

Japan International Cooperation Agency (JICA)  
Kingdom of Cambodia

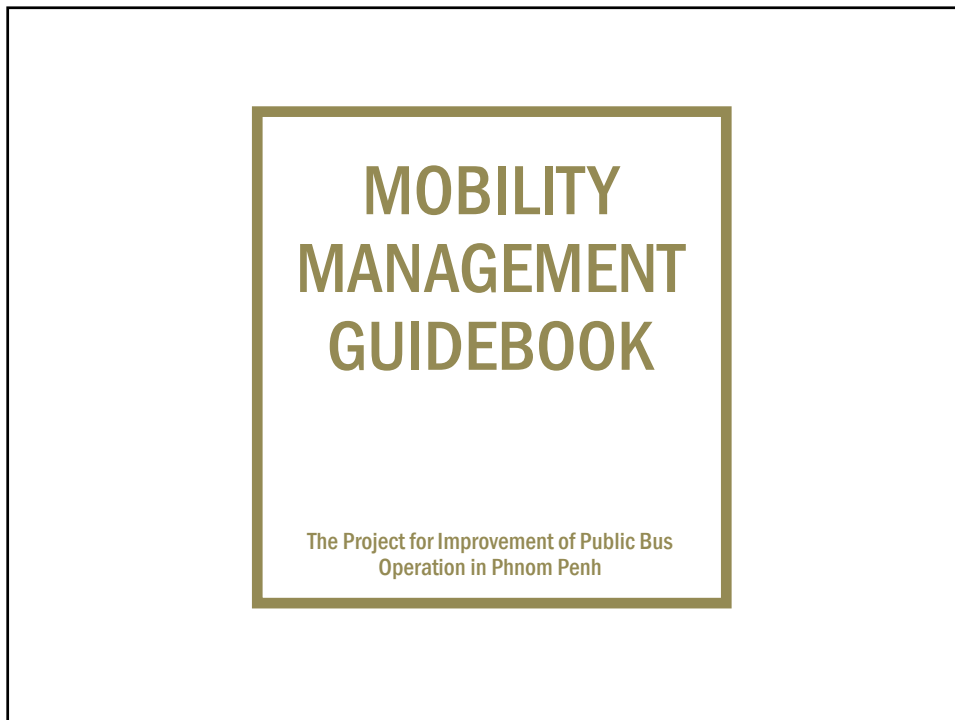
# **THE PROJECT FOR IMPROVEMENT OF PUBLIC BUS OPERATION IN PHNOM PENH**

## **TECHNICAL PRODUCT 5**

1. Mobility Management Guidebook
2. Guidebook on Public Transport  
Priority Measures
3. Bus Facility Planning Guidebook

SEPTEMBER 2022





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- Letting citizen know the merit of using public transportation

### Part 3 Monitoring and evaluation of MM measures implemented in PiBO

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- Online Surveys

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# Part 1

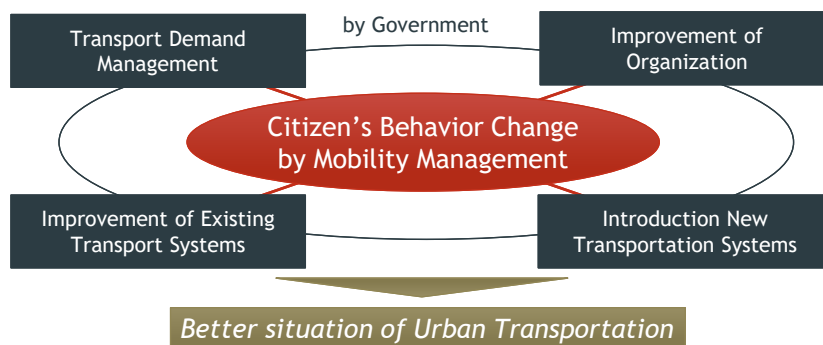
## Introduction of Mobility Management (MM)

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### What is Mobility Management(MM)?

#### Mobility Management is

- Activities in order to shift from “depending on automobile extremely ”to “using various mode including public transport and walking smartly ” in religion or city.
- Communication activities which appeal to each citizens individually to conduct travel behavior voluntarily with consideration for environment and health.

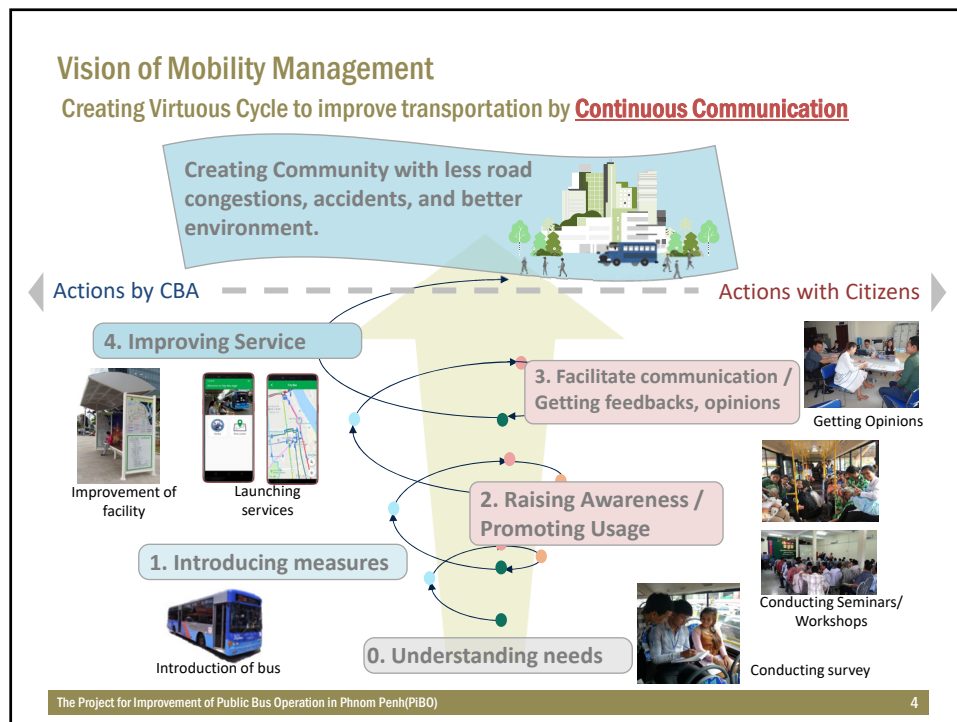


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### Why is Mobility Management important?

- Transportation policy can achieve its purpose only after people's behavior change.
- Only implementing each measures is imperfect in order to change people's behavior.
- If the merits of using new infrastructure and cooperating new measure don't spread to citizens no matter how you build perfect infrastructure and implement excessive measure, the citizens may not change their behavior.
- Therefore, the government/service provider must do their best to change their behavior by give them the merits of citizen's changing behavior and information to change their behavior.
- These process is "Mobility Management" and it is essential to succeed transportation policy.

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## Promotion measures as part of mobility management

- MM is communication measure to change people's action voluntarily.
- MM includes measure to support people's action voluntarily in a broad sense.

### Communication Activity(Main measure)

- measure in order to change people's action voluntarily by communication

### Improvement measure of Transportation (Support measure)

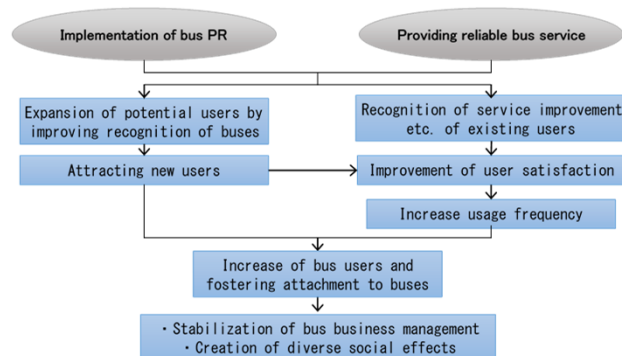
- Bigger change of people's action will be expected by combination "Communication Activity" and "Improvement measure of Transportation".
- For example, Enhancing convenience of public transportation(*Pull* measure), Road pricing (*Push* measure)
- If improvement measure of transportation are difficult, even temporary implementation would be effective.

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## Promotion measures as part of mobility management

- It is important that the bus promotion measures synchronize with the improvement of bus service.
  - Key benchmarks to be considered: Introduction of new buses, expansion of bus routes, introduction of bus service application, etc.

Flow for enhancing use of public bus



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## Communication Activity

- **Travel Feedback Program**

- Representative method of communication activity
- Promotion to change each person's behavior voluntarily through several times of communication
- Depending on the situation, Step1,2 and 4 could be eliminated

<b>Step1</b> Pre-survey	Acquisition of the information about transportation behavior before behavior change.
<b>Step2</b> Communication for behavior change	Provision of the information to promote behavior change; e.g., Public transportation information(Route, timetable, fare, how to board), Demerit of using automobile etc.
<b>Step3</b> Post-survey	Implementation of questionnaire survey on whether people's behavior and consciousness change or not after Step2.
<b>Step4</b> Feedback for behavior change	Provision of the information about behavior change for each people in order to prolong the effect of the communication activity for long time.

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## Target of Mobility Management

### RESIDENTIAL AREA (Basic)

- The specific transportation problem would be improved by targeting all resident in the area.

### SCHOOL

- The transportation situation "in the future" would be improved by conducting Communication Activities for students.

### WORK PLACE

- The transportation behavior of commuting and Business purpose would be changed efficiently by targeting employee.

### SPECIFIC ROUTE

- The utilization promotion of the specific route would be efficient by targeting resident who live along specific route.

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### Consideration points of MM

**POLITENESS**

- You have to explain the purpose of Mobility Management politely and to request people's behavior change politely.

**COMPREHENSIBILITY**

- You have to provide information to be able to understand for everybody easily.

**INDIVIDUALITY**

- You have to provide individual and suitable information for each people.

e.g. You provide information about bus stop A for residents who live near bus stop A. You give "the way to bus stop A", "Timetable of bus stop A", "Destination they can access from bus stop A" etc.

**DICHOTOMIC**

- You have to provide the information of "Good aspect/Merit" and "Bad aspect/Demerit" because only one-sided aspect create psychological repellece.

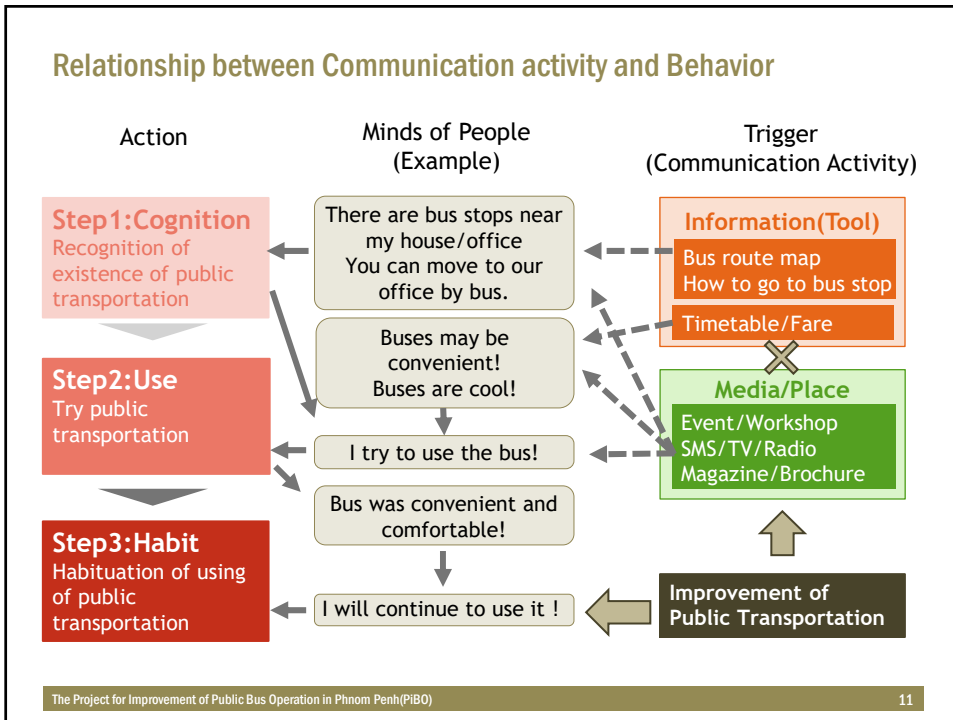
e.g. You provide both of merit and demerit on using car for car user.

**CONCRETENESS**

- You have to provide the concrete information to change the transportation behavior. People will not change their activities if they don't get the concrete information even if they have motive.

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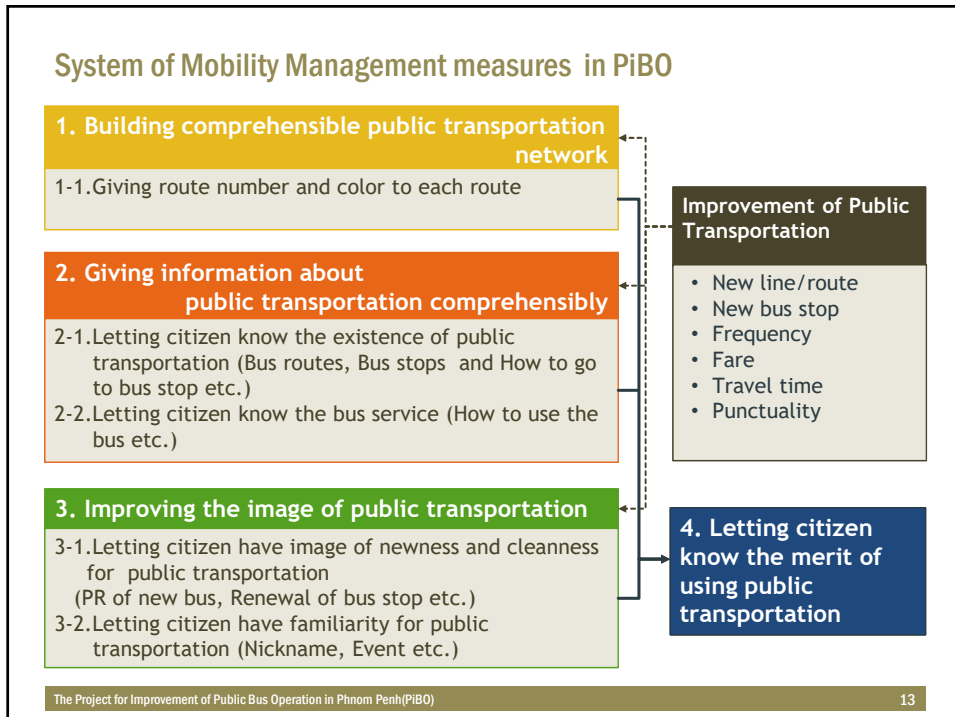


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# Part 2

## MM measures implemented in PiBO

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## 1. Building comprehensible public transportation network

### 1-1. Giving route number and color to each route

Promotion measure  
1-1-1

Creating an easy-to-understand route map

#### Purpose & Explanation

- For those who are not accustomed to public transportation, public transportation is difficult to understand.
- Provide them with an easy-to-understand public transportation route network, service content, and how to ride. Reduce the resistance to their use.

#### Target

- Phnom Penh citizens (especially car and motorcycle users) and foreign tourists

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## 1. Building comprehensible public transportation network

### 1-1. Giving route number and color to each route

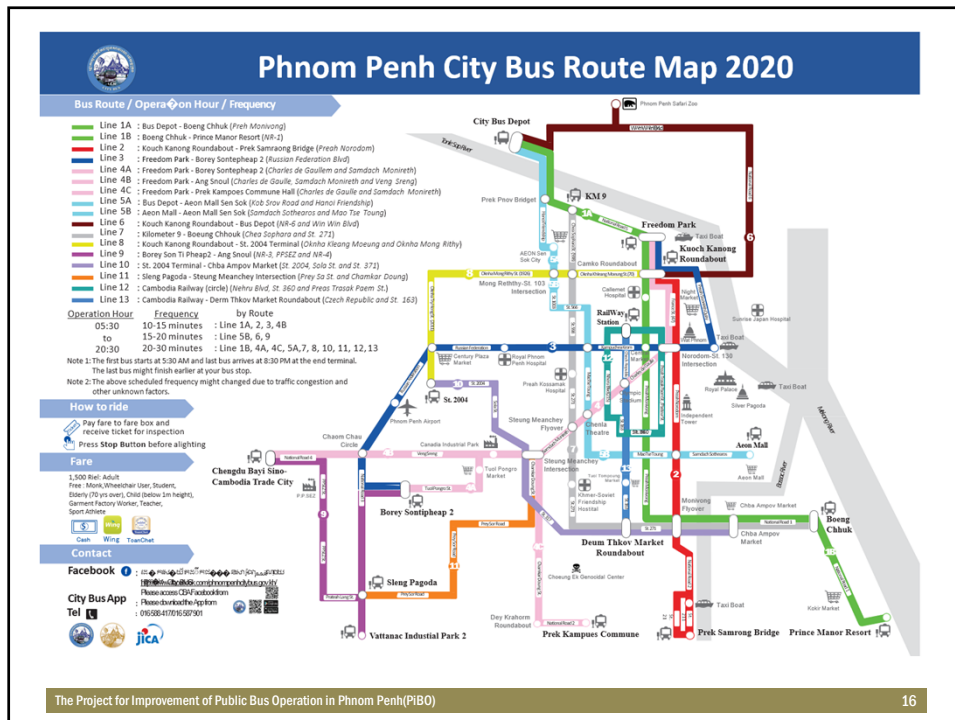
Promotion measure  
1-1-1

Creating an easy-to-understand route map

#### Method

- The route map should be easy to understand and should be the minimum necessary information. Detailed information will be directed to the website
- Two types are available: Khmer version (for Phnom Penh citizens) and English version (for foreign tourists)
- Paper should be A3 size and foldable and portable
- The route map is displayed in numbers and colors for each system. Numbers and colors are used not only for route maps but also for displaying bus destinations, etc., and provide unified information.
- By clearly stating the street name and major facilities along the line, it will be easier to understand which bus to take.
- In addition, it is desirable to include information necessary for use (how to ride, frequency of operation, fare, etc.)

