.
- Near the north part of Cenang Walk gate, there are some bike racks on the sidewalk. Some cyclist also parks their bike over there.
- Overall, the improvement in Cenang Beach area is impressive but there are some missing components and issues after they implement it. The issues are:
 - Obstacles to walking activity
 - Connectivity between Cenang Beach to other area surrounds
 - Allocation of road space



Continuous sidewalk even on driveway along Jalan Pantai Cenang



Raised crossing along Jalan Pantai Cenang

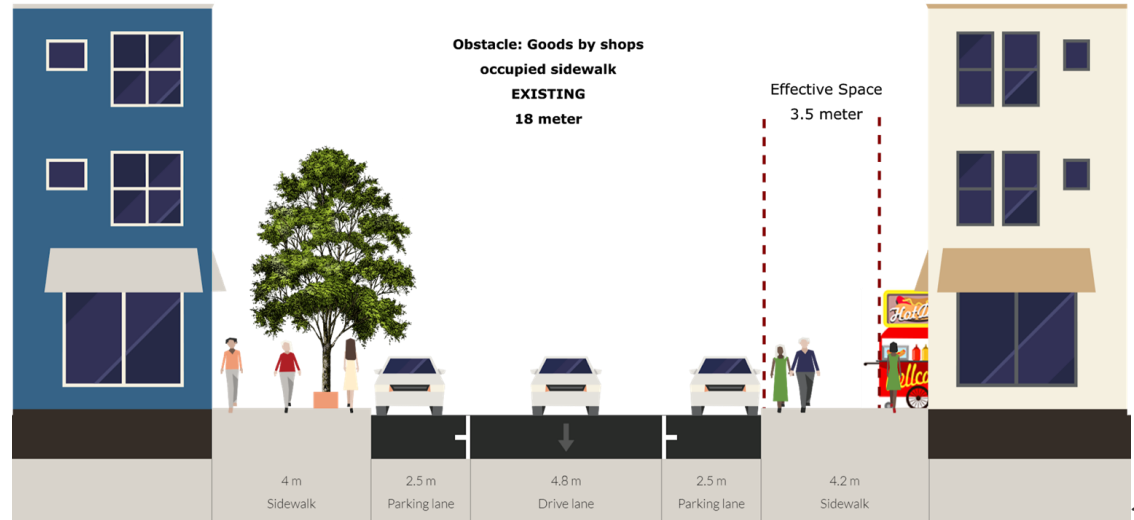
Cross section location



4.4.2 Obstacles to Walking Activity

A. EFFECTIVE SPACE ON SIDEWALK

- The sidewalk on Cenang Walk already wide, more than 3 meter. Unfortunately, there are some obstacles on sidewalk such as utilities, goods by the shops, and big planting box.
- The lack of enforcement to the shops or street vendors make the space on the sidewalk are claimed by them.
- Some utilities such as a lamp, box panel, or planting box also placed not in the buffer zone. Because of it, tactile pavement made following the obstacles.
- This situation makes effective spaces for pedestrian are smaller. For example.



4.4 Current Situation

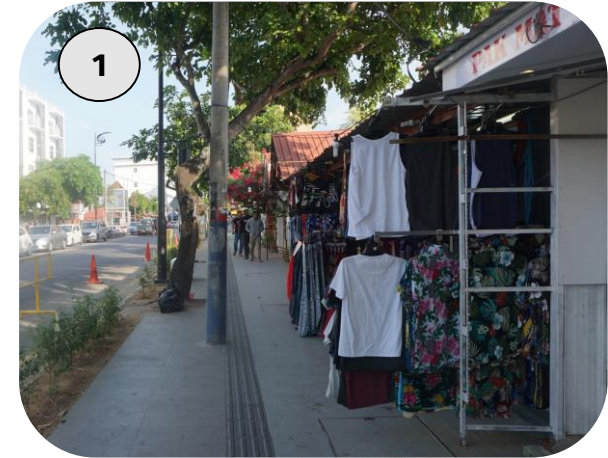
Obstacles on Sidewalk



Some part of sidewalk is occupied by the shops.



Tactile pavings follow the shape of shops which occupy the sidewalks.



Some utilities are placed in the middle of sidewalk which be obstacles for pedestrians.



Outside Cenang Walk, there is no consistency on sidewalk existence



On street parking along the road make pedestrian feel inconvenience when walking, especially on the night.

B. ON-STREET PARKING

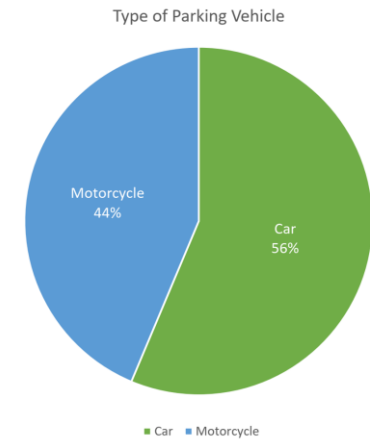
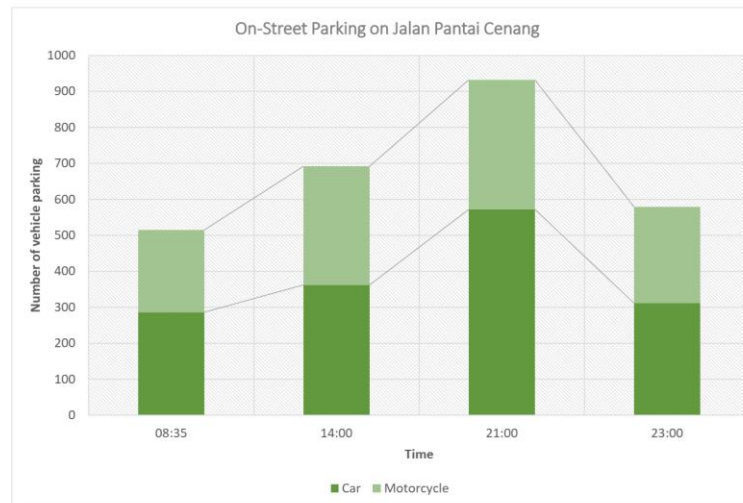
- The obstacles to walking activity not only be found on the sidewalk but also on the traffic lane, for example, the on-street parking.
- Vehicle parking overcrowds along Jalan Pantai Cenang and taking too much precious space in the area. On the other hand, the existence of on-street parking also blocking the pedestrians who want to cross the street.
- Currently, the government had implemented the policy of one-side on-street parking along Cenang Walk. But based on the survey some vehicles still parking on both of sides of Jalan Pantai Cenang. Sometimes they do double parking. This condition makes an unsafe and uncomfortable environment of walking and crossing the street.
- Having on street parking along the street will harm the existence of continuous walking environment. To prevent the illegal parking on both sides, expanding the area of sidewalk or curb can be one of the options to implement.
- Adding pinch-crossing type as way of support the existence of mid-block crossing will create the area to have more sense to prior the pedestrians. Not only preventing the parking to occupy both sides, it will also shorten the walking distance of pedestrians. Other ideas of implementing sidewalk expansion plus park(ing) with specific design of chichane can also help to reduce the speed of vehicles which will pass the street. It will also create better environment of walking.

4.4 Current Situation



Double on-street parking on Jalan Pantai Cenang. The cars and motorcycles start parking on both sides on the night.

- Based on the survey, cars are more dominant than motorbike on parking along Jalan Pantai Cenang.
- The number of vehicles which parking along Jalan Pantai Cenang are slightly increased at 21:00 reached 572 cars and 360 motorbikes.
- Regulation of parking on one side only is not strictly enforced. There are still a lot of vehicles parking on both side and create double parking.
- By removing the on-street parking along Jalan Pantai Cenang, more pedestrian-friendly amenities can be added on this street.



4.4 Current Situation

- On-street parking along Jalan Pantai Cenang is always full by visitors and car & motorbike rentals.
- Meanwhile, the park and ride which already built by the government are still quite empty.
- Not only because the on-street parking makes the people near their destination but also there is no regulation about parking fee based on zone.
- Parking area, both on-street and the off-street in Langkawi, are relatively cheap even free.
- This condition makes people feel they are facilitated to use their private vehicle to anywhere in Langkawi.



The park and ride only 200 meter from Cenang Beach but there is no people want to park their vehicle in this location.