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## 2. Giving information about public transportation comprehensibly

### 2-1. Letting citizen know the existence of public transportation

Promotion measure 2-1-1 Providing bus stop access information at houses

#### Purpose & Explanation

- Inform the residents around the bus stop where the bus stop is. It also provides information on where the bus goes.
- By showing concrete information that seems to be related to you, you will be familiar with the existence of the bus.
- By being able to imagine more concretely the scenes where buses can be used in daily life, it will be linked to actual use.

#### Target

- Residents within walking distance of the bus stop (about 300m area)
- Priority will be given to bus routes that you want to actively promote.

#### Method

- Create a bus map for each bus stop and distribute it to the target residents
- Describe the places and facilities where residents can use the bus routes that stop at each bus stop.
- Specify the boarding method, fare, number of buses (timetable), estimated time required to reach the main bus stop, etc.
- If necessary, describe information when returning home (location of bus stop in the center, timetable), etc.

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<Good Example from JAPAN> Give specific information about the bus stop near your home

By enlarging the map around the bus stop, it will be easier to recognize the location of the bus stop near your home.

**行き**

所要時間(分) 運賃

52番: 45分 運: 40分 320円

55番: 35分 運: 35分

59番: 35分 運: 30分

※152番は乗降可

※7時30分～8時15分、12時～13時、16時30分より乗降不可となります。

高松バスセンター 福岡 TEL: 02-733-3333

平日			土曜日			日曜日・祝日		
52番	55番	152番	52番	55番	152番	52番	55番	152番
05:26	48	50	05:45	48	50	05:47	52	51
06:19 29 41	25 58	10 30 45 52	06:05 23 40 53	25 59	20 45 50	06:06 24 42	29 59	21 36 46
06:57								
07:05 10 23 31	13 28 38	06 21 31 41	07:05 15 23 33	19 33 48	10 27 43 53	07:04 24 42	29 59	01 21 41
39 42 55	53	51	43 49					
08:05 11 27 42 46	07 28 48	01 11 26 46	08:03 14 21 39 49	08 28 48	03 13 30 45 54	08:02 24 38	24 48	01 21 38 59
09:05 20 35 46	12 35 55	08 28 39 54	09:03 18 33 43 49	13 38	10 30 50	09:02 22 38	08 28 48	19 24 39 59
10:05 20 35 46	15 35 55	08 28 48	10:08 23 38 49	03 23 43	08 14 30 47	10:02 22 38	18 48	19 39 59
11:05 20 35 46	18 45	08 28 48	11:08 23 38 49	08 33 56	12 38 50	11:02 22 38	18 48	19 39 56
12:05 20 35 46	15 45	05 28 38 53	12:08 23 38 49	23 43	10 30 48	12:02 22 38	18 48	05 21 41
13:05 19 35	18 45	08 28 48	13:08 23 38 49	13 38	10 30 50	13:02 22 38	18 48	09 11 41
14:05 20 35 46	18 45	08 28 48	14:08 23 38 49	08 33 56	12 38 50	14:02 22 38	18 48	07 36 46
15:30 45 56	08 28 48	08 28 48	15:08 19 33 43 49	18 38 58	10 27 44	15:02 24 34	18 48	01 39 59
16:30 30 38	08 28 48	04 16 32 48	16:08 19 38 49	18 43	00 16 32 51	16:03 20 38	18 48	19 39
17:00 06 25 40 51	03 23 43	12 32 50	17:08 23 38 51	03 21 42	10 35 50	17:02 20 38	16 46	03 19 40
18:10 23 42 55	08 34 56	10 34 54	18:13 34 52	07 33 58	10 30 54	18:00 20 40	26	01 21 42
19:12 27 42	16 36 56	14 24 49	19:14 35 52	23 46	21	19:01 17 42	09 44	05 25 56
20:00 22 45	16 46	19	20:14 35 53	18 48	02 24	20:08 44	24	29
21:01 25 45	21	01 36	21:27 56	28	41	21:05 25 44	09 48	02 32
22:19 35	14		22:22	14	01			
23:19		09	23:23		02			

Estimated time required to reach the center (morning, daytime), fare

Information on returning home (bus stop when returning home, timetable) is posted on the back side. It is important to give information not only about going but also about returning.

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<Good Example from JAPAN> Not only information about the bus stop near your home, but also information about your destination is important.

**バスルートマップ**

長住→天神・博多

**都心マップ**

天神・博多

Bus stop near target residence

Map of only bus routes that stop at the bus stop near your home (you can see where you can go by bus)

Shows central bus stops and major facilities (you can see which bus stop you should get off to get to your destination)

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## 2. Giving information about public transportation comprehensibly

### 2-1. Letting citizen know the existence of public transportation

Promotion measure  
2-1-2

Providing bus stop access information at facilities

#### Purpose

- Promoting recognition of access to bus stops, and information on bus service at major facilities

#### Explanation

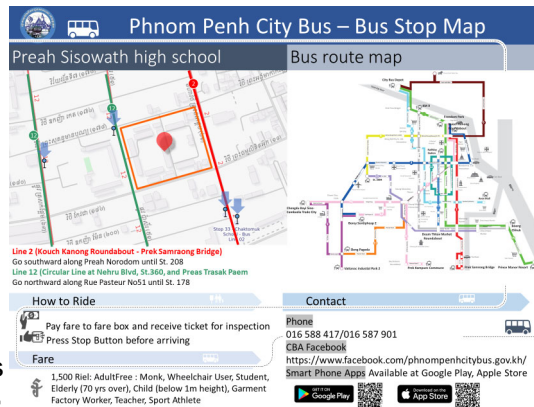
Promoting information by:

- Distribution of handouts;
- Posting notice on facility information;

#### Target

Users of the major facilities such as schools, shopping malls, hospitals, and public facilities.

Sample format for access information map



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## 2. Giving information about public transportation comprehensibly

### 2-1. Letting citizen know the existence of public transportation

Promotion measure  
2-1-2

Providing bus stop access information at facilities

#### Methodology

*Who prepares?*

1. CBA coordinates with the responsible person (facility owner, administrator) and get approval for displaying notice.
2. CBA or the responsible person (facility owner, administrator) prepare the access information map material

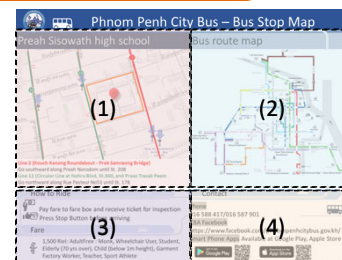
*What to prepare?*

- Place to display the notice
- Access Information map material (poster, sticker, or handout)

*Where to display?*

- Preferably on the bulletin board, entrance, or any other places where noticeable by facility.

#### Design Format (Draft)



- (1) Bus stop access information/ Bus lines
- (2) Bus route map
- (3) Bus service information (frequency, operation hours, fare, etc.)
- (4) Contact information

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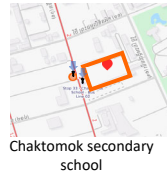
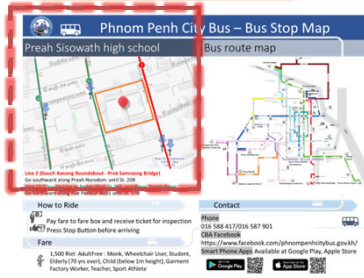
## 2. Giving information about public transportation comprehensibly

### 2-1. Letting citizen know the existence of public transportation

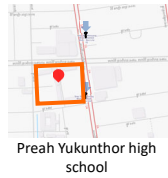
Promotion measure  
2-1-2

Providing bus stop access information at facilities

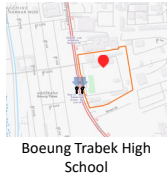
#### Access Map Samples



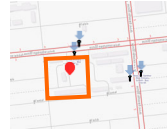
Chaktomok secondary school



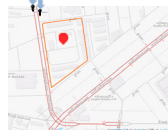
Preah Yukunthor high school



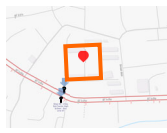
Boeung Trabek High School



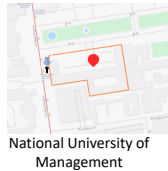
Santhormok high school



Bak Touk high school



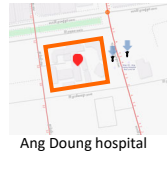
Chea Sim Samki high school



National University of Management



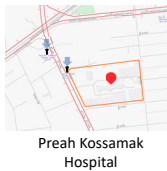
Royal University of Phnom Penh



Ang Doung hospital



Calmette hospital



Preah Kossamak Hospital

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## 2. Giving information about public transportation comprehensibly

### 2-2. Letting citizen know the bus service

Promotion measure  
2-2-1

Providing bus location information using smartphones

#### Purpose & Explanation

- By providing the current location information of the bus in real time, it is easy to grasp the expected arrival of the bus. This will make it easier to schedule actions using the bus and encourage bus users to continue using the bus.

#### Target

- Bus user (smartphone owner)

#### Method

- Currently, it only provides the vehicle position of the bus, but in the future, it is important to improve it as follows to improve convenience.
  - Estimated arrival time of boarding bus stop and getting off bus stop
  - Bus stops and routes to use when choosing any starting point and destination
  - Cooperation with Google Map
    - When searching for a route, not only information about cars but also information about using public transportation is displayed. (Travel time, recommended route, bus stop etc.)
    - Effective not only for improving convenience for bus users, but also for promoting the conversion from automobiles and motorcycles to public transportation.



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## 2. Giving information about public transportation comprehensibly

### 2-2. Letting citizen know the bus service

Promotion measure  
2-2-2

Informing the bus service to the public (Video Material)

#### Purpose & Explanation

- Video materials could be a useful and powerful tool to provide information and promote bus service.
  - It could be used in seminars, workshops, or for SNS (Facebook, YouTube, etc.)
- The target could vary according to the purpose of the information dissemination and promotion.
  - Video material could be prepared for general public



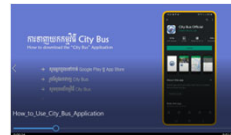
"Let's ride city bus"



"City bus Q&A"



"How to ride bus"



"How to use bus App"



"Measures against COVID-19"



"Staff Interview"

## 2. Giving information about public transportation comprehensibly

### 2-2. Letting citizen know the bus service

Promotion measure  
2-2-2

Informing the bus service to the public (Video Material)

#### Contents of prepared videos

Video	Video name	Contents	Ways for using/ Targets
1	<ul style="list-style-type: none"> <li>• Let's ride city bus in Phnom Penh</li> <li>• City bus Q&amp;A</li> </ul>	<ul style="list-style-type: none"> <li>• General and friendly introduction of bus service, how to ride, and benefits of using bus</li> </ul>	<ul style="list-style-type: none"> <li>• Useful for introducing the bus service to general public, especially to those who are not familiar with bus, and to young children.</li> </ul>
2	<ul style="list-style-type: none"> <li>• How to ride city bus</li> </ul>	<ul style="list-style-type: none"> <li>• Kind demonstration focusing on explaining how to ride the bus</li> </ul>	<ul style="list-style-type: none"> <li>• Useful for general guide for how to ride bus and make payments, especially for people who have not used bus yet.</li> </ul>
3	<ul style="list-style-type: none"> <li>• How to use city bus App</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to show how to make better use of the city bus with the smart phone App.</li> </ul>	<ul style="list-style-type: none"> <li>• Useful for guide to show how to make better use of the city bus with the smart phone App.</li> <li>• Mainly targeted for light users</li> </ul>



## 2. Giving information about public transportation comprehensibly

### 2-2. Letting citizen know the bus service

Promotion measure  
2-2-2

Informing the bus service to the public (Video Material)

#### Contents of prepared videos

Video	Video name	Contents	Ways for using/ Targets
4		<ul style="list-style-type: none"> <li>Measures against COVID-19</li> <li>Introducing the measures that CBA is taking against COVID-19</li> </ul>	<ul style="list-style-type: none"> <li>Inform the users of the measures for safe and secure usage of bus</li> </ul>
5		<ul style="list-style-type: none"> <li>CBA staff short stories</li> <li>Introducing CBA staff and their duties through interview</li> </ul>	<ul style="list-style-type: none"> <li>Introduce to users the daily activities and personality of CBA staff to familiarize and create feeling of friendliness</li> </ul>

## 2. Giving information about public transportation comprehensibly

### 2-2. Letting citizen know the bus service

Promotion measure  
2-2-2

Informing the bus service to the public (Video Material)

#### Methods and points to consider

- **Considering the target and purpose**
  - Target: consider whether it is for the general public or a specific target group (young/elder generation, user/non-user, etc.)
  - Purpose: promotion/ information provision etc.
- **Considering the contents and messages**
  - Structure the script, and messages
- **Shooting/ creating**
  - When filming a person, make sure to get consent from the person (portrait rights)
- **Editing**
  - Consider the length of video (not too long and not too short)

#### Example of script

**Example: COVID-19 video**

[Title scene]  
**Narration**  
"We, the City Bus Authority are committed to providing safe and secure transportation service for the citizen in Phnom Penh"  
"We are taking necessary measures to prevent COVID-19 from spreading"

[Scene 1]  
**Narration**  
"We are regularly monitoring our staff's health conditions"

[Scene 2]  
**Narration**  
"The drivers wears mask when on duty"

[Scene 3]  
**Narration**  
"We regularly and thoroughly conduct disinfection and cleaning inside the bus"

[Scene 4]  
**Narration**  
"We keep the windows opened and turn on the Air Conditioner to ventilate the air inside the bus"

[Scene 5]  
**Narration**  
"When using the bus, we would like your cooperation to prevent the spread of COVID-19"  
"First please cooperate to keep social distance and avoid congestion"  
"Please cooperate to wear masks"

## 2. Giving information about public transportation comprehensibly

### 2-2. Letting citizen know the bus service

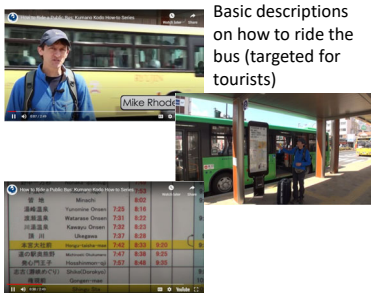
Promotion measure 2-2-2 Informing the bus service to the public (Video Material)

#### Reference Materials : Promotional videos created by other organizations

##### Example of Tanabe City

###### How to ride the bus

<https://www.tb-kumano.jp/en/transport/bus/how-to-ride-a-local-bus/>



Basic descriptions on how to ride the bus (targeted for tourists)

##### Example of World Bank project in India

###### Project promotion vide

World Bank: India: Mysuru's SMART Public Bus Transport for Livable Cities  
<https://www.facebook.com/WorldBankIndia/videos/737848716362930/>



Interview style video which introduce some user's opinion and interview with the staff

## 3. Improving the image of public transportation

### 3-1. Letting citizen have image of newness and cleanness for public

Promotion measure 3-1-1 PR for bus vehicles

#### Purpose & Explanation

- Make citizens aware that buses are clean and comfortable vehicles
- Make people want to use the bus positively and feel that using the bus is cool

#### Target

- Phnom Penh citizens (especially car and motorcycle users) and foreign tourists

#### Method

- Operating with a well-cleaned, cleaned and well-maintained bus vehicle is a very good PR for the public.
- Therefore, CBA should continue to clean, clean, and maintain the buses they are currently working on.
- In addition, CBA should actively publicize their efforts.
- Due to the Covid-19 pandemic, the implementation of infection prevention measures in bus vehicles is also very important in promoting the use of buses. For this reason, CBA should actively publicize the infection prevention measures taken by them.

### ***Using a clean and well-maintained vehicle is itself a very good advertisement***



Car wash (always wash when returning to the depot)



Repair and maintenance guidance (repair immediately where repair is required)

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## **3. Improving the image of public transportation**

### **3-1. Letting citizen have image of newness and cleanness for public**

Promotion measure  
3-1-2

Improving the bus stop

#### **Purpose & Explanation**

- The feeling of resistance to using the bus will be reduced by improving the bus waiting space.
- Appeal to the public that the bus is a clean, comfortable and cool vehicle.

#### **Target**

- Bus users (Phnom Penh citizens, tourists)
  - Encourage continuous bus use by providing a comfortable and convenient bus waiting space
- Motorcycle / Car users
  - Promote the goodness of the bus and encourage the conversion to bus use

#### **Method**

- Keep the following points in mind when improving the bus stop
  - Comfortable bus waiting space (roof, bench, internet connection, etc.)
  - Providing easy-to-understand information (bus route guidance by route number / color, timetable, bus location system, transfer information, facilities around the bus stop, etc.)
  - Safety and security (emergency notification button, security camera, etc.)
  - Attractive and cool design
- After improvement, bus stop cleaning and maintenance should be carried out continuously. It is also possible to ask the residents around the bus stop to cooperate in cleaning the bus stop.

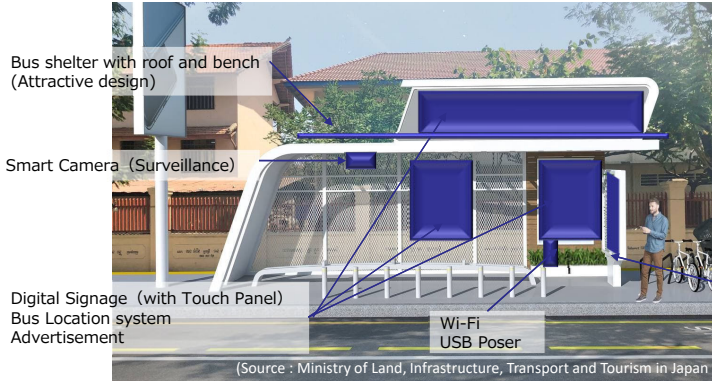
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### New bus stop



Information Board (refer to next slide)



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### New bus stop sign (Easy-to-understand guidance using route numbers, colors, icons, etc.)

Previous Sign	New design sign For 1 Line	New design sign For 2 Line	New design sign For 3 Line
<p>01</p> <p>០១ ផ្លូវ ក្រុង បឹងកេងកង 114 ម៉ែត្រ</p> <p>្រុក វិសាមញ្ញក្រុង ភ្នំពេញ</p> <p>បណ្ណាល័យ 114 ម៉ែត្រ បឹងកេងកង ផ្លូវ ក្រុង បឹងកេងកង ១១៤ ម៉ែត្រ</p>	<p>Bus Stop</p> <p>No. 3</p> <p>សម្រាប់បណ្ណាល័យ វិសាមញ្ញ ភ្នំពេញ</p> <p>Samsach Our Health Center</p> <p>1 Monivong St.</p> <p>Towards: Beoung Chhouk</p> <p>Route Network Map</p> <p>Transfer Operation</p> <p>Advertisement or Others</p>	<p>Bus Stop</p> <p>No. 37 No. 57</p> <p>ផ្លូវ ម៉ូនីវ៉ង់/ផ្លូវ 214</p> <p>Monivong/Road 214</p> <p>1 Monivong St.</p> <p>7A</p> <p>Towards: Beoung Chhouk</p> <p>Shanouk Blvd.</p> <p>Towards: Aeon Mall</p> <p>Route 1 Route 7A</p> <p>Network Map Operation info</p> <p>Transfer Advertisement or Others</p>	<p>Bus Stop</p> <p>No. 13 No. 3 No. 3</p> <p>ផ្លូវ ក្រុង បឹងកេងកង</p> <p>Clinic Rak</p> <p>1 Monivong St.</p> <p>3</p> <p>4</p> <p>Towards: Beoung Chhouk</p> <p>Shanouk Blvd.</p> <p>Towards: Aeon Mall</p> <p>Chassel de Gaulle</p> <p>Towards: Aeon Mall</p> <p>Route 1 Route 3 Route 4</p> <p>Network Map Operation info</p> <p>Transfer Advertisement or Others</p>

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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure  
3-2-1

Introducing the bus in the events

##### Purpose & Explanation

- Publicize the bus at various events and festivals in which many citizens participate. By doing so, citizens will have a sense of familiarity with the bus, which will lead to promotion of use.

##### Target

- Event participants (especially young people and students)

### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure  
3-2-1

Introducing the bus in the events

##### Method

- The content of the PR will change depending on the purpose, target, and scale of the event.
- Through experience and enjoyment, participants will have a sense of familiarity with the bus, which will lead to promotion of use.

##### Riding experience

- Buses run to the event venue. Have participants get on the bus and experience the goodness of the bus

##### Friendliness to the Bus

- Driver experience (door opening / closing operation, announcement experience)
- Bus vehicle exhibition
- Exhibition of equipment such as bus location system and fare payment system



### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure  
3-2-1

Introducing the bus in the events

#### Method

##### Entertainment

- Wrapping bus contest, character contest
- Drawing contest (exhibitions in buses and public facilities, rewards to motivate participants)
- Route Planning Board Game

##### Information

- Inform about bus boarding method, route map, service contents by poster and video
- Individually teach how to use the bus according to each individual's traffic behavior (bus stop near home / destination, usage system, etc.)

##### Listen to opinion

- Directly listen to opinions about the bus and reflect it in bus management

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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure  
3-2-1

Introducing the bus in the events

#### Case 1 :Introducing and using buses at events: Tanabata Festival

##### Riding Experience

- Test-riding events for attendees
- Transporting high school students to the festival (2 buses)

##### Friendliness to the Bus

- Exhibition of bus at events
- Nickname contests



Test riding event



Bus exhibition event

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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure 3-2-1 Introducing the bus in the events

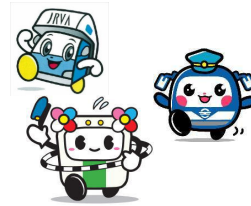
##### Case 1 :Introducing and using buses at events: Tanabata Festival

###### Entertainment

- Bus wrapping design contests Proposal only, not yet implemented
- Character design contests Proposal only, not yet implemented



Bus wrapping design contest



Bus character design contest

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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure 3-2-1 Introducing the bus in the events

##### Case 2 :Introducing and using buses at events: Kizuna Festival

###### Entertainment

- Drawing contest
  - The excellent works were used as posters in the bus. Therefore, many participants (240 people) were obtained.
  - In addition to in-car posters, it can also be used to improve recognition and image, such as designing posters and wrapping buses.



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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure 3-2-1 Introducing the bus in the events

##### Case 3 :City buses to be used in JACAM Bon-Odori Festival

- Provide an idle bus as an eating space for visiting people.
  - If the Bon-Odori event and the food stands are outside, it may be good to provide them a cool eating space in a bus (may be with bon-odori music inside) so that they could experience the air-conditioning and the comfortable seats.
- Conduct additional nickname campaign
  - The nickname campaign at Tanabata Festival, the respondents were mostly teenage students. It is a good opportunity to gather nickname ideas from broader age groups (kids, parents, and elderly)
- Handing out bus route maps
  - Hand out the readily available map to let people know about the new network.



### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure 3-2-1 Introducing the bus in the events

##### Case 4 :City buses provided free long distance transport on Pchum Ben day

- City buses transported 3,000 people on first day, and 4,000 people on second day to help them get to their home towns.
- These activities contribute to disseminating the city bus as Phnom Penh City's public transport system.

Announcement for bus transport service on Pchum Ben Day



People getting on the bus from freedom park



Couple, supposedly going back to their home town on Pchum Ben day

### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure 3-2-2 Riding experience at the time of the event

##### Purpose & Explanation

- By having them actually get on board, they will experience the goodness of transportation by public transportation.
- In particular, when an event is held, you will create opportunities to board the bus by operating the bus as a means of access to the venue, and create an opportunity for people to use the bus in the future.

##### Target

- Phnom Penh citizens (event participants)

##### Method

- If it is positioned as an opportunity to use the bus, the fare may be free. However, it is better not to push the free fare to the front. This is because there is a high possibility that they will not be able to use the service unless the fare is free.
- Give the impression that the bus will arrive at the destination sooner, such as by creating an environment where the bus can be driven with priority.

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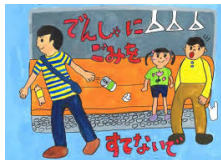
### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure 3-2-3 Conducting drawing contest at schools/events

##### Purpose & Explanation

- Promoting recognition of buses/ encouraging disciplinary manners in bus
- Developing a sense of familiarity and to encourage disciplinary manners in bus
- Conduct drawing contests



“Don't leave rubbish on bus”



“It's exciting to go out on bus”



“Think about others on bus”



Excellent works would be exhibited on buses

##### Target

- Students

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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure 3-2-3 Conducting drawing contest at schools

#### Method

#### Procedures and instructions

- **Who organize: PiBO team / CBA / Local schools**
  - PiBO team and CBA would approach local schools to organize a drawing contest (as a part of their education activity).
  - Local schools and person to be approached would be identified mainly based on attendance list of workshop in Khan.
- **What to draw in the Contest: City bus, and riding rules**
  - School student shall depict the image of the Phnom Penh City Bus, or a drawing with promotion messages or rules.
  - **Example of promotion messages:**
    - "Lets use the city bus", "It is safe and convenient to ride the city bus", "Anyone, Anytime, Anywhere", "Wing cards are convenient to use", etc.
  - **Example of messages regarding rules:**
    - "Get on from front side, Get off from rear side", "Don't leave rubbish inside the bus", "Offer the seats to the elderly and the handicapped", etc.
- **Where to put up the drawings: Inside the buses/ on local newspapers**
  - The good drawings shall be put up inside the buses, or on local newspapers.

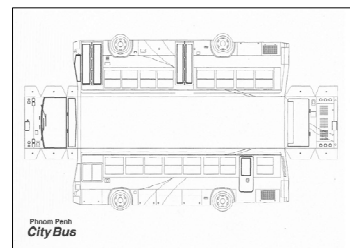
### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure 3-2-3 Conducting drawing contest at schools

#### Method

#### Example of drawing contest in Kizuna Festival



### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure  
3-2-4

Naming "NICKNAME" to the new bus

##### Purpose & Explanation

- Citizens get more familiar with the bus
- Make the public aware that it is their vehicle through the process of thinking and choosing together

##### Example of bus nicknames



BOLT BUS (U.S.A)  
Image: Speedy



Panda BUS Nin Nin (Japan)  
Image: Cute, Children like

##### Target

- Citizens



Chi BUS (Japan) Image: Friendly

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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure  
3-2-4

Naming "NICKNAME" to the new bus

##### Method

##### Example of nickname campaign of Tanabata Festival

- **General:** Gather idea for nickname for the bus
- **Objective:** To develop a sense of familiarity towards bus
- **Target people:** Mainly students from below category
  - Participants of test-riding event,
  - People who visited the bus exhibition
  - General public
- **Term:** From 5th to 6th . July. 2018 (2 days)
- **Location:** CJCC inside of Royal University of Phnom Penh
- **How to collect ideas:**
  - Handout notices for the campaign at test-riding event, bus exhibition, and other places during the "Tanabata Festival"
  - Get the people to write down the nickname idea at the site, and collect them at the site.
- **What to do with ideas:**
  - The ideas would be shortlisted and presented at CBA website (Facebook).
  - The best ideas would be then decided based on vote from CBA, or the public by using CBA Facebook, the idea corrected more "Like!" is decided.

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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure  
3-2-4

Naming "NICKNAME" to the new bus

##### Nickname campaign – Handout image

**Give an original nickname for the Bus!**

We invite you to give a nickname for the city bus!  
Good ideas would be introduced at the CBA website!  
We welcome your creative ideas!!

**How to submit:**

1. Write down your name, and the bus nickname in the column below.
2. Put the paper in the collecting box, or hand it to the staff.

City Bus Nickname: \_\_\_\_\_

Your name: \_\_\_\_\_ Your age : \_\_\_\_\_ School name : \_\_\_\_\_

To contact: xxxxx@yyyyyy

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### 3. Improving the image of public transportation

#### 3-2. Letting citizen have familiarity for public transportation

Promotion measure  
3-2-4

Naming "NICKNAME" to the new bus

##### Nickname campaign – Gathered nicknames

- Number of gathered nicknames: Ideas from 139 people
- Type of nicknames:
  - Stylish image: "cool", "smart"
    - "Cool Bus", "Coolest Bus", "Smart Bus", "Incredible Bus", "Special Bus", "Royal Bus", "New Bus", "GO GO Bus"
  - Friendly image: "friend", "safe", "comfortable"
    - "Friendly Bus", "Our Friend Bus", "Safe and Sound Bus", "Safe and Peace Bus", "Comfortable Bus", "Sunshine Bus", "Public Charity Bus", "Entertainment Bus", "Phnom Penh Everywhere Bus"
  - Color related names: "blue"
    - "Blue Bus", "Triple Blue Bus", "Blue Whale Bus", "Rainbow Queen Bus", "Blue Dragon Bus"
  - Cambodian culture related names:
    - "Angkor Bus", "Khmer Angkor Bus", "Angkor Bus", "City Silk Blue Bus", "Rumduol Bus"
  - Japanese culture related names
    - "Blue Samurai Japan Bus", "Samurai Angkor Bus", "Sakura Bus", "Kawaii Bus"

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#### 4. Letting citizen know the merit of using public transportation

Promotion measure  
4-1

Reaching out through dissemination seminar/ workshops

##### Purpose & Explanation

- Arranging seminars/ workshops are good way of engaging citizens and promoting direct communications

##### Target

- General public (including bus users and non-users)

##### Methodology

- In PIBO, workshops for local residents were arranged at each khans, inviting around 100 people for each workshops.
  - Held in May ~ June 2018, for 12 khans

##### Image of the workshops

- Workshops included free bus ride trials



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#### 4. Letting citizen know the merit of using public transportation

Promotion measure  
4-2

Promotion of buses through events and campaigns

##### Purpose & Explanation

- Increase exposure to enhance perception by the people

##### Target

- General public (including bus users and non-users)

##### Methodology

- In PIBO, festivals, events and other occasions were capitalized as opportunities to enhance perception and improve the image

##### Image of promotions in events and campaigns



Free bus trial campaigns for workers, elderly, students



CBA Booth at Kizuna Festival

Free ride on Pchum Ben day

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### 4. Letting citizen know the merit of using public transportation

Promotion measure 4-3 Dissemination of benefits of using bus service

**Purpose & Explanation**

- Providing people with information on the benefits of using the bus service
- Disseminating the information in tangible way.

**Target**

- General public (including bus users and non-users)

**Methodology**

- Gathered empirical data (and also collaborating with the University of Tsukuba) on benefits of bus and compiled the information in a brochure.
  - Benefits include: health, savings on personal budgets, accident reduction, environmental aspects

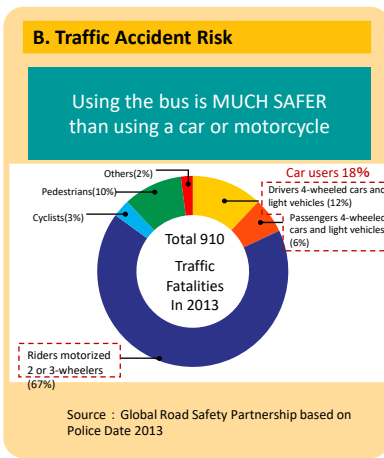
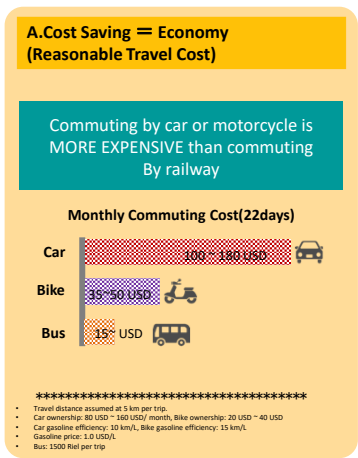


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### 4. Letting citizen know the merit of using public transportation

Promotion measure 4-3 Dissemination of benefits of using bus service

Reference Materials : Benefits of using bus service



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### 4. Letting citizen know the merit of using public transportation

Promotion measure  
4-3

Dissemination of benefits of using bus service

Reference Materials : Benefits of using bus service

#### C. Safety Concerns (Tragedy of Traffic Accident)

How do you think your family would feel if you get killed or kill someone in a traffic accident?

Family play an important role in our life. Cars and motorcycles are very convenience but can also be **very dangerous**. Think about your loved ones and **do not rely too much** on cars and motorcycle.

source

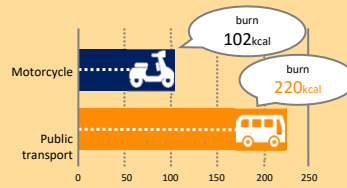
<https://www.police.pnph.gemina.jp/hoonchubu/02kenaki/kyaku.html>



#### D. Health Benefit (Calories Burned)

Public Transportation is Recommended to tackle the lack of exercise

Calorie consumption when commuting 15km



### 4. Letting citizen know the merit of using public transportation

Promotion measure  
4-3

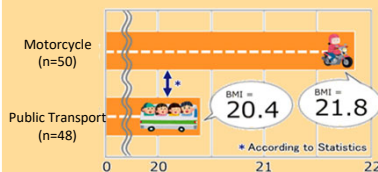
Dissemination of benefits of using bus service

Reference Materials : Benefits of using bus service

#### E. Health Benefit (BMI: Body Mass Index)

Public Transportation users are slimmer compared to motorcycle users.

Comparing the BMI between the usage of Different transport modes to go to school



※ Result of Questionnaire Survey in Binh Dong, Vietnam in 2015

#### F. Fashionable Lifestyle

Riding a motorcycle is convenient but needs helmet and extra care from sunshine and pollution.

On the other hand, riding the bus can be **FASHIONABLE AND COMFORTABLE**.



### 4. Letting citizen know the merit of using public transportation

Promotion measure 4-3 Dissemination of benefits of using bus service

Reference Materials : Benefits of using bus service

#### G. Health Hazard by Air Pollution

Air pollution from transportation contributes to breathing problems, chronic diseases, increased hospitalization, and premature mortality

**Asthma rate**  
\*Based on Disability Adjusted Life Years

Source : WHO country report

#### H. Effective Time Use

Spend time effectively on public transport

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### 4. Letting citizen know the merit of using public transportation

Promotion measure 4-3 Dissemination of benefits of using bus service

Reference Materials : Benefits of using bus service

#### I. CO2 Emissions

CO2 emissions contribute to climate change

Source: CH2MHill de la calculatrice Ademe <http://www.ademe.fr/co2-deplacements/calculatrice/>

Passenger carbon footprint is 80% lower by bus than by car

#### J. Efficient Use of Road Space

Do you think it is necessary to use your own car or motorcycle when up to 72 people can share one bus?