Crossing facilities in Cenang Walk



4.4.3 Connectivity between Cenang Beach to other area surrounds

- Cenang Walk already has good crossing facilities at some locations but some of the facilities is occupied by vehicles. Some vehicles spotted parking on the zebra cross.
- By considering the number of pedestrian volume, raised crossing not only needed on the mid-block crossing but also on the intersection. Raised intersection is suitable to adopt in Cenang Walk to make the vehicle more slower when turning.
- The crossing facility also to be considered to be put outside Cenang Walk to make a good connectivity from Cenang Walk to other surrounded area.
- The sidewalk also missing on the some locations outside Cenang Walk. The uncontinuous sidewalk can create a lack connectivity from on road to other roads. The consistency of sidewalk should be implemented.



Sidewalks outside Jalan Pantai Penang have bad conditions, some segments are missed, have a different level with another parallel sidewalk. This condition makes walking unpleasant

4.4 Current Situation



The lack of bicycle infrastructure, such as dedicated lane, dedicated parking and bicycle sharing system, making cycling not too popular for tourists. Cenang beach and central beach in reality are perfect locations for cycling.

4.5 Focus of Improvement

4.5.1 Walking Improvement

The improvement will focus on re-allocating vehicle space to create a better walking environment, especially on the area with high pedestrian volume. Pedestrian safety and comfort should be the main priority in improving walking.

Walking improvement in Cenang Walk can be done through the following activities:

1. Provide sidewalk and remove on-street parking to create more space for pedestrian and cycling movement
2. Provision of safe crossings facility
3. Improve connectivity from Cenang Walk to Pantai Tengah and the nearby area within 2 kilometer radius.

4.5.2 Cycling Improvement

While not many cyclists are spotted in Langkawi, Cenang Walk is an ideal area for cycling, especially for a shorter distance. Meanwhile, the current road conditions are unsafe for cyclists, without any dedicated lane.

The bike sharing system also will be a good alternative for tourist mobilization in Cenang Walk. Commonly, the tourist rent a car or motorbike to their mobility. If bike sharing is provided in Cenang Walk, the tourists can access bicycle easily.

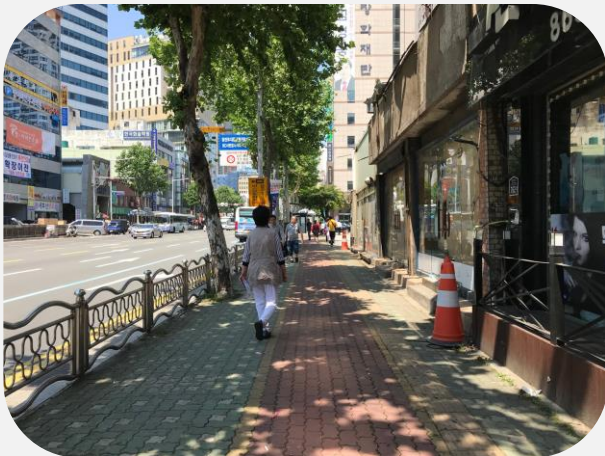
To improve cycling facilities, the following activities shall be introduced :

1. Safer cycling network and infrastructure
2. Bike-sharing initial plan



Best practice pictures from South Korea

Continuous sidewalk even on the driveway. The sidewalk also has buffer and/or bollards.



4.6.1 Walking Facility Improvement Guidance

1. Complete street

The street is complete if it can provide the needed functions for all of the designated users. In the case of the inner-city area, all streets need to serve pedestrian as the first priority. On a street which also serves motorized vehicles at high volume, pedestrian priority is ensured by providing a continuous exclusive sidewalk.

2. Obstruction-free

Walkways need to be free 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 in a specific space to give pedestrians exclusive space to walk.

3. 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.

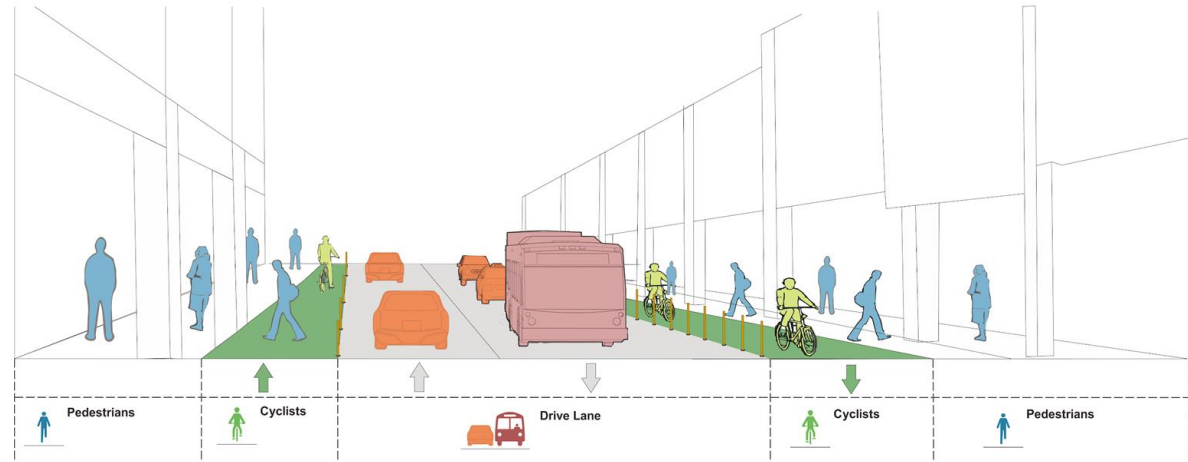
4. Continuous over driveways and intersections

Giving priorities to the pedestrian can be practically done by raising walkways over intersection 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 also forced to slow down their speed, which makes the pedestrian safer to cross the road.

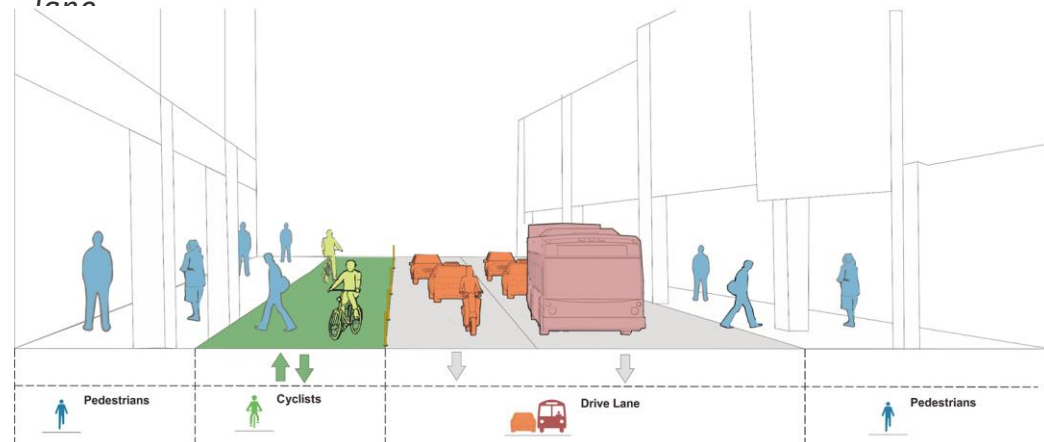
4.6.2 Street Design

- Based on Cenang Walk condition, a set of proposed workable street cross section design is created.
- These templates are created for various street types based on road situation and obstacles, such as street vendors, opened gutter, one side-sidewalk, and narrow road. Each cross section template is composed of five components i.e. buffer/utility area, shared space, sidewalk area, street vendor/parking space, and drive the lane.
- All the templates below were designed with pedestrian priority activity in mind, thus traffic lane can only be justified after sufficient sidewalk is provided, and should there be no sufficient space for traffic available, traffic will not be allowed on that street.
- On-street parking will be not allowed along Jalan Pantai Cenang and Jalan Pantai Tengah.