50 cars      1 bus      72 bicycle

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#### 4. Letting citizen know the merit of using public transportation

Promotion measure  
4-4

Public relations using various mass media

##### Purpose & Explanation

- Mobility management is essentially a communication measure that is carried out for each individual.
- However, the awareness of buses is not yet high in Phnom Penh, and public relations using the media is also effective.

##### Target

- Phnom Penh citizens

##### Method

- Public relations using the media such as TV and newspapers has the advantage of being able to publicize to many people at the same time regardless of gender or age. However, due to limited time and space, detailed information should not be given and only a brief explanation should be given.
- In Phnom Penh, Facebook is used mainly by young people, and it is also effective to use Facebook to provide detailed information.
- However, some citizens, especially the elderly, do not use Facebook, so instead of relying solely on Facebook, other means should be used.

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#### 4. Letting citizen know the merit of using public transportation

Promotion measure  
4-4

Public relations using various mass media

##### Case 1 :Appearance on Television

- The Governor of CBA appeared on an interview in a TV news program to discuss the recent progress of the city bus project.

Available at: <https://www.facebook.com/BTVCambodia/videos/415201162641343/>



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### 4. Letting citizen know the merit of using public transportation

Promotion measure 4-4 Public relations using various mass media

Case 2 :Appearance on Internet ( newspaper etc.)

- News article on launching of five new bus routes.  
Available at: <https://www.khmertimes.com/50538462/city-hall-launches-five-new-bus-routes/>

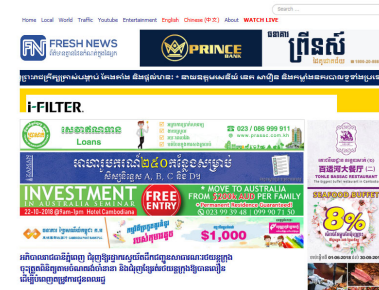


### 4. Letting citizen know the merit of using public transportation

Promotion measure 4-4 Public relations using various mass media

Case 2 :Appearance on Internet ( newspaper etc.)

- News article on new bus launching ceremony and test riding for city officials.  
Available at: <http://www.freshnewsasia.com/index.php/en/localnews/100760-2018-10-01-07-38-28.html>



#### 4. Letting citizen know the merit of using public transportation

Promotion measure  
4-4

Public relations using various mass media

##### Case 3 :Facebook official page of CBA

- Public relations by Facebook is a very effective means because it is good at two-way communication, such as not only providing detailed information but also being able to directly hear the reaction of the "Like" button and the opinions of the citizens.



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#### 4. Letting citizen know the merit of using public transportation

Promotion measure  
4-5

Schools Dissemination Campaign

##### Purpose & Explanation

- Before the habits of using cars and motorcycles are developed, you will properly educate the merits of using public transportation and how to ride in the field of school education.
- Have them understand the advantages and disadvantages of each means of transportation correctly and learn how to select the correct means of transportation according to the situation.

##### Target

- For schools along the bus route
- For junior high school and high school students who have more opportunities to move

##### Method

- In addition to classroom lectures, students will enjoy learning about public transportation through practice (ride experience, etc.) and games.
- Create multiple program plans with different contents and select the most suitable plan according to the needs of the school.

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### Things to consider in dissemination campaigns for schools



#### □ Simple and concise explanation

- Make the presentation and explanation short and simple and understandable



#### □ Interactive communication

- Ask questions, give feedbacks to get the attraction from students



#### □ Experience-based

- Bus ride experience and workshops to get students involved



#### □ Attract younger generation

- Introduce new technologies (smart phone application and GPS locationing), encourage taking pictures (for sharing SMS)



#### □ Trial and error

- Continuously review and revise the content of the campaign

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### Specific Activities for Dissemination at Schools

#### Activity A: Simple activity

<b>Target, Scale</b>	Class ~ Whole school (50 people ~)
<b>Place</b>	School hall or classroom
<b>Activities (60 mins ~ 90mins)</b>	<p>To give lecture on how to ride the bus and the manner</p> <ol style="list-style-type: none"> <li><b>1. General introduction</b> (update of the presentation for each Khans made in <u>2018</u>) <ul style="list-style-type: none"> <li>• To provide information on normal route (before suspension of operation)</li> <li>• To provide information on tentative route (after restarting the bus)</li> </ul> </li> <li><b>2. Promotion Video for riding buses</b> <ul style="list-style-type: none"> <li>• To provide information on how to ride bus and the manner</li> </ul> </li> <li><b>3. Information of recent updates regarding bus services (bus location system)</b> <ul style="list-style-type: none"> <li>• To provide information on bus location system and smart phone application</li> <li>• To give lecture on how to use the system and application</li> <li>• Information of pilot project on line 4, Bus shelter project</li> </ul> </li> <li><b>4. Bus on-board lecture/ free bus ride tour</b> <ul style="list-style-type: none"> <li>• Go to nearest bus stop and ride bus</li> <li>• Lecture on board how to ride, pay for fare</li> <li>• (collaborate with wing or other card companies for the fare payment system)</li> </ul> </li> </ol>
<b>Handouts</b>	<ul style="list-style-type: none"> <li>• New bus route map, and a brochure that explains benefit of using bus</li> <li>• Information of pilot project, Bus shelter project</li> <li>• Questionnaires</li> </ul>

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### Specific Activities for Dissemination at Schools

### Activity A: Simple activity

**Handouts at seminar**

Updated version of bus route map

- To be able to know the current bus service

Bus benefit brochure

- To promote bus benefit for users

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### Specific Activities for Dissemination at Schools

### Activity B: Class workshop

<b>Target, Scale</b>	Class (30 people ~)
<b>Place</b>	Classroom
<b>Activities</b> (90 mins ~ 120mins)	<ol style="list-style-type: none"> <li><b>General introduction</b> (update of the presentation for each Khans made in 2018)</li> <li><b>Information of recent updates regarding bus services</b> (bus location system)</li> <li><b>Bus route understanding and planning</b> <span style="background-color: #e67e22; color: white; padding: 2px;">Difference with Activity A</span> <ul style="list-style-type: none"> <li>Distribute bus map to all</li> <li>Ask students to place sticker on the nearest bus stop from school and home</li> <li>Ask students the route from home to school by bus, and expected time, number of stops, number of transfers.</li> </ul> </li> <li><b>Bus trip workshop (see next slide for details)</b> <span style="background-color: #e67e22; color: white; padding: 2px;">Difference with Activity A</span> <ul style="list-style-type: none"> <li>Get together with groups (5~6 people)</li> <li>Identify on a large map the places they commonly visit (schools, shopping malls)</li> <li>Discuss among students which trips they can possibly use buses.</li> </ul> </li> </ol>
<b>Handouts</b>	<ul style="list-style-type: none"> <li>New bus route map, and a brochure that explains benefit of using bus</li> <li>Information of pilot project, Bus shelter project</li> <li>Questionnaires</li> </ul>

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Specific Activities for Dissemination at Schools **Activity B: Class workshop**

□ How to facilitate bus trip workshop

1. Organize groups of people
  - about 5-7 people per group **with one CBA staff as facilitator**
2. Ask around the participants have they ever ridden bus, **where and when** they would use buses
3. Ask around the participants the trips they make often **by motorcycle**
  - e.g., Homes to Schools, Homes to Shopping malls
4. Discuss in groups which **trips they can replace by bus service**
  - Using the bus route maps, or application
5. Discuss in groups issues or **benefits of using bus services and what they can do/ what they need to use bus more**



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Specific Activities for Dissemination at Schools **Activity B: Class workshop**

□ (Ref) Idea for route planning experience: “Route Planning Board Game”

Board game to learn bus route map and experience bus route planning

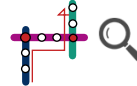


**Objective of the game**

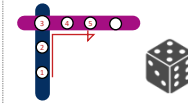
To go to a destination to collect much points as possible

**Rules and how to play**

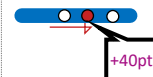
① Bus route planning - Plan the route



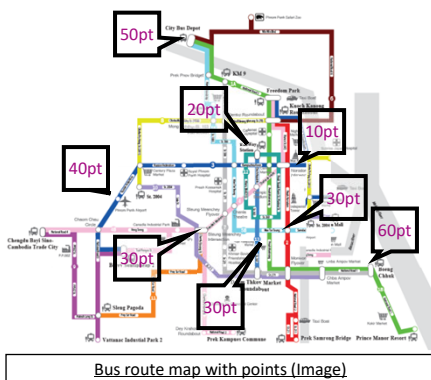
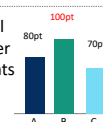
② Throw Dice and proceed



③ Collect points as you reach certain places



④ After several turns, the player with more points wins








Bus route map with points (Image)

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Specific Activities for Dissemination at Schools		Activity C: CBA Depot Workshop
Arranging sightseeing tour at CBA Depot ( <a href="#">This could be arranged as School Trip Program</a> )		
Target, Scale	Class (30 people ~)	
Place	CBA Depot (Sight tour)	
Activities (90 mins ~ 120mins)	Invite students to CBA Depot <ol style="list-style-type: none"> <li><b>General introduction</b> (update of the presentation for each Khans made in <a href="#">2018</a>)               <ul style="list-style-type: none"> <li>To provide information <b>on normal route (before suspension of operation)</b></li> <li>To provide information <b>on tentative route (after restarting the bus)</b></li> </ul> </li> <li><b>Show around depot (see next slide for details)</b> <ul style="list-style-type: none"> <li>Show maintenance facilities, demonstrate maintenance operation</li> <li>Show bus location system and management system</li> </ul> </li> <li><b>Bus trip workshop (same as shown in previous slide)</b> <ul style="list-style-type: none"> <li>Get together with groups (5~6 people)</li> <li>Identify on a large map the places they commonly visit (schools, shopping malls)</li> <li>Discuss among students which trips they can possibly use buses.</li> </ul> </li> </ol>	
Handouts	<ul style="list-style-type: none"> <li>New bus route map, and a brochure that explains benefit of using bus</li> <li>Information of pilot project, Bus shelter project</li> <li>Questionnaires</li> </ul>	

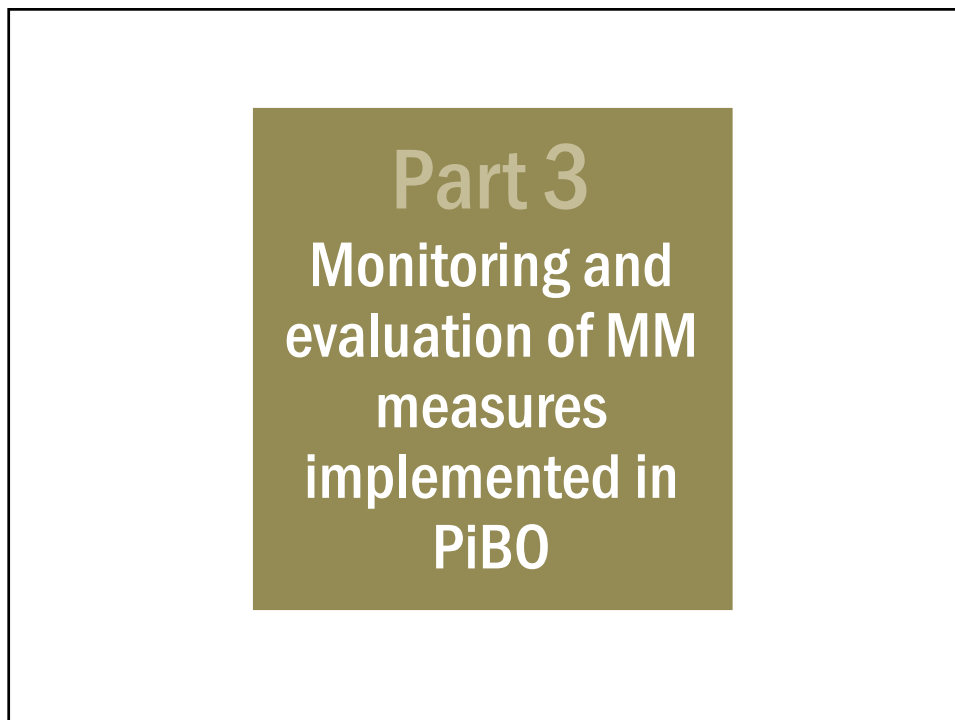
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Specific Activities for Dissemination at Schools		Activity C: CBA Depot Workshop
<input type="checkbox"/> <a href="#">Arranging sightseeing tour at CBA Depot (as part of school trip)</a> <ol style="list-style-type: none"> <li>Explain the general facility layout</li> <li>Demonstrate different type of buses (Japanese buses, Chinese buses, Korean buses)</li> <li>Demonstrate good driving skills by good drivers</li> <li>Explain how <b>daily maintenance and management work</b> is carried out</li> <li>Explain how <b>bus services are managed with system</b></li> <li>Explain how information are available in smart phone application and how to use the application</li> </ol>		
<div style="display: flex; justify-content: space-around; align-items: center;">      </div>		

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Arrangement of dissemination campaigns		
Patterns	Activities	Description, Notes
<u>Pattern 1:</u> Basic	Activity A: Simple (About 60 mins)	This shall be the basic menu for conducting dissemination campaigns at most of schools, because it is expected that it is hard for schools to prepare time.
<u>Pattern 2</u>	Activity A: Simple + (About 60 mins) Activity B: Class workshop (About 60 mins)	Activity B (Workshop activity) could be added to Activity A, by inviting smaller number of students (e.g., Voluntary students)
<u>Pattern 3</u>	Activity C: CBA Depot Workshop (About 120 mins)	Activity C could be done as school trips, or weekend tour for students.

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## 1. Opinion Survey

*Basic opinion survey which is conducted every year*

### Purpose & Explanation

- Survey citizens on their usual traffic behavior, awareness and evaluation of buses.
- Appropriately grasp the effects of bus service improvement activities and reflect them appropriately in bus operations.
- For problems and improvements, promptly consider countermeasures and reflect them in bus operations.
- Continuously implemented about once a year

### Target

- Bus User, Non-Bus user (500 samples for each)

## 1. Opinion Survey

### Method

#### How to carry out the survey

- Pay close attention to methods and survey items so that comparisons with past results can be made. Therefore, the survey method and contents of previous years will be thoroughly reviewed before implementation.
- Survey subjects should be careful not to bias their personal attributes (age, gender, occupation, etc.)
- The investigator will interview the subject directly and write the answer on the questionnaire.
  - In the past surveys, about 20 samples could be collected per investigator per day. Use this as a reference to create a survey plan.
  - For users, it is basically carried out inside the bus and at the bus stop. For non-users, it will be implemented at high schools / universities, commercial facilities / markets, hospitals, offices, government agencies, etc.
  - If there is a desk, it is also good for the subject to fill out the questionnaire. In that case, the investigator will give a supplementary explanation.
  - Investigate after sufficient measures against COVID-19 infection.

## 1. Opinion Survey

### 2019 Opinion Survey Location(For non-users)

Survey Location	Facility
Phnom Penh International University	University
Bak Touk High School	HighSchool
Tuol Tompoung Market(Normal Market)	Shoppinng
Olympic Market(Normal Market)	Shoppinng
Ministry of Agriculture Forestry and Fisheries	AdministrativeAgency
Phnom Penh Tower(Commercial Building)	Office
Boeung Keng Kang High School	HighSchool
Royal University Of Law And Economics	University
Aeon Mall Phnom Penh	Shoppinng
The iCON Professional Building(Commercial Building)	Office
Preah Kossamak Hospital	Hospital
National Maternal and Child Health Center	Hospital
Ministry of Public Works and Transport	AdministrativeAgency

University	2
HighSchool	2
Shoppinng	3
Hospital	2
AdministrativeAgency	2
Office	2
<b>Total</b>	<b>13</b>

### State of investigation



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## Opinion Survey

### Method

#### Survey form

- Survey items are based on past survey forms so that comparisons over time are possible.
- In particular, the following questions are mandatory and the items are unchanged.
  - Personal information (gender, age, occupation)
  - Awareness of buses (existence of buses, awareness by route)
  - Satisfaction with bus service (comprehensive evaluation, evaluation of each item)
- When adding survey items, consider the questions while being aware of the purpose of implementation, analysis content, and feedback to the bus business.
  - In the monitoring survey at the time of resumption of operation, the survey items are changed as appropriate according to the purpose and analysis.
- In order to reduce the burden on the respondents, the number of questionnaires should be 2 or less on A4 paper.

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## 1. Opinion Survey

### Method

### Analysis

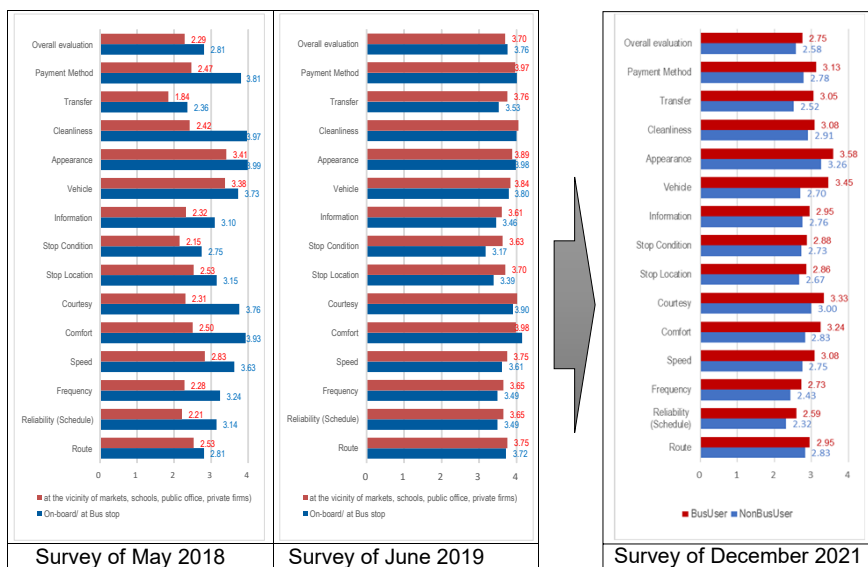
- The following items are of particular importance in the monitoring analysis.
  - Changes in bus awareness (bus presence, awareness by route)
  - Changes in bus service satisfaction (comprehensive evaluation, individual evaluation)
- Satisfaction with bus service will be created based on the graph format on the next page and compared with the results of previous years.
- Items that have deteriorated compared to the previous time and items that are less satisfied than other items require improvement in the future.
- If necessary, it is also possible to analyze by individual attribute and use it as a base for implementing countermeasures by target.

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## Analysis Example(Changes in bus service satisfaction )

Before Covid-19

After Covid-19



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## 2. In-depth Opinion Surveys

Conducting in-depth opinion survey focusing on interactive communication

### Purpose & Explanation

- To promote behavior change for transportation, understanding of peoples' transportation behaviors and preferences is important
- In addition to the conventional questionnaire survey, in-depth opinion surveys that focus on value and perceptions and interactive communication with the interviewee is also effective.

More focus on  
*values and perception*

*Interactive interview*



### Target

- Survey with Interactive communication takes time and resources, so it is effective to identify the target group according to the objective and the theme of the survey.

## 2. In-depth Opinion Surveys

### Survey method in PIBO

- For PIBO, in-depth survey was conducted under the perspective shown below.

#### Objective

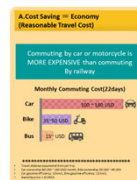
To determine important factors related to people's preferences and values of people that motivate them to use the bus

#### Main theme

- What image does the people have towards the City Bus?
- What kind of bus benefits are important for people?

#### Survey method

- Survey using the bus benefit information sheet developed together with the University of Tsukuba.
- Facilitating communication and honest opinions about the city bus





## 2. In-depth Opinion Surveys

### Survey method in PiBO

#### Questions of the Mobility Management Survey conducted with Univ. of Tsukuba

- General attributes of the interviewee
- Attitude towards using motorcycle and cars
- Perception of the transportation mode
- Personal values
- Fact sheet on beneficiaries of using buses**

Questionnaire sheet

<p><b>Transport Cost :</b> “ Bus is cheaper than cars or bikes”</p>	<p><b>Safety :</b> “ Accidents with buses are less than cars or bikes”</p>	<p><b>Environment :</b> “ Buses produce less CO2 emission”</p>
<p><b>Time Efficiency :</b> “You can use time more efficiently on buses”</p>	<p><b>Health issues :</b> “Bus users consume more calories”</p>	<p><b>Traffic Congestion :</b> “ Buses contribute to reducing traffic congestion”</p>

## 2. In-depth Opinion Surveys

### Survey method in PiBO

#### Survey schedule

##### 1. Preliminary Survey – Conducted by CBA Staff + PiBO Team

- 16<sup>th</sup> (Tue) Dec 2019
  - On-site individual interviews to 30+ interviewees
  - Conducted by 4 CBA staffs

**OBJECTIVE: To grasp the general trend and identify focus group**
- 17<sup>th</sup> (Wed) Dec 2019
  - Individual interviews to 4 MPWT staffs
  - Conducted by PiBO Team

**OBJECTIVE: To complement preliminary survey**

##### 2. Survey – Conducted by University of Tsukuba + PiBO Team

- 19<sup>th</sup> (Fri) Dec 2019 & 20<sup>th</sup> (Sat) Dec 2019
  - Individual + group interviews
  - Conducted mainly by University of Tsukuba, supported by PiBO Team

**OBJECTIVE: To gain implications for effective Mobility Management activities in PP.**

## 2. In-depth Opinion Surveys

### Survey method in PIBO

#### 1. Preliminary Survey

16<sup>th</sup> – 17<sup>th</sup> Dec 2019 | Conducted by CBA Staff + PIBO Team



#### 2. Group Survey

19<sup>th</sup> – 20<sup>th</sup> Dec 2019 | Conducted by Univ.of Tsukuba + PIBO Team



The Project for Improvement of Public Bus Operation in Phnom Penh(PIBO)

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## 2. In-depth Opinion Surveys

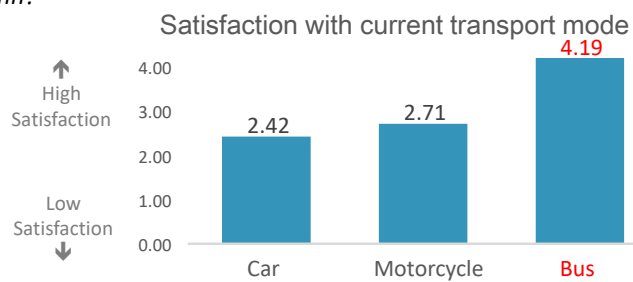
### Survey result in PIBO

#### Overview of the result

- ✓ Satisfaction with current bus system was significantly higher than cars and motorcycles
  - Citizens see the big improvement on bus systems

#### Question:

*Are you satisfied with the current car/ motorcycle traffic and bus service in Phnom Penh?*



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## 2. In-depth Opinion Surveys

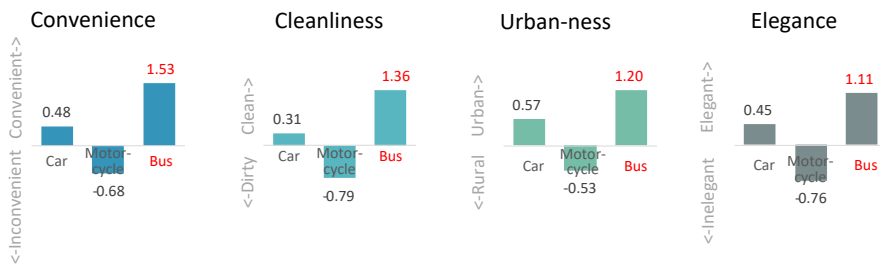
### Survey result in PIBO

#### Overview of the result

- ✓ The image of bus system is significantly better than cars or motorcycles
  - Citizens see the big improvement on bus systems

#### Question:

How would you describe cars, motorcycles, and buses in terms of Convenience, Cleanliness, Urban-ness, Elegance?



## 2. In-depth Opinion Surveys

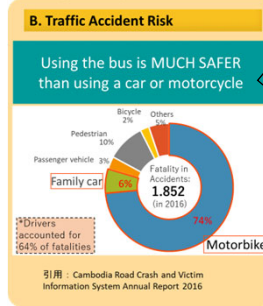
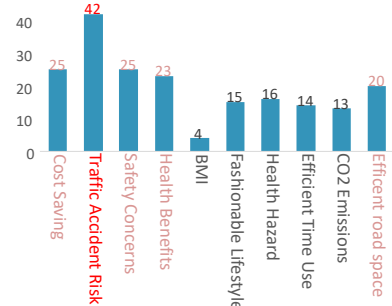
### Survey result in PIBO

#### Overview of the result

- ✓ Traffic Accident Risk was the most selected fact for impressive bus benefit.
  - Citizens are aware of the high number of accident with private vehicles
  - Citizens are also conscious of the health (fitness) and road congestion.

#### Question:

What was the more impressive topic among the fact sheet?



Traffic Safety :  
“Accidents with buses are less than with cars or bikes”

### 3. Online Surveys

*Conducting online survey for agile and inexpensive survey*

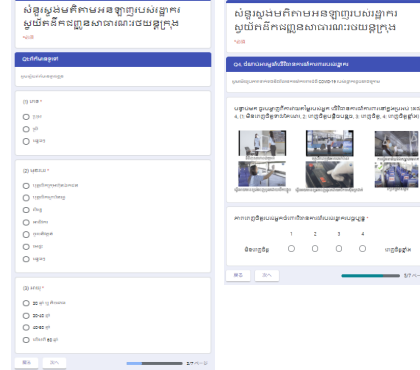
#### Purpose & Explanation

- Conducting surveys online in digital format is one way of conducting a quick preliminary survey
- Easy to prepare and requires less human resource, but need caution, because the respondents tends to be biased to younger generation, who are familiar with digital technologies.

#### Target

- General public (but need to take note that online survey cannot reach all kind of people)

#### Questionnaire survey with Google Form



<https://docs.google.com/forms/d/1qfv17Ct-yxWZIHnQgyQh-JfCWBYaQDCG8BPvK4PRh1Y/edit?usp=sharing>

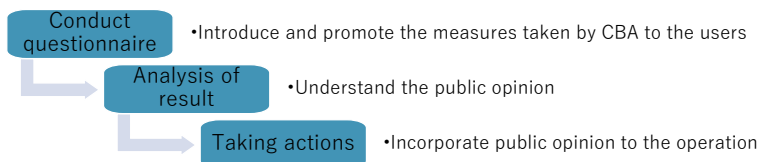
### 3. Online Surveys

#### Online survey conducted by PIBO Team

- Online survey was conducted from Oct. 2020 to Nov.2020
- The objective was to understand the people's opinion regarding City Bus during COVID-19, and to promote the measures taken by CBA.

#### Objective of the online questionnaire

- To understand the public's opinion regarding City bus during COVID-19
- To introduce and promote the measures taken by CBA
- To incorporate the public opinion to the operation
- To show the result (to PPCA) to convey the needs for restarting operation



### 3. Online Surveys

#### Online Survey result

- Collected 192 responses

There were opinions expressing problems with bus operation suspension and request for resumption of bus operation.

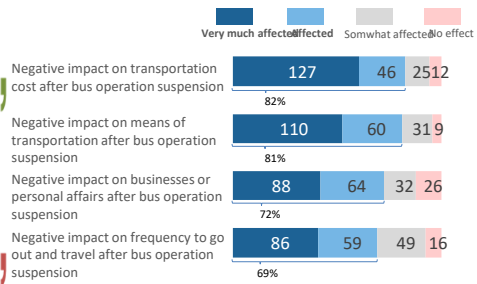
About 70% to 80+% of users are negatively affected by the bus service suspension in terms of transport cost, transport options, opportunities, etc.

*“Have to take other personal transportation means, which is expensive”*

*“Have difficulty going to school without bus service”*

*“Concern that road is more congested with personal transport vehicles”*

*“Please re-operate with measures to prevent Covid-19 for passengers. I wait for swift restart of operation”*



# Part 4 MM for COVID-19

### Mobility Management for COVID-19

#### Mobility management during COVID-19 pandemic

- **Mobility management concept:** “communication measures to promote behavioral change towards realizing better community” could also be applied in dealing with COVID-19 pandemic.

#### Objective and Approach for Mobility Management in dealing with COVID-19 pandemic

<b>Objective</b>	To promote safe and sensible bus usage by developing a trust for the bus system
<b>Approach</b>	<ol style="list-style-type: none"> <li>1. Disseminating the information to users CBA's measures for preventing the spread of COVID-19</li> <li>2. Promoting prevention measures to the users</li> </ol>



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### Mobility Management for COVID-19

Promotion measure 1	Disseminating the information to users CBA's measures for preventing the spread of COVID-19
------------------------	---

#### Purpose & Explanation

- Providing the information regarding CBA's measures for tackling COVID-19 to users in an appropriate manner is essential for assuring the users for using the bus service under the pandemic situation

#### Target

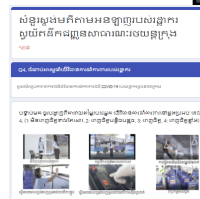
- Mainly the frequent user of the bus service

#### Method

- PIBO Team prepared a video material and an online survey that explains CBA's measures

#### Activities conducted by PIBO Team

Provided video material explaining the measures that are taken by CBA



The measures were also introduced in the online survey.

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## Mobility Management for COVID-19

Promotion measure  
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Promoting prevention measures to the users

### Purpose & Explanation

- Encouraging users to practice infection prevention behaviors such as wearing masks, washing hands, keeping social distance, and whisper talking.

### Target

- Mainly the frequent user of the bus service

### Method

- PIBO Team prepared a video material and a sticker to explain the encouraged behavior inside the bus

### Activities conducted by PIBO Team

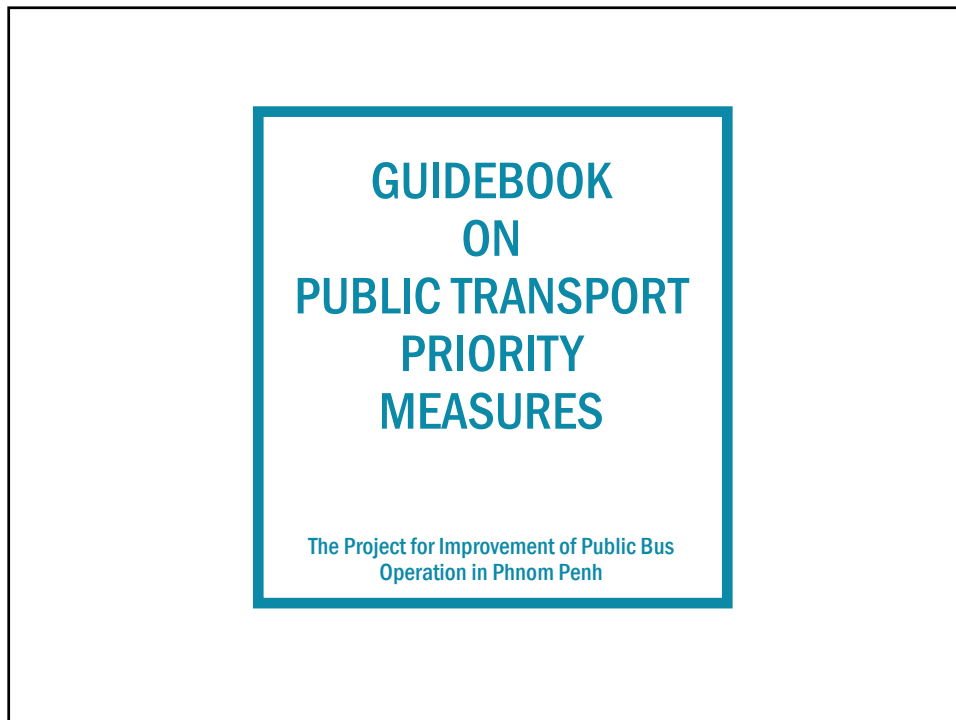
Provided video material explaining how to ride bus during pandemic



Provided stickers to encourage prevention measures (wearing masks, washing masks, etc.)







## Contents

### Introduction

#### Part 1 Public Transport (PT) in Phnom Penh at a Glance

Urban transport in Phnom Penh and issues arising

Overview of PT in Phnom Penh (Infra, service, organizational setting, etc.)

#### Part 2 Policy Direction and Strategies for Improvement of PT in Phnom Penh

Review of empirical studies (JICA MP, ADB)

Policy direction and strategies for improvement of urban transport and PT

#### Part 3 Catalogues of Public Transport Priority Measures/Programs

Overview of public transport priority measures

Catalogues of public transport priority

#### Part 4 Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

Bus Priority Traffic Signal Control

Bus Priority Lane

E-bike Sharing

Paratransit Management

## Introduction

The Project for Improvement of Public Bus Operation in Phnom Penh, so called 'PiBO', aims at increasing ridership of City Bus as the overall project goal in order to sustain the bus operation and management business of CBA and address the urban transport issues caused by private owned car-centered transport system in Phnom Penh.

To achieve the project goal, the PiBO worked with CBA and DPWT/PPCA to improve the bus network and service by providing the priority on the City Bus, which contributes to improving travel speed, frequency and reliability of the City Bus.

This Guidebook was developed, compiling meeting materials and study reports prepared during the course of PiBO, to help the CBA and DPWT/PPCA to examine the public transport priority measures.



The Project for Improvement of Public Bus Operation in Phnom Penh(PiBO)

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# Part 1 Public Transport (PT) in Phnom Penh at a Glance

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## Part 1 in General



Part 1 focuses on two themes: 1) Urban transport in Phnom Penh and arising issues and 2) Overview of PT in Phnom Penh.

Urban transport in Phnom Penh and arising issues addresses the current urban transport situation, problems, and issues in Phnom Penh. It also describes organizations related to road and public transport, parking demand, RHS, and transportation infrastructure.

The overview of PT in Phnom Penh then covers the current situation of infrastructure, bus services, and bus operations. The causal analysis of public transportation promotion is presented.

All of the information included in Part 1 is adapted from presentation materials from the PiBO and JICA's Data Collection Survey on Urban Transport in Phnom Penh.

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## Urban Transport in Phnom Penh and Arising Issues - Overview



### Urban Development

- Urban sprawl and population decreases in CBD (AAGR of Population in CBD -3.82%, AAGR in Suburban Area+2.43%)
- Transport Infrastructure Mega Projects in Suburban Area (Int.Airport, Expressway)



### Institution and Regulation

- Absence of agreed transport Master Plan (Inconsistency with long-term budget plan)
- Absence of transport planning and coordination agency (MPWT-PPCA-Khan, Public-Private)



### Transport Infrastructure and Facilities

- Rapid increase of private vehicle (1.8 times in 2021 compared to 2013), Rapid increase of RHS vehicle (1.5 times in 2017 compared to 2014)
- Privatized sidewalk, lack of bus stop/terminals, transit facilities and parking facilities



### Transportation Services

- Low quality of city bus (low speed(8-12km/h), low frequency, low punctuality, delay/early departure), new transport service (RHS)
- Traffic congestion (average speed of arterial roads in 2001 is 22.9km/h. It decreased to 12.2km in 2017)

Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

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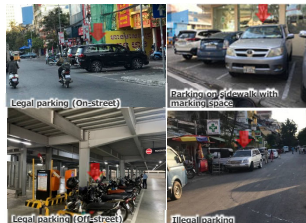
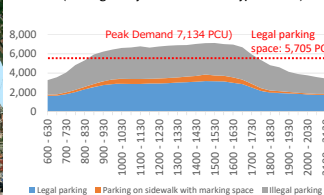


## Urban Transport in Phnom Penh and Arising Issues - Parking

- Parking occupancy rate in CBD: 125%. Only 14% use parking space. (remaining are on sidewalk/on-street)
- Increasing illegal parking fine makes increase of legal parking.