TEMPLATE 1: Two direction of drive lane

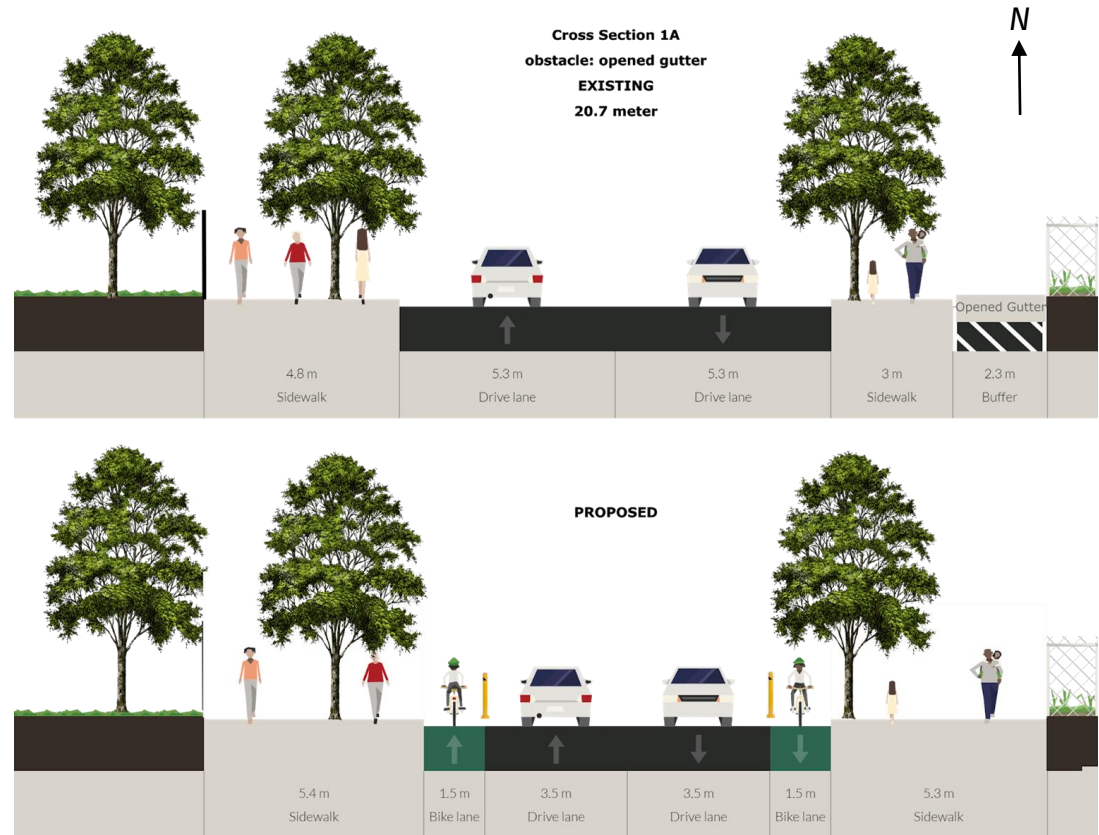
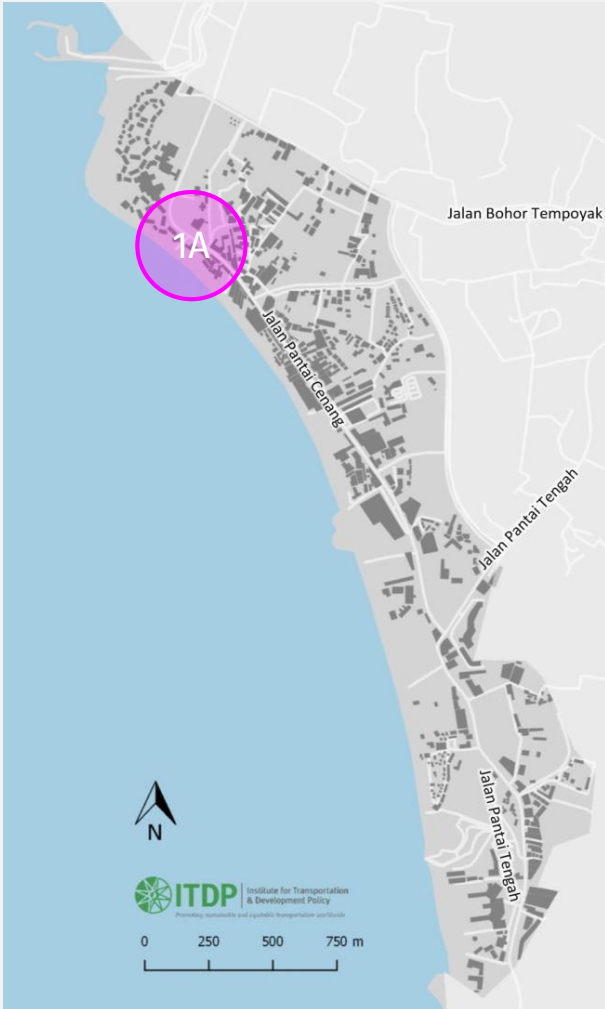


TEMPLATE 2: One direction of drive lane



4.6 Walking Facility Improvement

North Part of Cenang Beach

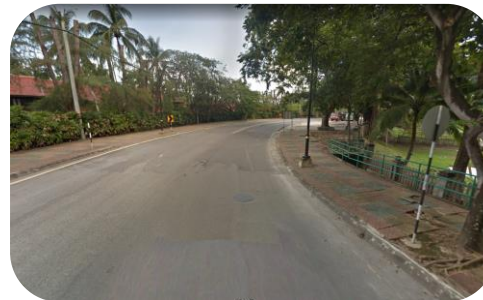
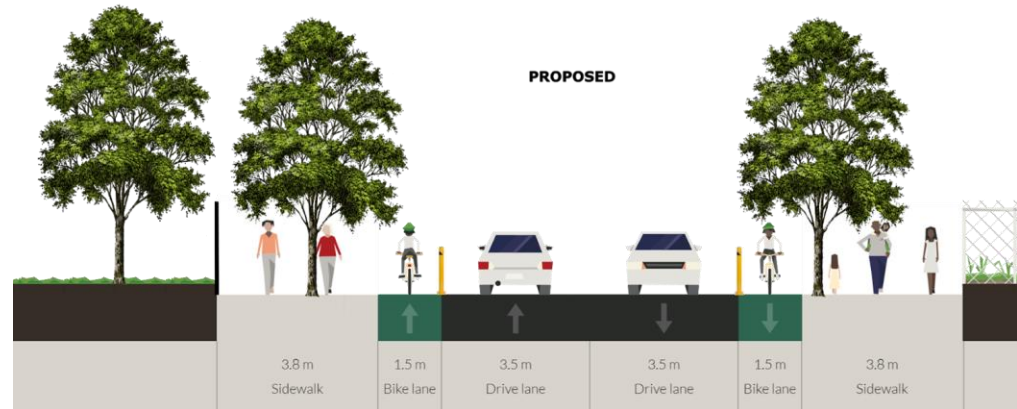
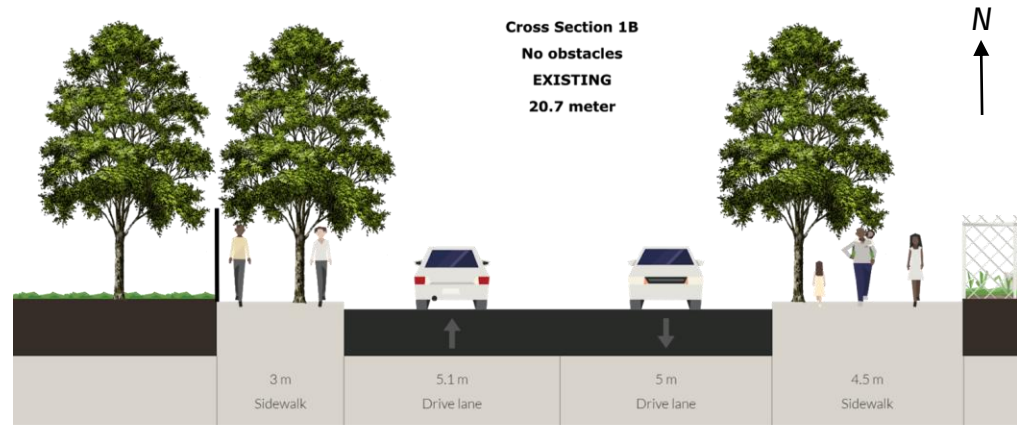


Improvements:

- Widen walkways area through closed the opened gutter
- Put bollards on both sides
- Add bike lane on both sides
- Establish 2 driving lanes as existing