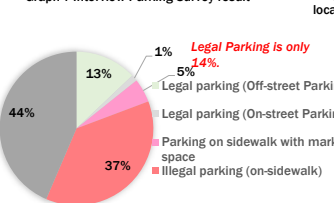


Graph: Parking Demand and Capacity in CBD (Parking survey result. All vehicle types in PCU)

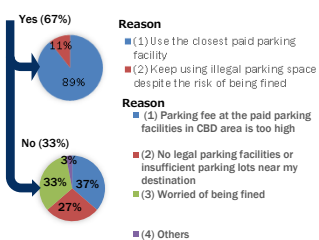
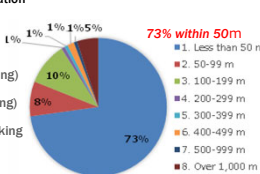


Q: Even if fines for illegal parking increases to 25,000 Riels, are you still willing to use car?

Graph: Interview Parking Survey result



Graph: Distance between destination and parking location



Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

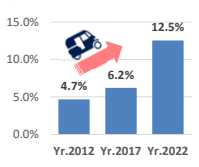
## Urban transport in Phnom Penh and issues arising - RHS

- Rapid increase of RHS vehicle due to the lack of restriction on total volume
- 70% of RHS users agree on "No Entry Policy" for Arterial Roads (Norodom Blvd.)



Registered with Pass App.

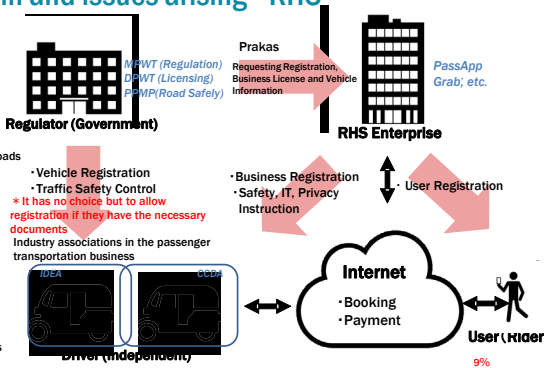
Graph: Trend of RHS share in arterial roads



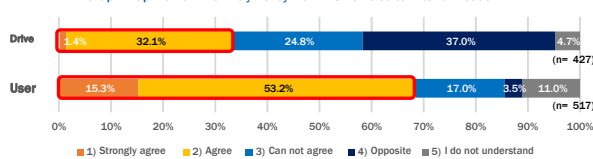
Results of roadside traffic count survey by vehicle type on screen lines outside the CBD (Preliminary)



Condition of Arterial Roads during Commute (2022.2)



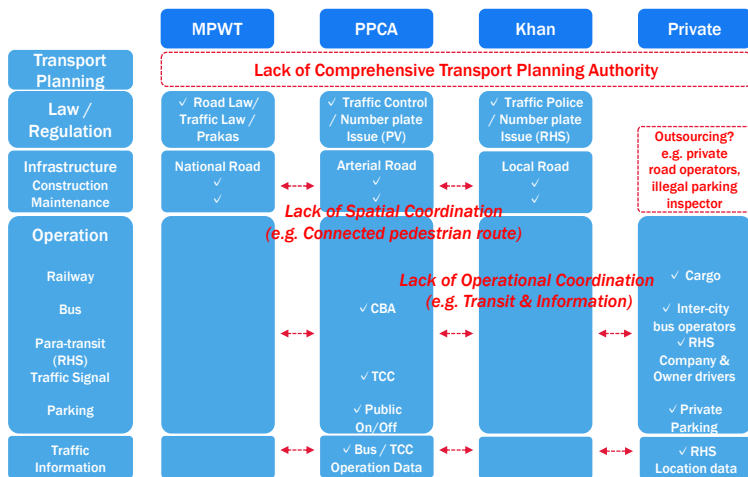
Graph: Opinion on "No Entry Policy" for RHS Vehicles to Arterial Roads



Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

## Overview of PT in Phnom Penh: Infra, Services, Organizational Structure, and Other Aspects

### Absence of transport planning and coordination authority



Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

The Project for Improvement of Public Bus Operation in Phnom Penh (PiBO)

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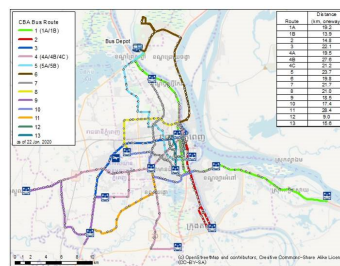
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## Overview of PT in Phnom Penh – Bus Infrastructure

### Number of Bus Routes/Terminals and Bus Fleet

The bus routes operated by CBA started at 3 lines in 2015 with 54 second-hand Korean buses. Since then, the bus route has been steadily expanded to 8 routes in November 2017, and 13 routes in October 2018. In September 2019, CBA decided to suspend the use of these routes, due to the high operation and maintenance cost of these Korean buses; CBA owns 181 buses as of April 2021. The end/start points of each bus route have bus terminals/parking, for a total of 14 bus terminals.

Since 26<sup>th</sup> March 2020, the bus operation has been suspended as part of preventive measures caused by COVID-19 pandemic. After 20 months suspension, on 2nd November 2021, the operation resumed on 4 routes (5 lines) (Line 1A, Line 2, Line 3 and Line 4A/4B).

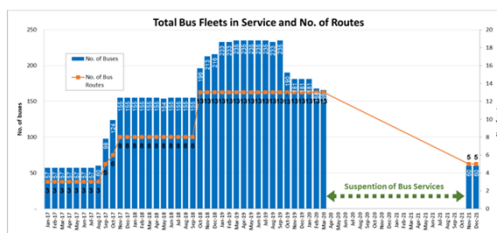


Bus Routes and Terminals



Bus Route Map when Operation Resumed in November 2021

Source: PiBO



Number of Bus Fleet and Route

The Project for Improvement of Public Bus Operation in Phnom Penh (PiBO)

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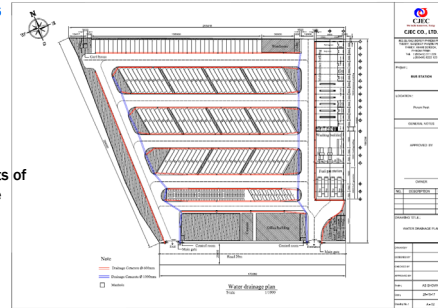
## Overview of PT in Phnom Penh – Bus Infrastructure

### Bus Facilities: Bus Depot, Bus Terminals and Bus Stops

The CBA developed a 4-hectare bus depot equipped with an administration office, workshop, and parking space. This single depot has been in operation since January 2019.

The bus depot is located 15 kilometers North along the National Road (NR) No. 5 across the Prek Pnov Bridge.

CBA also operates 14 bus terminals at the starting/ending points of each bus route and maintains 865 bus stops, 270 of which have bus shelters installed while the rest are bus stands.



Layout Plan of Bus Depot



Bus Shelter with Information



Bus Stop



Parking at Bus Depot



Bus Terminal at Parking Freedom park

Source: PiBO

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## Overview of PT in Phnom Penh – Bus Service

### Service Type and Operation KM of Each Bus Route

The bus routes are classified into four functions: (i) Trunk Line, (ii) Feeder Line, (iii) Regional Line, and (iv) Circular Line, which determine the route assigned and service frequency.

Each bus route operates around 20 kilometres and takes about 1 to 2 hours of travel time to complete their one-way service as it is difficult to have terminal facilities in the city due to limited vacant land and publicly owned land.

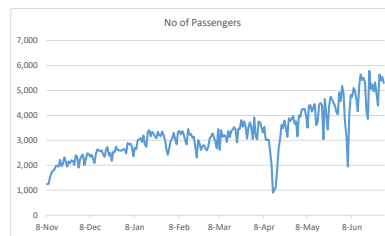
### Number of Passengers

At the beginning of PiBO, the number of bus passenger was recorded at 7,000 pax per day (0.2% of total trip makers in Phnom Penh) and increased to 28,000 pax per day (maximum of 30,000 pax per day) by July 2019.

Due to COVID-19 related restrictions in social and economic activities, as well as travel, in addition to the temporary suspension of the City Bus service, the number of passengers significantly decreased. On November 2<sup>nd</sup> 2021, bus operations resumed on 4 routes (Line 1A, 2, 3, 4A/B) with a total of 60 buses. As of June 2022, the daily ridership of these routes reached 6,000 pax, which still represents a significant drop in ridership from the 16,000 passengers before the COVID-19 pandemic.

The bus fare is fixed at 1,500 KHR. However, passengers such as elderly people (older than 70 years old) and students are given a free ride, which account to around 65% of total passengers.

Line	Origin	Destination	Type	Operation Km (km)	Average Speed (km/h)
Line 1A	New Depot	Boeung Chhrouk	Trunk	25.1	11.6
Line 1B	Chbar Ampov	Keon Svay Hospital	Regional	24.1	21.4
Line 2	Old Stadium R/A	Takhmao	Trunk	15.0	11.4
Line 3	New Freedom Park	Borey Santepheap 2	Trunk	22.0	11.1
Line 4A	New Freedom Park	Borey Santepheap 2	Trunk	19.6	12.3
Line 4B	New Freedom Park	PPSEZ	Trunk	27.6	10.5
Line 4C	Olympic Stadium	Del Krahom Roundabout	Feeder-Trunk	24.8	12.3
Line 5A	New Depot	AEON Mall	Feeder (Ring)	24.2	16.4
Line 5B			Feeder (Ring)	22.6	12.4
Line 6	Old Stadium R/A	New Depot	Feeder	25.8	20.5
Line 7	Kilometer 9	Chbar Ampov	Feeder (Ring)	21.6	16.5
Line 8	Old Stadium R/A	Century Plaza	Feeder (Ring)	23.3	13.3
Line 9	PPSEZ	Borey Santepheap 2	Trunk	23.1	18.2
Line 10	Century Plaza	Chbar Ampov	Feeder (Ring)	26.1	13.7
Line 11	Olympic Stadium	Wat Sleng	Regional-Trunk	14.2	18.3
Line 12 (C1)	Olympic Stadium	Olympic Stadium	Circular	16.6	7.8
Line 13 (C2)	Old Stadium R/A	Old Stadium R/A	Circular	10.6	10.5
				366.3	



Number of Daily Passengers since 2<sup>nd</sup> November 2021

Source: PiBO

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## Overview of PT in Phnom Penh– Bus Business

### City Bus Authority (CBA)

#### Organisation

The City Bus Authority (CBA) is directed by a Governor and managed by 2 Deputy Governors. 4 Departments are responsible for the day-to-day operations and management of city buses.

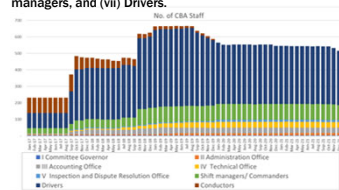
The Business Committee is composed of 12 members from PPCA, DPWT, and CBA; it is chaired by the Governor and monitors performance of the CBA.

#### Number of Staff

As of December 2021, the total number of employees of CBA is 516, including 329 bus drivers.

Even after the bus operation was suspended in March 2020, PPCA made their best effort to maintain the hired drivers and staff in order for a smooth restoration of bus operations. On November 2nd 2021, bus operations on Line 1, Line 2, Line 3, and Lines 4A/4B were resumed smoothly.

Regarding staff allocation, the below graph shows the staff assigned to: (i) Committee Governor, (ii) Administration Office, (iii) Accounting Office, (iv) Technical Office, (v) Inspection and Dispute Resolution Office, (vi) Shift managers/Commanders, and (vii) Drivers.



Source: PiBO

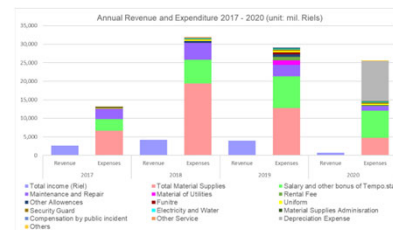
#### Annual Revenue and Expenditure

The total expenditure has significantly increased from 2017 to 2018 and 2019 due to the increase of the bus fleet and expansion of the bus network and service, as well as relocation of the office to the new depot.

In 2020, CBA revenue dropped sharply to 700 million KHR due to the COVID-19 pandemic and suspension of bus operation that started on March 26th, 2020.

During the suspension of bus operations, CBA maintained employed the drivers/staff and retained depreciation expenses for future improvement/replacement of CBA's assets, such as the bus fleet. As a result, expenditure amounted to around 26 billion KHR in 2020.

2018: Expenditure 320 billion KHR/year  
Revenue 40 billion KHR/year (deficit 280 billion KHR)  
2019: Expenditure 290 billion KHR/year  
Revenue 40 billion KHR/year (deficit 250 billion KHR)  
2020: Expenditure 260 billion KHR/year  
Revenue 7 billion KHR/year (deficit 253 billion KHR)



## Overview of PT in Phnom Penh– Bus related Institutional Issues

### Duties of PPCA or MPWT, and CBA

The following table shows the duties of PPCA or MPWT, and CBA concerning the city bus planning, management and operation according to a proposed Sub Decree of CBA as a Public Administrative Enterprise (PAE).

Besides the operation work, CBA will be a responsible body for planning, reporting, and other related works as a PAE.

Major responsibilities of PPCA or MPWT, and MEF are responsible for approving and confirming those works.

Item	PPCA or MPWT	CBA	Reference
<b>Planning and implementation</b>			
• Mid-term plan	Approval	Planning/ Implementation	MEF approval MEF approval
• Annual Budget Plan	Confirmation	Planning/ Implementation	
• Financial Statements Report	Confirmation	Compilation/ Reporting	
• Annual Activity Plan and Report	Approval	Planning/Reporting	
• Organizational Structure and Personnel	Approval	Planning/Execution except for members of the Board of Directors and management officials	
• Procurement	Approval	Planning/Reporting	
<b>Management</b>			
• Work style, fare, etc.	Approval	Planning/Making a Proposal	
<b>Operation</b>			
• Vehicle / crew management	Confirmation	Notifying	
• Fare collection management	Confirmation	Notifying	

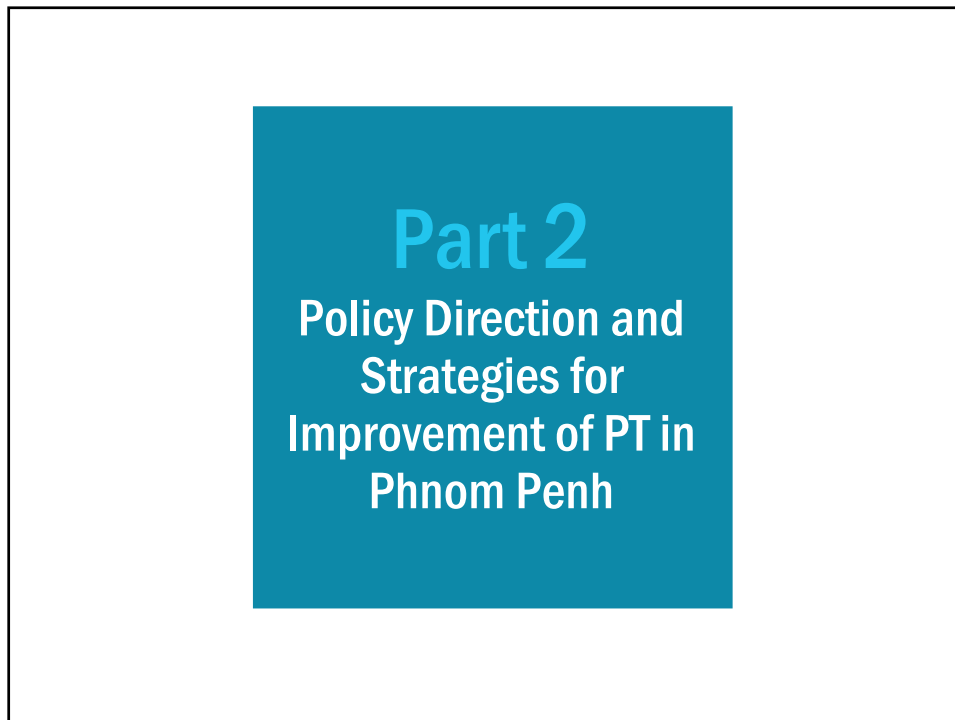
Source: PiBO

### Emerging Issues

For the CBA to change its organization to a PAE, the following issues will be on the central agenda


1. Agreement among the parties involved
2. Clarification of roles and division of responsibilities among the parties involved
3. Separation of management and execution
4. Initial assets, liabilities, and equity
5. Arrangements for operational risks, including operational losses or cash flow shortfalls





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### Part 2 in General



**Part 2 focuses on two themes: 1) Review of empirical studies (JICA MP and ADB studies) and 2) Policy direction and strategies for improvement of urban transport and PT.**

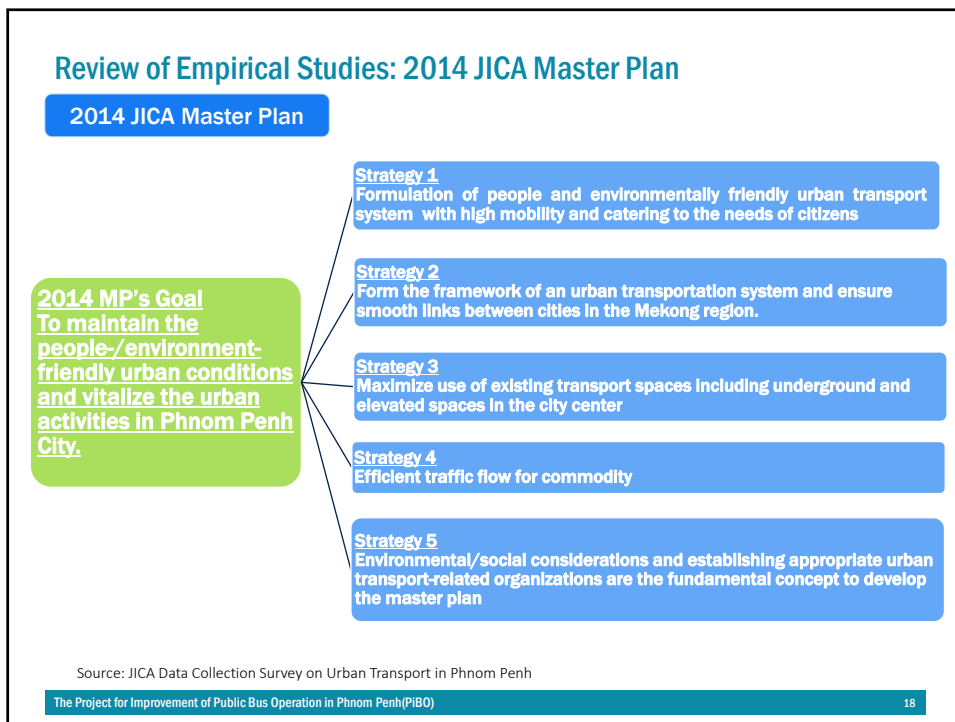
The review of empirical studies, focuses on a review JICA's Master Plan 2014 and Data Collection Survey 2022. For urban transport strategies, a review of short and medium to long-term urban transport development scenarios for urban transport strategies is presented.