4.6 Walking Facility Improvement

North Part of Cenang Beach

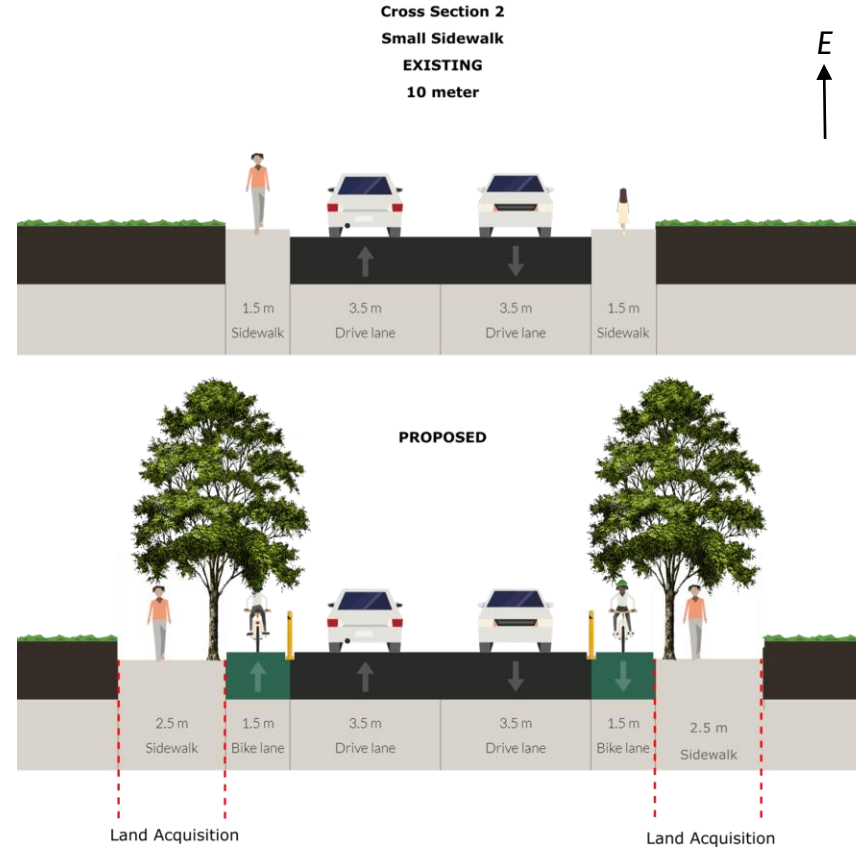
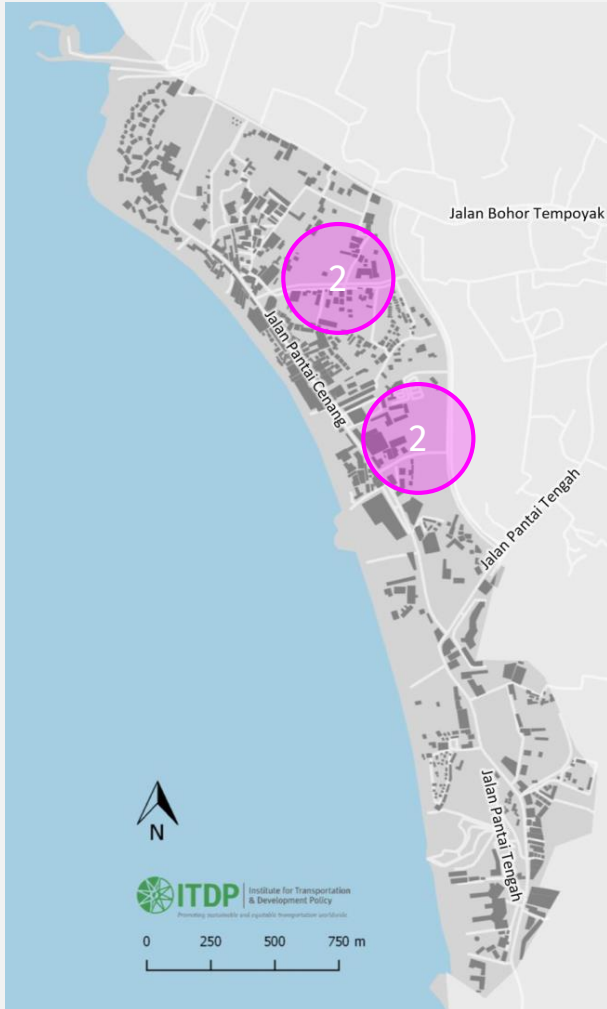


Improvements:

- Widen walkways area
- Put bollards on both sides
- Add bike lane on both sides
- Establish 2 driving lanes as existing

4.6 Walking Facility Improvement

East Part of Cenang Beach



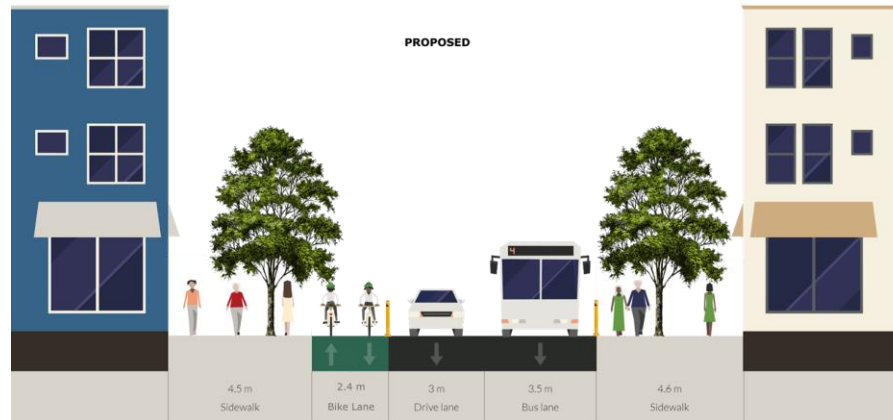
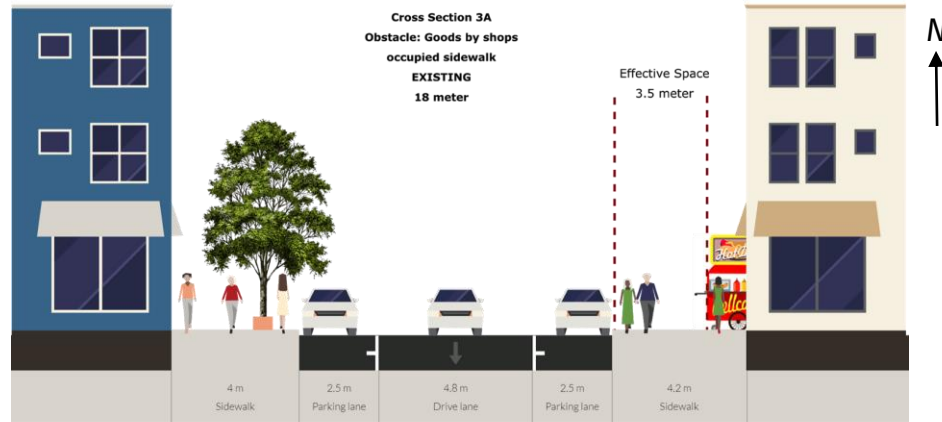
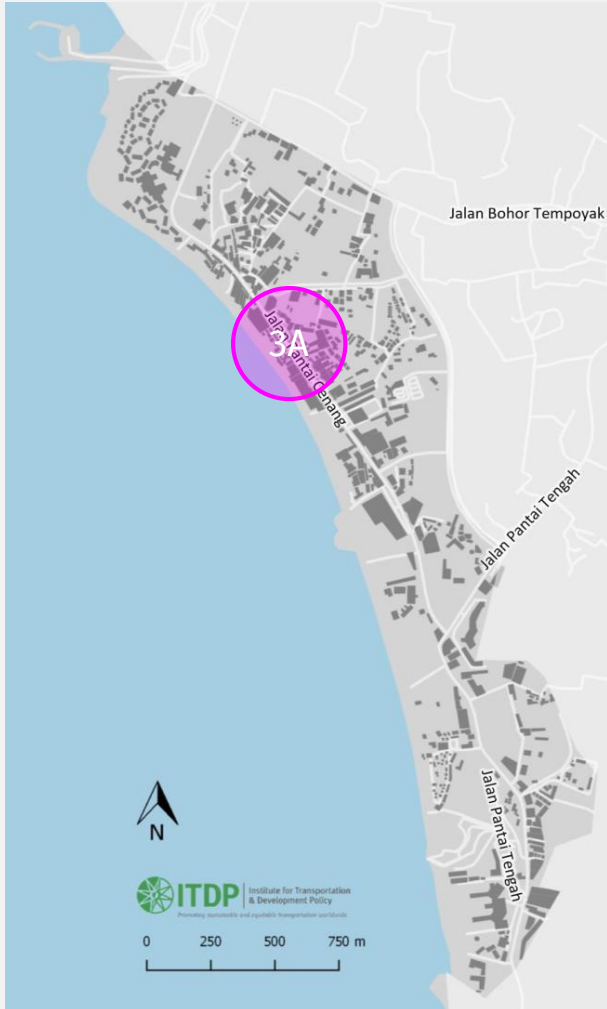
Improvements:



- There are a lot of greenfield along the street on the west area of Cenang Beach.
- The greenfield can be used for land acquisition to add more space for walkways
- Put bollards on both sides
- Put some trees along the street
- Add bike lane on both sides
- Establish 2 driving lanes as existing

4.6 Walking Facility Improvement

Center of Cenang Beach

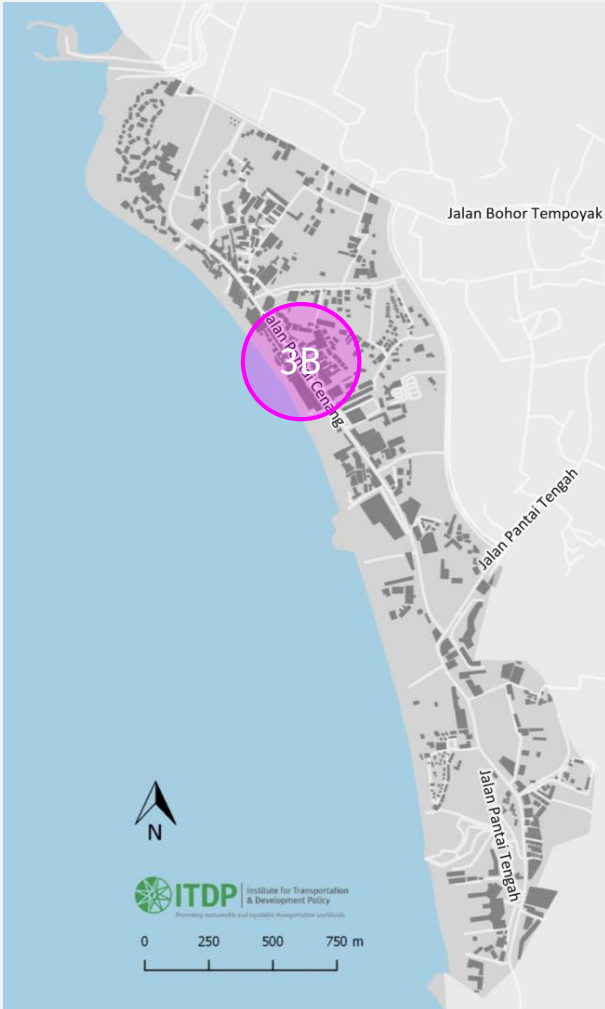


Improvements:

- Widen walkways area through
- Cleared the sidewalk from street vendors, shops' goods, etc
- Put bollards on both sides
- Add bike lane on one side for two-directions
- Establish 2 driving lanes for one-direction to accommodate public buses and shuttle buses

4.6 Walking Facility Improvement

Center of Cenang Beach

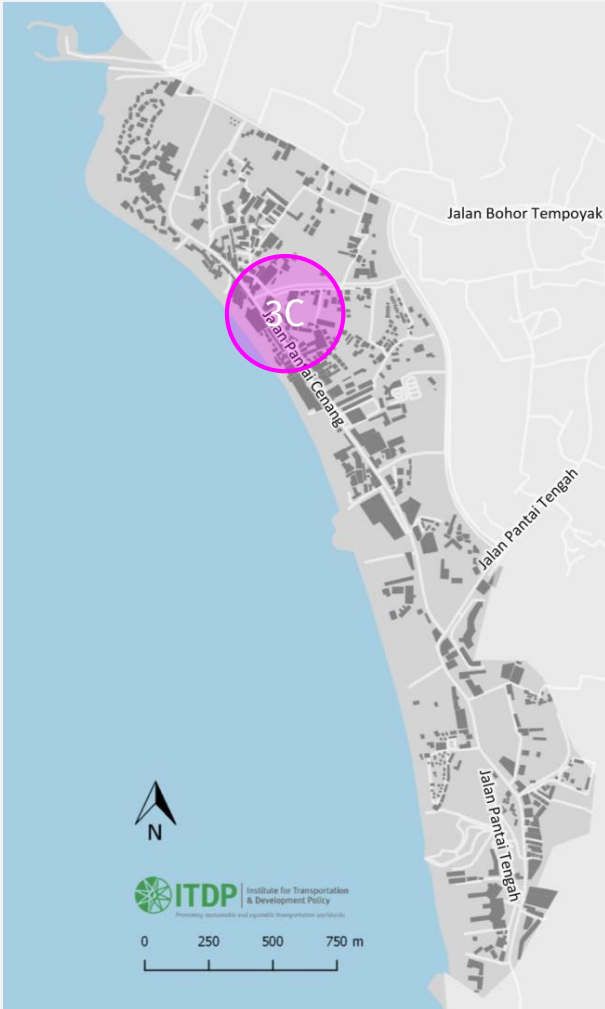


Improvements:

- Widen walkways area through
- Establish loading bay as existing
- Put bollards on both sides
- Add bike lane on one side for two-directions
- Establish 2 driving lanes for one-direction to accommodate public buses and shuttle buses

4.6 Walking Facility Improvement

Center of Cenang Beach

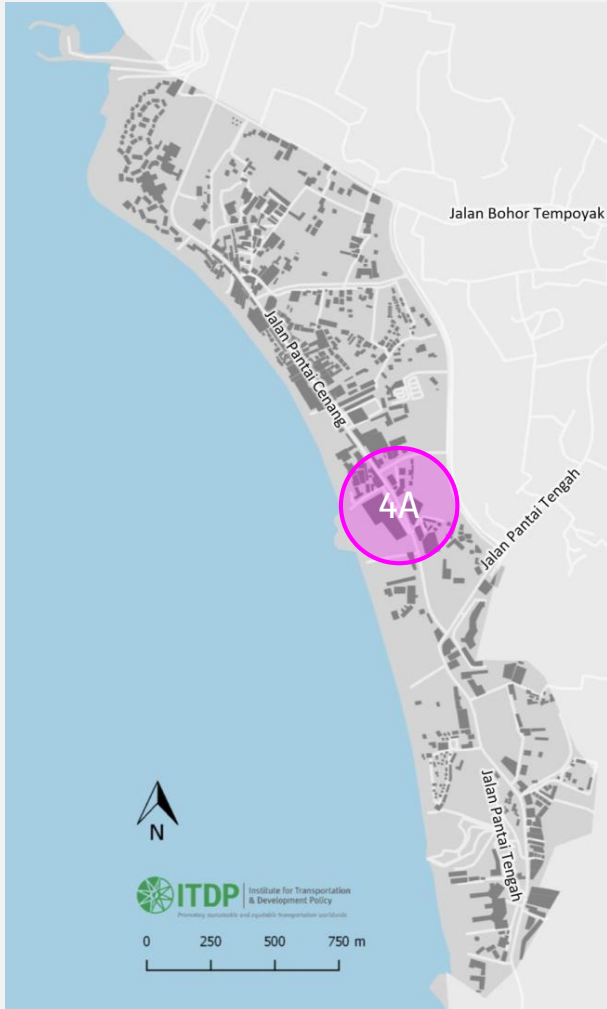


Improvements:

- Widen walkways area through
- Put bollards on both sides
- Add bike lane on one side for two-directions
- Establish 2 driving lanes for one-direction to accommodate public buses and shuttle buses