In addition, the Strategic Objectives and the list of projects presented by the ADB Public Transport Improvement Projects are included.

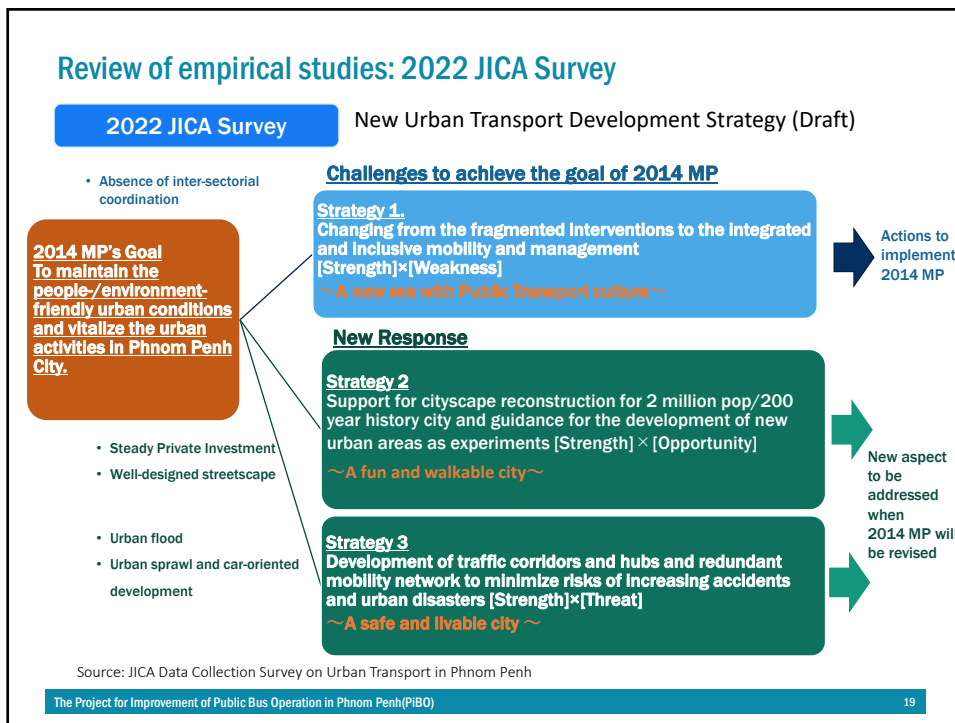
The information presented in Part 2 is adapted from JICA's "Data Collection Survey on Urban Transport in Phnom Penh" and ADB's "Public Transport Improvement Project" presentation materials.

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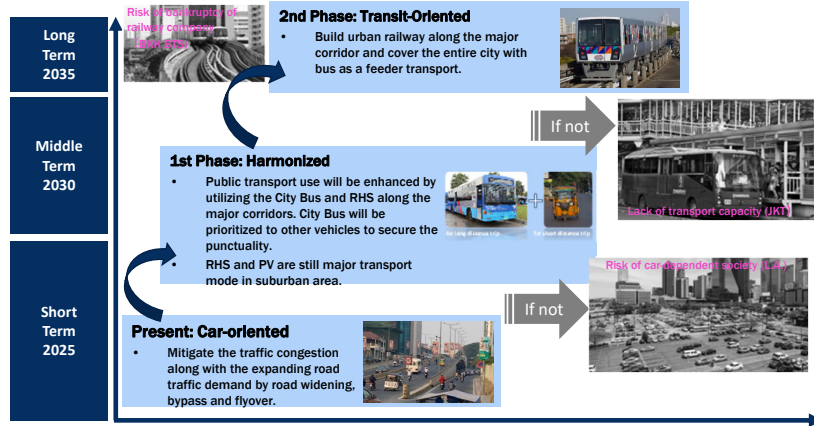
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## Review of Empirical Studies: 2022 JICA Survey

2022 JICA Survey

New Urban Transport Development Strategy (Draft)

Considering the financial/spatial constraints, public transport system will be promoted gradually. Urban railway will be developed at a suitable timing.



Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

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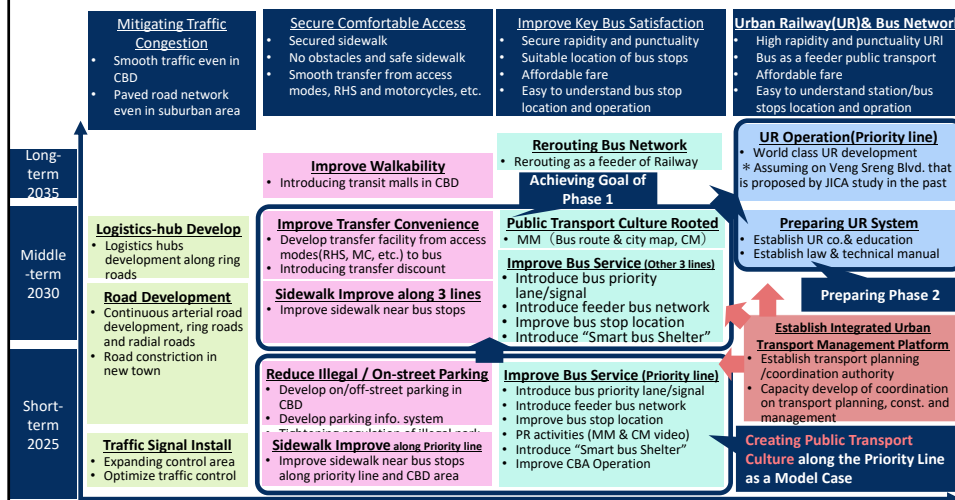
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## Review of empirical studies: 2022 JICA Survey

2022 JICA Survey

New Urban Transport Development Strategy (Draft): Challenges to achieve the goal of 2014 MP



Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

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### Review of Empirical Studies: 2022 JICA Survey

The following are the proposed measures for Immediate Action Plan that have been studied and proposed in 2014 MP by JICA.

#### Creating Public Transport Culture along Priority Line as a Model Case

Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

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### Review of Empirical Studies: 2022 ADB TRTA

#### 2022 ADB TRTA

#### Matching PTIP-1 to Strategic Objectives and CUTP Long List

- Increased public transport mode share ✓
- A financially sustainable public transport system ✓
- Improved public transport infrastructure to raise level of service and efficiency and with a connected network ✓
- A revitalized and efficient city, more orderly and enjoyable and comfortable for residents and visitors ✓
- Public transport which is safe, convenient, and available to all (affordable and accessible)
- Unified management of urban transport in Phnom Penh

From the CUTP long-list:  
 TM- Traffic management PT - Public Transport

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## Review of Empirical Studies: 2022 ADB TRTA

### 2022 ADB TRTA

#### Matching PTIP-2 to Strategic Objectives and CUTP Long List

- Increased public transport mode share ✓
- A financially sustainable public transport system ✓
- Improved public transport infrastructure to raise level of service and efficiency and with a connected network ✓
- A revitalized and efficient city, more orderly and enjoyable and comfortable for residents and visitors ✓
- Public transport which is safe, convenient, and available to all (affordable and accessible) ✓
- Unified management of urban transport in Phnom Penh

From the CUTP long-list:  
 TM- Traffic management PT - Public Transport



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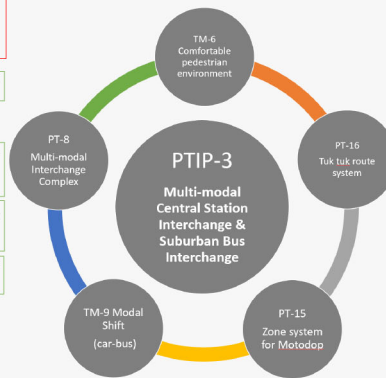
## Review of Empirical Studies: 2022 ADB TRTA

### 2022 ADB TRTA

#### Matching PTIP-3 to Strategic Objectives and CUTP Long List

- Increased public transport mode share ✓
- A financially sustainable public transport system ✓
- Improved public transport infrastructure to raise level of service and efficiency and with a connected network ✓
- A revitalized and efficient city, more orderly and enjoyable and comfortable for residents and visitors ✓
- Public transport which is safe, convenient, and available to all (affordable and accessible) ✓
- Unified management of urban transport in Phnom Penh

From the CUTP long-list:  
 TM- Traffic management PT - Public Transport



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## Review of Empirical Studies : 2022 ADB TRTA

### PTIP-1 Inner City Revitalization

- Action 1: Bus Prioritization and One-Way System
- Action 2: Transit Mall/Walk Street along Sisowath Quay
- Action 3: Parking Management Measures and Regulations

### PTIP-2 Bus Rapid System

- Median alignment
- Split-median stations
- Hybrid operation
- Capacity-up to 7200 pax/PHP
- Fully integrated with the bus network
- Can uses existing bus fleet

### PTIP-3 Integrating Urban Development and Transport

A TOD Policy for Phnom Penh built on 5 key elements

• ប្រើប្រាស់ទំនាក់ទំនងរវាងការអភិវឌ្ឍន៍ក្នុងតំបន់ និងការកែលម្អប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន ដើម្បីលើកកម្ពស់ប្រសិទ្ធភាព និងសុវត្ថិភាពនៃប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន។

• ជំរុញការអភិវឌ្ឍន៍ប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន និងការកែលម្អប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន ដើម្បីលើកកម្ពស់ប្រសិទ្ធភាព និងសុវត្ថិភាពនៃប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន។

• បង្កើនការប្រើប្រាស់ប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន និងការកែលម្អប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន ដើម្បីលើកកម្ពស់ប្រសិទ្ធភាព និងសុវត្ថិភាពនៃប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន។

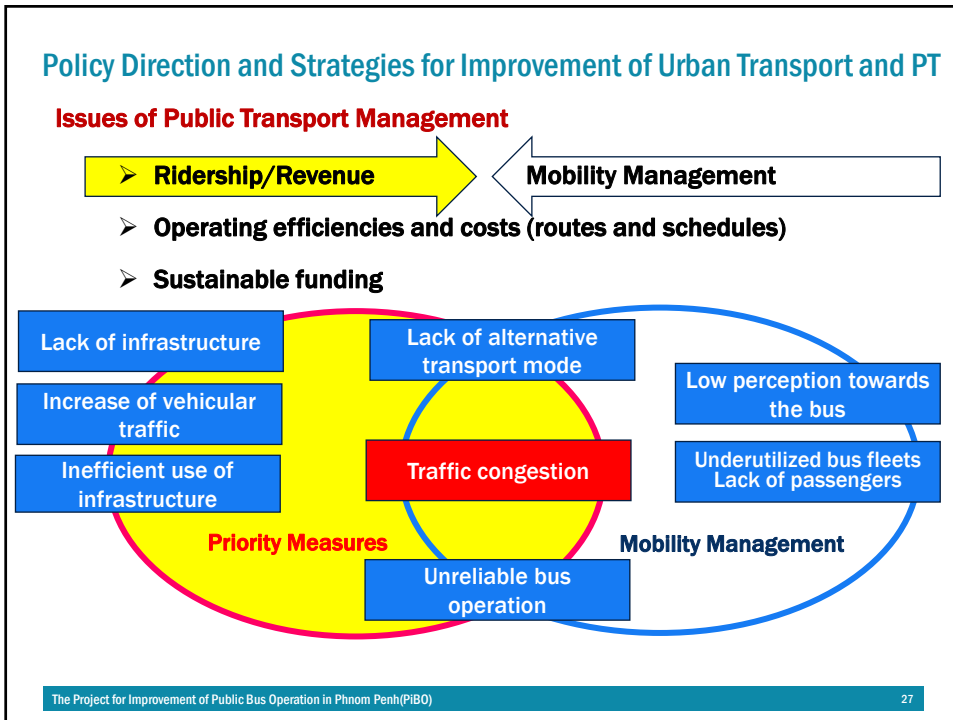
• លើកកម្ពស់ប្រសិទ្ធភាព និងសុវត្ថិភាពនៃប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន និងការកែលម្អប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន ដើម្បីលើកកម្ពស់ប្រសិទ្ធភាព និងសុវត្ថិភាពនៃប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន។

• លើកកម្ពស់ប្រសិទ្ធភាព និងសុវត្ថិភាពនៃប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន និងការកែលម្អប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន ដើម្បីលើកកម្ពស់ប្រសិទ្ធភាព និងសុវត្ថិភាពនៃប្រព័ន្ធសាមញ្ញដឹកជញ្ជូន។

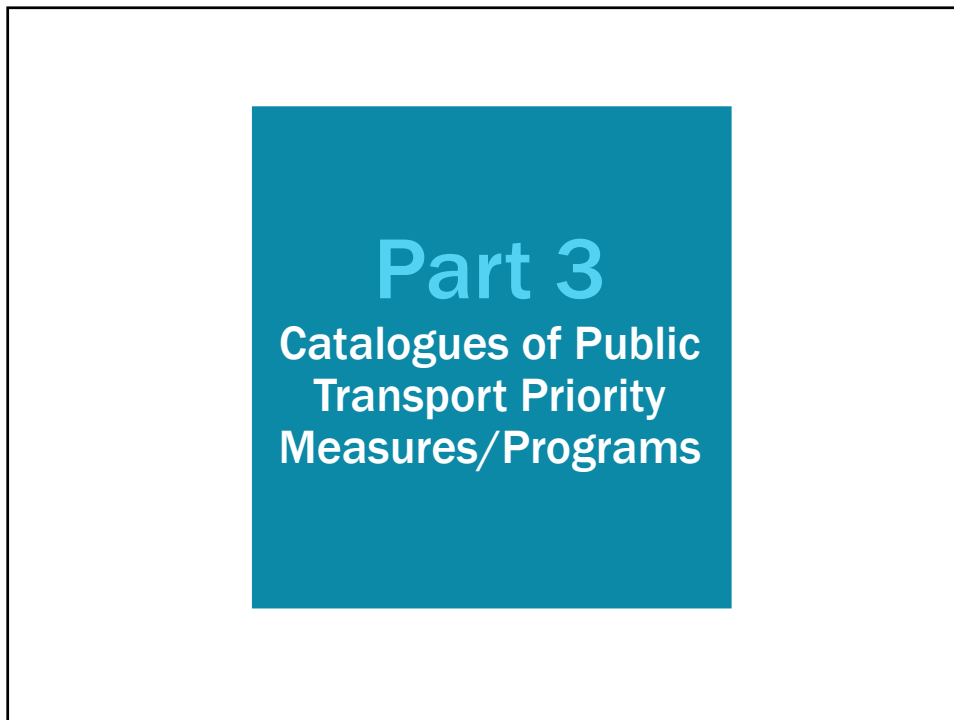
This can also provide a template for TOD development in other major cities in Cambodia.

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**Part 3 in General**

**Part 3 focuses on two themes: (1) Overview of public transport priority measures and (2) Catalogues of public transport priority measures.**

**There are a variety of traffic demand management measures, both soft and hard. This part introduces some of the public transportation measures that are directly or indirectly related to part of public transportation measures.**

**The following is a list of public transportation measures proposed in 2014 MP. Then, some examples of public transportation measures are introduced.**

**Material information and photographs from the Internet are used and compiled.**

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### Overview of Public Transport Priority Measures

In considering traffic management measures in 2014 MP, 2014 MP identified synergies with public and road transportation measures and proposed the content and timing of implementation of the measures.