4.6 Walking Facility Improvement

South of Cenang Beach

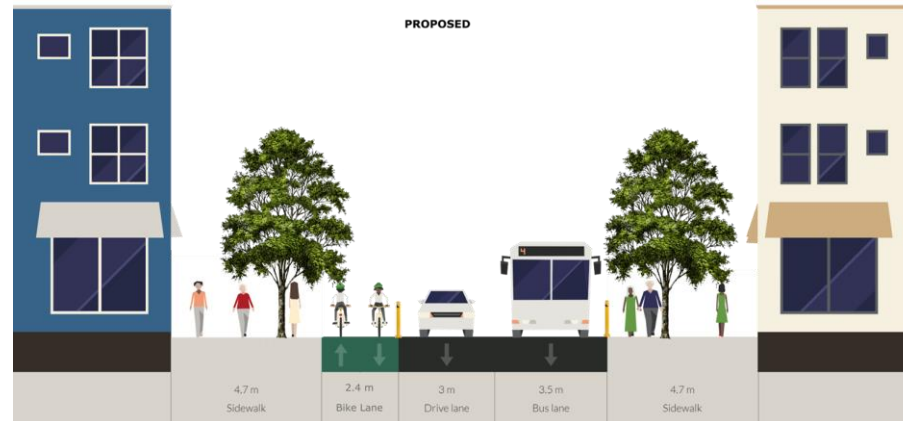
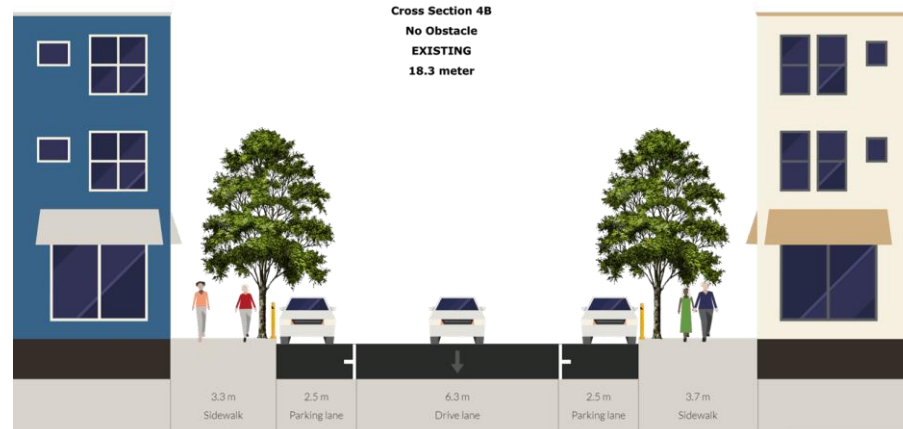
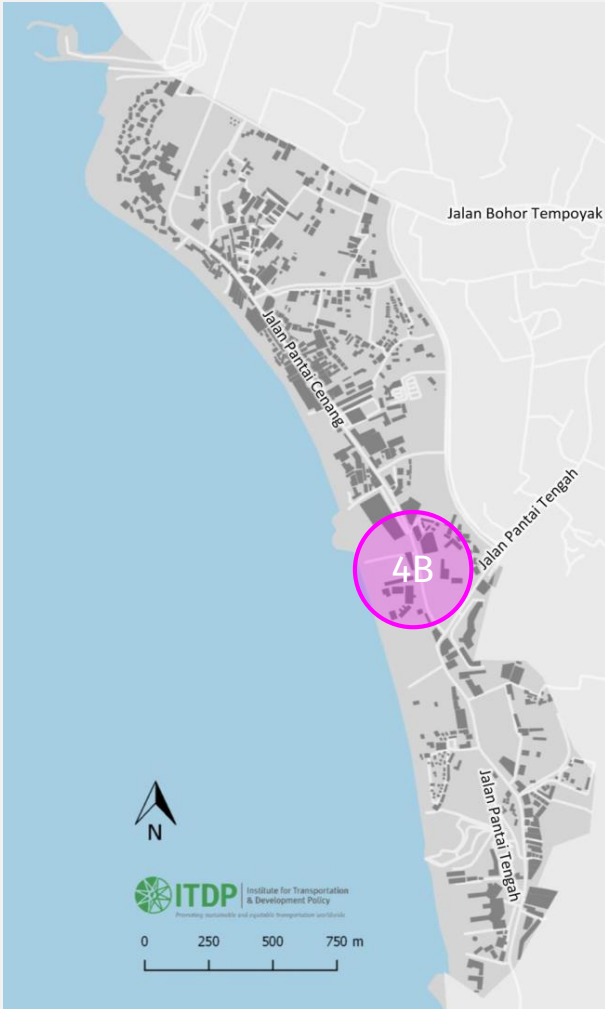


Improvements:

- Widen walkways area through
- Cleared the sidewalk from street vendors, shops' goods, etc
- Put bollards on both sides
- Add bike lane on one side for two-directions
- Establish 2 driving lanes for one-direction to 50 accommodate public buses and shuttle buses

4.6 Walking Facility Improvement

South of Cenang Beach

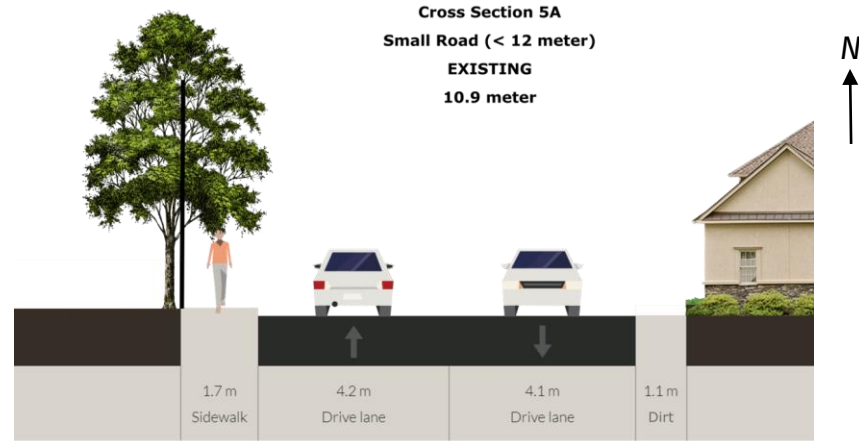
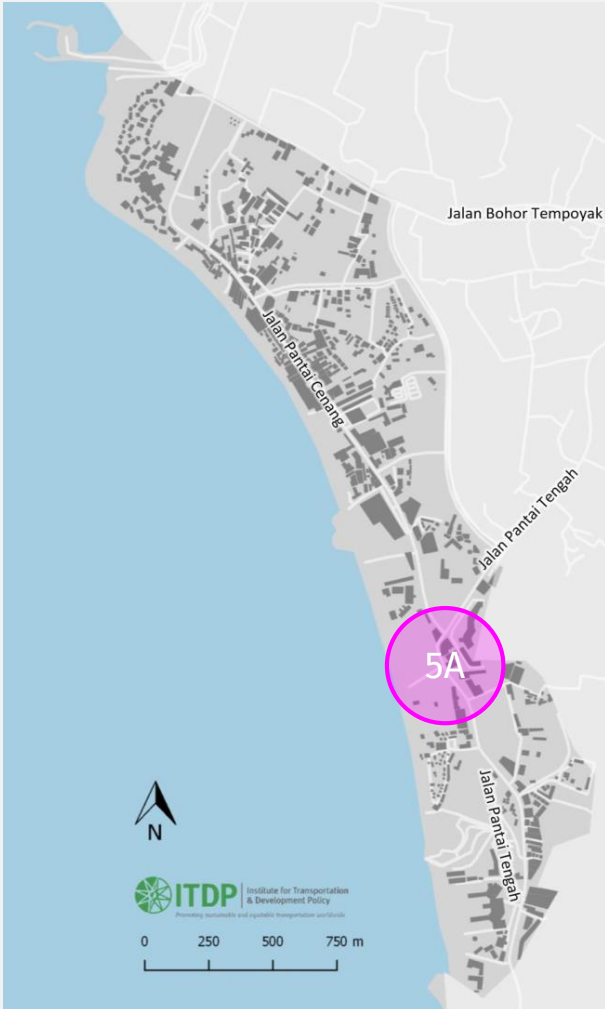


Improvements:

- Widen walkways area through
- Put bollards on both sides
- Add bike lane on one side for two-directions
- Establish 2 driving lanes for one-direction to accommodate public buses and shuttle buses

4.6 Walking Facility Improvement

South of Cenang Beach

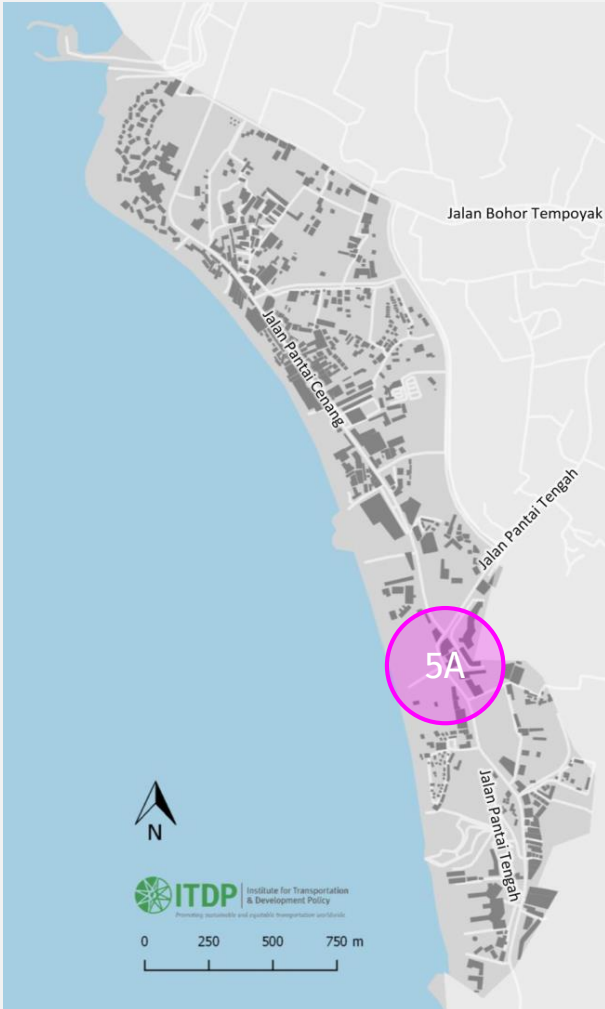


Improvements:

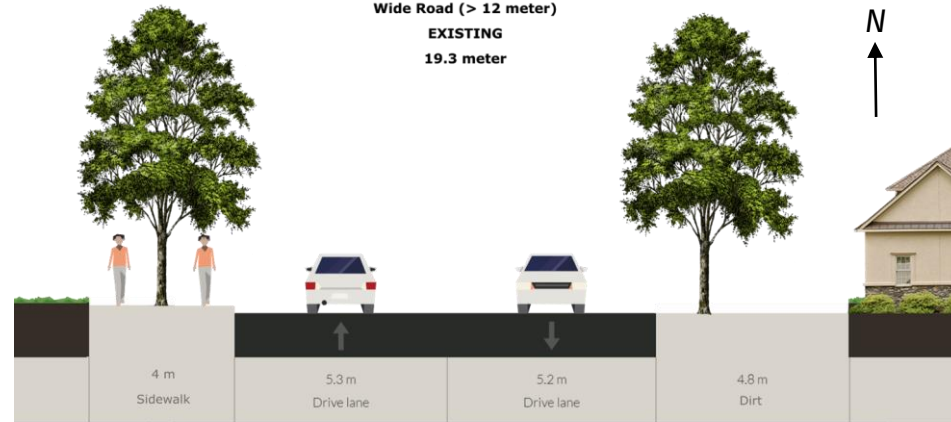
- Widen walkways area through
- Claiming the dirt to be sidewalk
- Put bollards on both sides
- Add bike lane on one side for two-directions
- Establish 2 driving lanes as existing

4.6 Walking Facility Improvement

South of Cenang Beach



Cross Section 5B
Wide Road (> 12 meter)
EXISTING
19.3 meter



PROPOSED



Improvements:

- Widen walkways area through
- Claiming the dirt to be sidewalk
- Put bollards on both sides
- Add bike lane on one side for two-directions
- Establish 2 driving lanes as existing

4.7.1 Intersection Redesign Guidance

*Best practice:
Raised intersection in Melaka,
Malaysia*



Raised Intersections reinforce slow speeds and encourage motorists to yield to pedestrians at the crosswalk. Raised intersections are needed to make vehicles slowing down at intersections. This is as a way to prioritize pedestrians and cyclists in the conservation zone. For Cenang, raising the intersections at certain locations would help to facilitate safe walking and crossing environment.

Raised Intersection Design Guidance:

1. Raise the intersections to create a safe, slow-speed intersection. Provide speed humps and other vertical deflection elements to reduce speeds and signal to motorists that they must yield to pedestrians.
2. Add curb extensions to increase the pedestrian space, reduce the crossing distance, and prevent parking at the intersection corners. Use the extension of these spaces to also provide landscaping and street furniture
3. Where illegal parking on the sidewalks is a common problem, consider using bollards or street furniture to prevent vehicles from invading the pedestrian space.
4. Where vehicles are not turning, design corners with the smallest constructible radius, approximately 0.6 m.
5. Prioritize bicycle traffic on low-speed corridors by treating them as bicycle streets with shared lane markings.
6. Consider removing one lane of parking to create a contraflow cycle lane. Raised intersections increase safety for cyclists riding contraflow and for performing turns across oncoming traffic.

4.7.2 Intersection Redesign

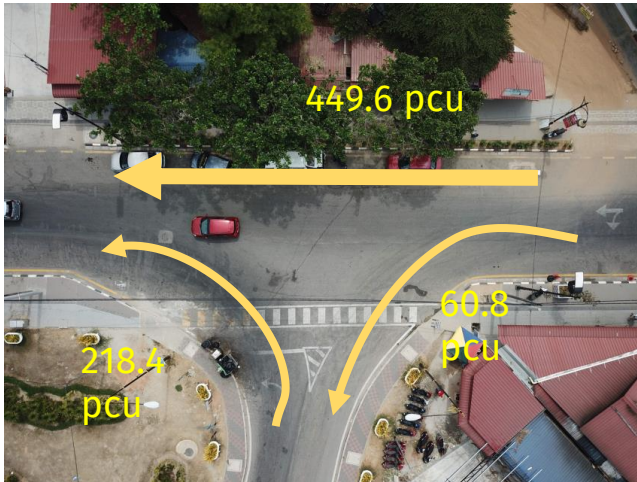
Template of improvements:

- Reduce motorized turning radius
- Establish raised crossing
- Add more zebra cross
- Put continuous bike lane
- Relocate on-street parking



Intersection on the north part of Jalan Pantai Cenang

Existing



Hourly traffic volume on the north junction of Cenang Walk.



Proposed

4.7 Intersection Improvement

Intersection on the middle part of Jalan Pantai Cenang



Existing

Intersection on the south part of Jalan Pantai Cenang



Existing



Proposed



Proposed

4.8.1 Bike Sharing Planning

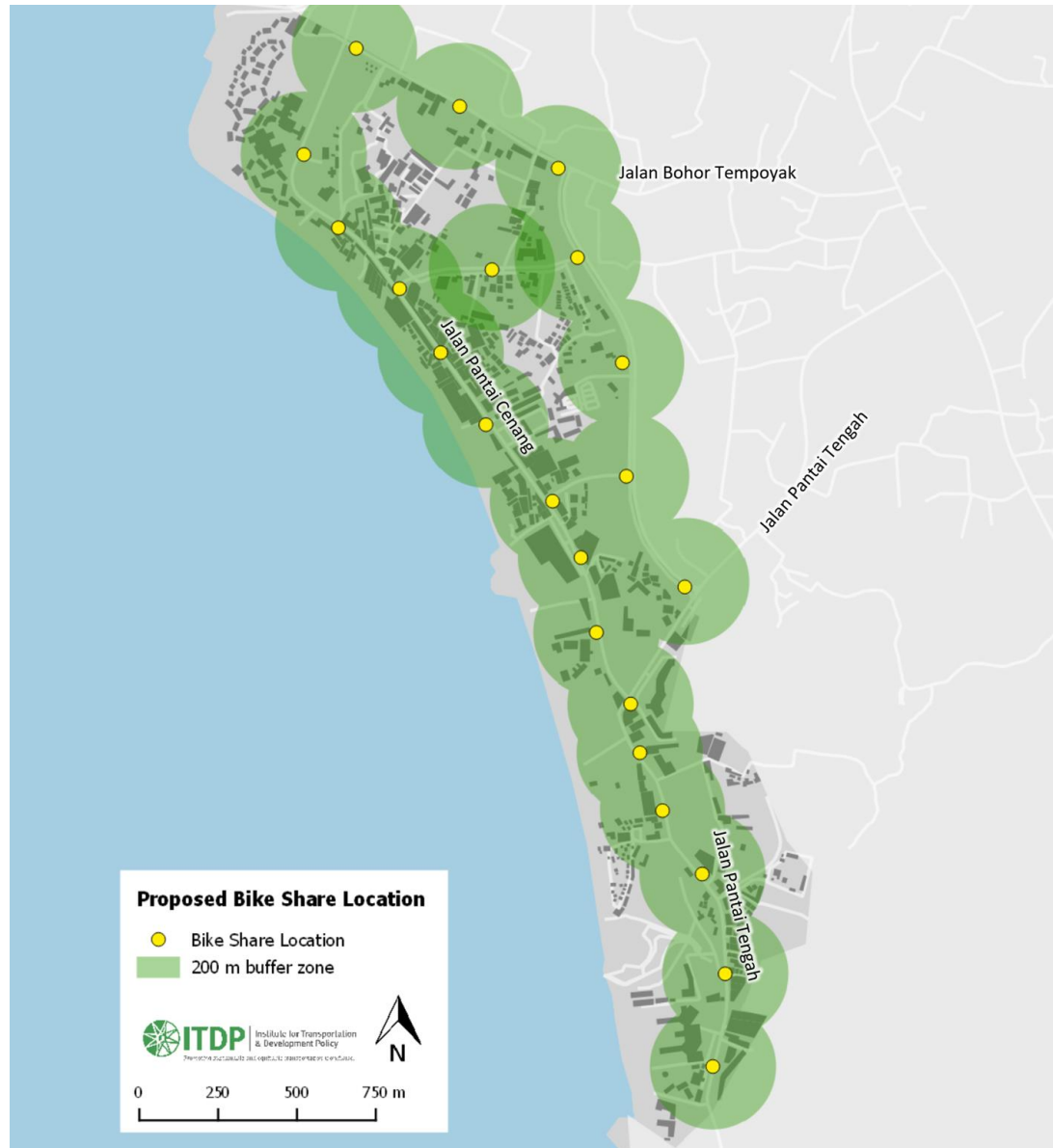
A bike-sharing system is a type of ride-sharing service, in which bicycles are made available for shared use on a short term basis. The bike sharing scheme allows people to borrow a bike for short trips, with bike available to grab and be returned at different stations and locations.

As part of the public transport system, the bike-sharing system solves not only the 'last mile' issue of longer public transport trips, but it also creates a new way of travel, especially for shorter trips.



4.8.2 Parking Location

- Good planning for station location is the success key of the bike sharing system. The planning of bike-sharing shall be determined based on the density, position, and scale of bike parking locations.
- The stations should be located closer to demand, such as tourist attractions restaurants, central business districts, and residential areas. The distance between stations should be 150 - 200 meter.
- From the proposed street design, Jalan Pantai Cenang and Jalan Pantai Tengah will have a wide sidewalk so the bike sharing station can be put on the sidewalk on the buffer zone.
- Cottages and hotels are welcomed to collaborate with bike sharing operator and put the bike sharing station in their hotel.



Form 1: Combine bike-sharing with sidewalk

Best practice: Penang, Malaysia



Proposed bike sharing station on sidewalk in Jalan Pantai Cenang:



Form 2: Bike-sharing station based on field condition

Best practice: Shanghai, China

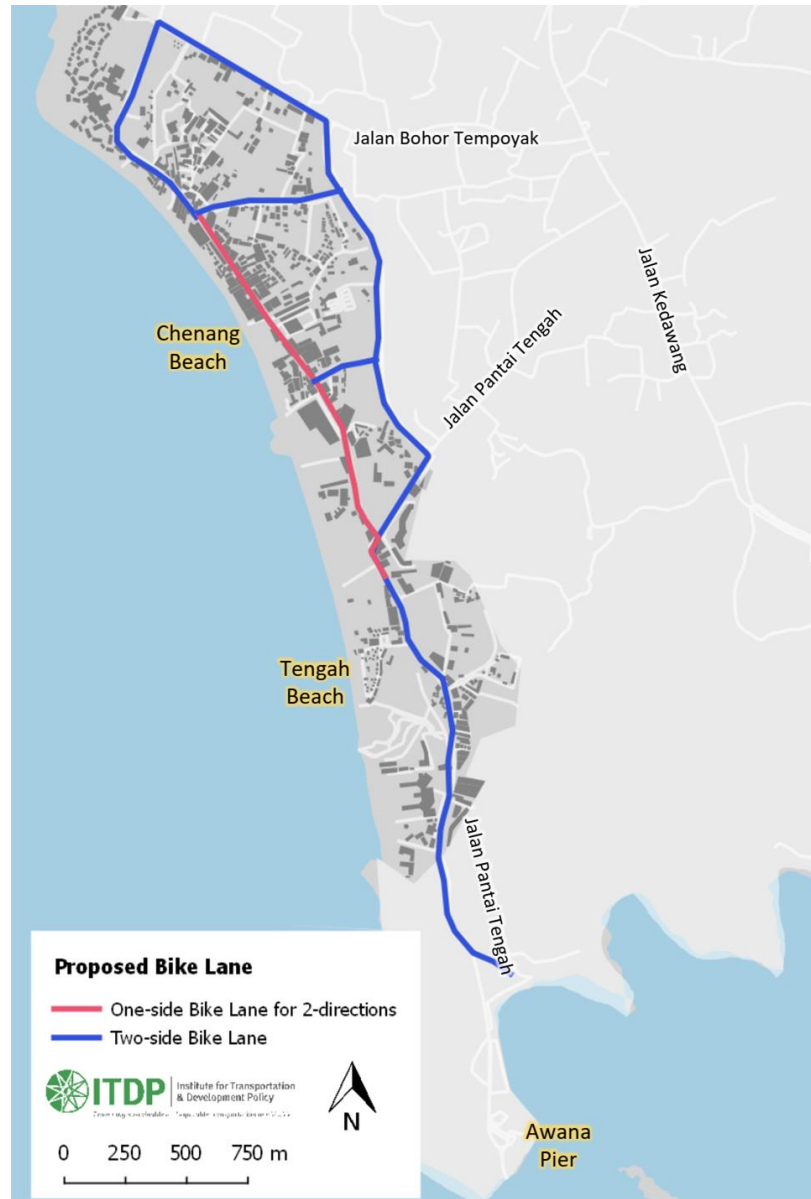


Proposed bike sharing station based on field condition on the plaza in front of Cenang Beach



4.8.3 Bike Lane

- To support cyclist activities and bike sharing system, the bike lane should be established along Jalan Pantai Cenang and Jalan Pantai Tengah which have many tourists.
- The bike lane will on a dedicated lane with bollards to separate it from the drive lane.
- On the roads with one direction, the bike lane will be put on one side with two directions. The other side will facilitate bus, taxi, and bus for passenger boarding-alighting.
- On the roads with two directions, the bike lane will be put on both of side and follow the traffic direction.



4.9.1 Proposed Route and Shuttle Stops

- Cenang Beach is always busy with tourist throughout the day and evening.
- Most of the tourist come with their motorbike/car rented.
- Currently, there is a park and ride facility exist behind the Plaza of Cenang beach. If all on-street parking will be removed along Jalan Pantai Cenang, a shuttle service from P&R site which cover the whole Cenang area need to be established.
- A free shuttle bus service can be provided to cater the movement of people along Chenang Road, unless for those who choose to walk or cycle.
- The proposal for shuttle service in Chenang can be seen on the right.
- Introduction of electric bus can also begin in this shuttle bus route.



4.9 Free Shuttle Bus Service

4.9.2 Type and Service Plan



Electric-Powered Microbus (Motor India Online)



Electric 7 meter bus in Istanbul, Turkey

Service Plan:

- Route Length : 5.2 meter (loop)
- Start and finish stop location : bus bay on the north part of Jalan Pantai Cenang
- Operating hours : 08:00 - 21:00
- Speed average : 22 km/hour
- Headway : 10 minutes
- Fleet requirement (with 10% margin): 4 unit

Bus Type:

- Dimension : (length) 6 - 7 meter,
(width) max. 2.1 meter,
(height) max. 2.9 meter
- Fuel : 100% electric
- Capacity : 30 passengers (seat+standing)

5. Project Cost Estimate

Public Transport Improvement Project

Improvement	Units	Unit Price	Cost (USD)	Notes
Public Transport Bus 12 meter				30,162,430 USD
Fleet	85 bus	350,000	29,750,000	
Operational Costs (in the first year for 85 buses)			412,430	
Bus Stop Improvement				12,956,200 USD
Signage	277	300	83,100	
Bench and seating	277	300	83,100	
Shelter	277	45,000	12,465,000	
Passenger information system	1 set	325,000	325,000	
TOTAL				43,118.630 USD

5. Project Cost Estimate

Cenang Walk Improvement Project

Improvement	Units	Unit Price	Cost (USD)	Notes
Street Design - Cenang Walk to Pantai Tengah				10,403,221 USD
Sidewalk Improvement	34,486 m ²	200	6,897,160	
Bike Lane	11,660 m ²	300	3,497,976	
On-street removal	162	50	8,085	
Bike Share System				125,400 USD
New Stations	22 stations	3,200	70,400	
New Bikes	220 bikes	250	55,000	
Intersections				405,000 USD
New Raise Crossing	3 intersections	135,000	405,000	
Shuttle Bus - Bus 7-9 meter				620,726 USD
Fleet	4 units	150,000	600,000	
Bus Stop	13 bus stops	300	3,900	
Operational Costs (in the first year for 4 buses)			16,826	
TOTAL				11,554,347 USD