Transport Priority Measures		Public Transport								
		Bus System including bus priority measures			Recommendation of bus system including railway feeders		Urban Railway systems	Reorganization of paratransit operations	Introduction of commuter trains	Development of water taxi
Component	Project	Bus route	Bus terminal	Bus priority measures	BRT	Complex transit station	Urban railway			
One-way system										
Parking measures	Off-road parking									
	On-street parking									
	Parking guidance system									
Creating a comfortable pedestrian environment	Removal of illegal parking on sidewalk	⊙		⊙	⊙					
	Sidewalk widening	⊙		⊙	⊙					
Transit Mall		○		⊙	○	○				
Improved signal crossings	Signal synchronization control and area control system	○								
	Traffic Information System (Road Information Board)									
	Public Transportation Priority Signal System			⊙	⊙					
Park and Ride		○	○		⊙	○	⊙		⊙	○
Mobility Management		⊙		⊙	⊙		⊙	⊙	⊙	⊙
Driver Education and Traffic Control								○		

Note) ⊙:Strong co-relation (Synergy effects) between Public transport/Road traffic measure and traffic management scheme,  
 ○: Some co-relation between Public transport/Road traffic measure and traffic management scheme  
 Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

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### Overview of Public Transport Priority Measures

Transport Priority Measures		Road Traffic							
		Widening of sidewalks on the trunk roads	Improvement un-concentrated roads in the city center	Widening radial national highways	Improvement and widening of the ring road	Widening of urban trunk roads	Road improvement in the suburban district	Flyover development in the city center	Flyover development in suburban areas
Component	Project								
One-way system		○	○						
Parking measures	Off-road parking	⊙				⊙			
	On-street parking	⊙				⊙			
	Parking guidance system	⊙				⊙			
Creating a comfortable pedestrian environment	Removal of illegal parking on sidewalk	⊙				⊙	⊙		
	Sidewalk widening	⊙				⊙	⊙		
Transit Mall									
Improved signal crossings	Signal synchronization control and area control system		○	⊙	⊙	⊙	○		
	Traffic Information System (Road Information Board)		⊙	⊙	⊙	⊙	○		
	Public Transportation Priority Signal System								
Park and Ride									
Mobility Management									
Driver Education and Traffic Control		○	○	○	○	○	○	○	○

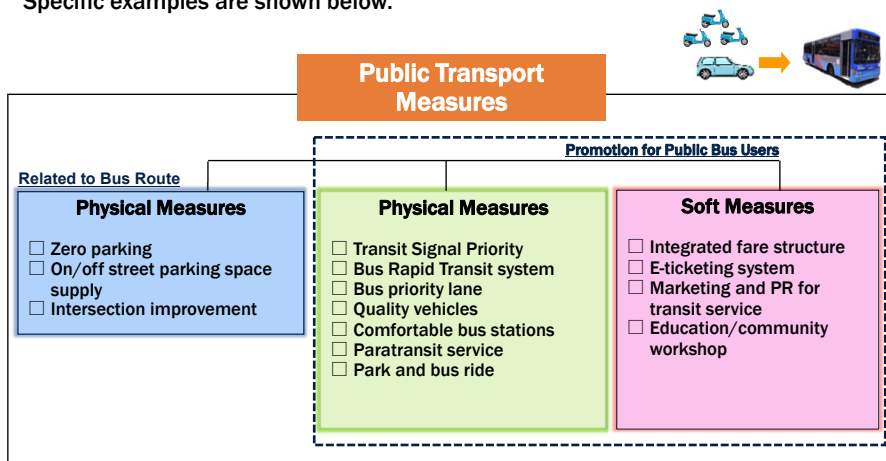
Note) ⊙:Strong co-relation (Synergy effects) between Public transport/Road traffic measure and traffic management scheme  
 ○: Some co-relation between Public transport/Road traffic measure and traffic management scheme  
 Source: JICA Data Collection Survey on Urban Transport in Phnom Penh

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## Overview of Public Transport Priority Measures

Some public transport measures are directly or indirectly related. Specific examples are shown below.



## Catalogues of Public Transport Priority Measures

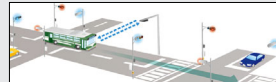
### Introduction of Public Transport Priority Measures

- 01** Transit Signal Priority
- 02** Bus Rapid Transit (BRT) System
- 03** Bus Priority Lane
- 04** Comfortable Bus Stations
- 05** Paratransit Service
- 06** Park and Bus Ride

## Catalogues of Public Transport Priority Measures

### 01 Transit Signal Priority (TSP)

<b>Purpose</b>	The primary purpose of Traffic signal priority (TSP) is to reduce travel times, improve safety, and clear a path so that the priority vehicle can arrive at its next destination faster and safer.
<b>Outline</b>	<ul style="list-style-type: none"> <li>• TSP allows for the modification of traffic signal timing and gives priority to specific vehicle types, such as buses, light rail, streetcars, trucks, emergency vehicles, or trains.</li> <li>• In addition, Public Transit Priority System (PTPS) implements traffic signal priority control over buses by communicating with optical vehicle detectors on ground equipment and special devices on board buses to extend green lights and shorten red lights.</li> <li>• This PTPS is designed to control signals according to traffic conditions and does not always allow the bus to pass on a green light.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Ensuring proper operation time by shortening bus operation times</li> <li>• Improvement of bus service and increase in bus users</li> </ul>
<b>Concerns</b>	• Reduction in road capacity of the crossing road and traffic congestion will occur.
<b>Time Line</b>	• Short-term Project (2023-2025)
<b>Expense</b>	• High - Low



Source: Sumitomo Electric System Solutions Co., Ltd.

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## Catalogues of Public Transport Priority Measures

### 01 Transit Signal Priority (TSP)

#### Case Study : TSP effect after implementation in other cities (1)

City	Priority for late buses only	Bus detection	Delay saving	Travel time	Variability	Disturbance on other traffic
Aalborg, Denmark	No	GPS and odometer	5.8 sec./Int.	4% reduction		
Auckland, New Zealand	No	GPS	11 sec/bus./Int.			
Brighton, UK	Yes	GPS		Reduced	Reduced	
Cardiff, UK	Yes	GPS		3-4% reduction	Reduced	1-2% increase
Chicago, USA	No	Loopdetection		15% reduction		Minimal
Genoa, Italy	Yes	GPS		7-10% reduction		
Gothenburg, Sweden	No			13-15% reduction		
Helsinki, Finland	Yes	GPS, door opening sensor and odometer		11% reduction	20% improvement in regularity and 58% in punctuality	
Kawasaki, Japan	No	Infrared beacon and GPS		5.1% reduction		
King County, USA	No	RFID	25-34%	5.5- 8% reduction	35-40% reduction	Minimal effect
London, UK	Yes	GPS and odometer	9 sec./bus./Int. at isolated intersections and 3-5 sec./bus./Int. at SCOOT intersections			
Los Angeles, USA	Yes	Loopdetection		19-25% reduction		1 sec./veh./Int. increase
Malmö, Sweden		GPS			Headway reduced from 10 min to 7.5 min.	

Note. Adapted from "Review of Bus Priority at Traffic Signals around the World", by Gardner, D., Souza, Hounsell, Shrestha, et al., 2009 and from "Transit signal priority control at signalized intersections: A comprehensive review" by Lin et al., 2015, Transportation Letters, 7(3), p.168-180.

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## Catalogues of Public Transport Priority Measures

### 01 Transit Signal Priority (TSP)

#### Case Study : TSP effect after implementation in other cities (2)

City	Priority for late buses only	Bus detection	Delay saving	Travel time	Variability	Disturbance on other traffic
Miami, USA	No	GPS	4 %	12.1% reduction		
Oakland, USA	Yes	Encoded infrared	9 %			Almost non-existent
Prague, Czech Republic	No	Infrared beacon		2% reduction		
Seattle, USA	No	Passive radio frequency		35-40% reduction	5.5-8% reduction during peak hours	
Southampton, UK	No	Infrared beacon and odometer	9.5 sec/Int.			3.8 sec/Int. increase
Stuttgart, Germany	No	Infrared beacon and GPS		Speed increased from 14.48 to 16.25 km/h		
Sydney, Australia	Yes	GPS		Up to 21% reduction	Up to 49% reduction	
Tallinn, Estonia		Infrared beacon		Speed increase by 2km/h		
Tacoma, USA	No	Encoded infrared	40% reduction			Minimal
Toulouse, France	Yes	GPS and odometer		5-24% reduction	Reduced	
Turin, Italy	No	Infrared beacon		19% reduction		Up to 2% increase
Vancouver, Canada	Yes	Encoded infrared and visual recognition			40-50% reduction	No noticeable impact

Note. Adapted from "Review of Bus Priority at Traffic Signals around the World", by Gardner, D Souza, Hounsell, Shrestha, et al., 2009 and from "Transit signal priority control at signalized intersections: A comprehensive review" by Lin et al., 2015, Transportation Letters, 7(3), p.168-180.



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## Catalogues of public transport priority measures

### 02 Bus Rapid Transit (BRT) System

Purpose	This system aims to improve punctuality, increase transportation capacity, improve convenience and promote the use of public transportation.
Outline	<ul style="list-style-type: none"> <li>• BRT does not cost as much as subways or railroads, and has more transport capacity than regular buses.</li> <li>• Like railways, BRT runs on a dedicated roads that are not accessible to regular vehicles, thus shortening the time required compared to regular buses that only run on regular roads.</li> <li>• There is no traffic congestion on the exclusive lane, and it is possible to operate at a time close to the prescribed schedule.</li> </ul>
	 
Outcomes	<ul style="list-style-type: none"> <li>• Ensuring proper operation time by shortening bus operation time</li> <li>• Improvement of bus service and increase of bus users</li> </ul>
Concerns	• Reduction of road capacity and traffic congestion will occur.
Time Line	• Middle-term Project (2025-2035)
Expense	• High-Middle

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## Catalogues of public transport priority measures

### 02 Bus rapid transit (BRT) system

#### Case Study : Comparison of BRT in five cities.

	Lagos, BRT-Lite	Johannesburg, Rea Vaya	Jakarta, TransJakarta	Delhi, HCBS Busway	Ahmedabad, JanMarg
Date of first line opening	March 2008	September 2009 (line 1A)	December 2004 (line1) February 2009 (line 8)	May 2008	July 2009
Number of Corridors	1 in operation; extension UC; additional line under construction	1 in operation; additional line being implemented	11 trunk routes and 3 feeder routes in operation;	1 in operation; 25 more planned	3 in operation; 5 more planned
Total System Length Operating, planned	22 Km 20+ km under construction	25.5 Km 300+ Km planned	135.11 Km	5.8km, dedicated median transitway (being debated) 8.7 km, side- curb lanes without enforced segregation; 300 Km planned	45Km 41 Km additional planned
Construction cost \$US per Km	\$1.2m+/Km.	\$14.2m/Km++	\$1.3m/Km+	\$5m/Km	\$3m/Km
Number of existing stations	26	30	142	29	67
Average daily ridership on system (Approx.)	200,000	45,000	280,000	85,000	135,000
Travel time savings from previous	29% over length of initial corridor		40-50% over length of each corridor	30% over length of median transitway	20-30% over length of each corridor

+ Initial transitways had to be rebuilt ++ All stations have passing lanes

Source: International Experience in Bus Rapid Transit Implementation : Synthesis of Lessons Learned from Lagos, Johannesburg, Jakarta, Delhi, and Ahmedabad,2012



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## Catalogues of Public Transport Priority Measures

### 03 Bus Priority Lane

Purpose	The purpose is to improve bus service by securing on-time operation of buses as a public transportation system and convenience of buses.
Outline	<ul style="list-style-type: none"> <li>General vehicles are restricted from passing through this priority lane, but the restriction may be applied only at certain times of the day, such as in the morning or evening when many people commute to work or school.</li> <li>General vehicles can use the priority lane, but not when it is expected to be difficult to exit the priority lane, such as in a traffic congestion.</li> <li>When a route bus comes from behind, it is necessary to go out of the priority lane immediately so as not to disturb the bus operation.</li> <li>In either case, it is allowed to pass through the bus priority lane to make a right or left turn.</li> </ul>
	  <p>Photo: Nagoya, Japan from Web site      Photo: Los Angeles, USA from Web site</p>
Outcomes	<ul style="list-style-type: none"> <li>Ensuring proper operation time by shortening bus operation time</li> <li>Improvement of bus service and increase of bus users</li> </ul>
Concerns	<ul style="list-style-type: none"> <li>Reduction of road capacity and traffic congestion will occur.</li> </ul>
Time Line	<ul style="list-style-type: none"> <li>Short-term Project (2023-2025)</li> </ul>
Expense	<ul style="list-style-type: none"> <li>High-Low</li> </ul>

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## Catalogues of public transport priority measures

### 03 Bus priority lane

#### Case Study : Comparison of Bus Priority Lane in Seven cities.

	London	Los Angeles	New York	Paris	San Francisco	Seoul	Sydney
Year bus lanes first established	1968	1974	1963	1964	1970	1984	1992
Kilometres	285 km	6 km	80 km	190 km	27 km	204 km	23* km
City/urban center definition	Greater London	City of Los Angeles	City of New York	Paris + Petite Couronne	City of San Francisco	Seoul Special City	Sydney Inner Region
Population (millions, 2010)	7.8	3.8	8.2	6.6	0.8	9.7	1.5
Land area – km <sup>2</sup>	1,572	1,215	786	762	121	605	355

Notes: Ridership data exclude unscheduled services (e.g., vanpools, demand-responsive transit) and services primarily serving suburban travel markets (e.g., commuter rail, commuter express buses). \* Network extent includes City of Sydney only and does not include significant bus lane  
 Source: REPORT 11-10, Shared-Use Bus Priority Lanes on City Streets: Case Studies in Design and Management April 2012, MINETA TRANSPORTATION INSTITUTE

#### Pavement Markings and Barriers Designating Bus Lanes

Feature	London	Los Angeles	New York	Paris	San Francisco	Seoul	Sydney
<b>Lane separation features</b>							
Painted line							
Low curb or tactile barrier	Solid	Solid	Solid	Dashed	Solid	Variable	Solid
<b>Markings on pavement</b>							
"Bus Lane" or "Buses Only"	●	●	●	●	●	●	●
Painted or colored pavements	●		●			●	●
Non-bus vehicle types permitted	●		●				●
Hours regulations are in force						●	●
<b>Markings on or along curb</b>							
Stripe on pavement or colored curb denotes parking/stopping rules	●	●			●		

Notes: ● = yes, for at least some lanes in the system. Empty cell indicates either "no" or "don't know."

Source: REPORT 11-10, Shared-Use Bus Priority Lanes on City Streets: Case Studies in Design and Management April 2012, MINETA TRANSPORTATION INSTITUTE

The Project for Improvement of Public Bus Operation in Phnom Penh(PIBO)

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## Catalogues of public transport priority measures

### 03 Bus priority lane

#### Case Study : Comparison of Bus Priority Lane in Seven cities.

#### Content of Bus Lane Signage

Feature	London	Los Angeles	New York	Paris	San Francisco	Seoul	Sydney
<b>Content of signs</b>							
"Bus Lane" or "Buses Only"		●	●			●	●
Hours of operation	●	●	●		●	●	●
Text with permitted/prohibited users (e.g., "Taxis ok")	●	●			●		
Symbols showing permitted/prohibited users	●			●		●	●
Sign indicates turns allowed from bus lane		●	●		●		
Instructions for loading/unloading	●			●			
<b>Color scheme</b>							
White-on-blue	●		●	●		●	
Black-on-white		●	●		●		●

Notes: ● = yes, for at least some lanes in the system. Empty cell indicates either "no" or "don't know."

Source: REPORT 11-10, Shared-Use Bus Priority Lanes on City Streets: Case Studies in Design and Management April 2012, MINETA TRANSPORTATION INSTITUTE

#### Bus Lane Hours of Operation (Approximate Percent of Total Lane Miles)

Hours of Operation	London	Los Angeles	New York	Paris	San Francisco	Seoul	Sydney
24-hour, 7 days a week	29%		<2%	100%	66%	44%	12%
Daytime hours, typically weekdays	25%		40%		11%	32%	18%
Peak periods only (morning and/or afternoon rush hours; typically weekdays)	46%	100%	58%		23%	24%	70%

Source: REPORT 11-10, Shared-Use Bus Priority Lanes on City Streets: Case Studies in Design and Management April 2012, MINETA TRANSPORTATION INSTITUTE

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## Catalogues of Public Transport Priority Measures

### 04 Comfortable Bus Stations

<b>Purpose</b>	<ul style="list-style-type: none"> <li>The feeling of resistance to using the bus will be reduced by improving the bus waiting space.</li> <li>Appeal to the public that the bus is a clean, comfortable and cool vehicle.</li> </ul>
<b>Outline</b>	<p>Keep the following points in mind when improving the bus stop:</p> <ul style="list-style-type: none"> <li>Comfortable bus waiting space (roof, bench, internet connection, etc.)</li> <li>Providing easy-to-understand information (bus route guidance by route number / color, timetable, bus location system, transfer information, facilities around the bus stop, etc.)</li> <li>Safety and security (emergency notification button, security camera, etc.)</li> <li>Attractive and cool design</li> </ul> <div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;">Photo: Singapore from Web site</p> <p style="text-align: right;">Figure: Ministry of Land, Infrastructure, Transport and Tourism, Japan</p>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>Improvement of bus operation service and convenient for bus users</li> <li>High maintenance cost</li> </ul>
<b>Concerns</b>	<ul style="list-style-type: none"> <li>Cleaning and maintaining bus stops.</li> <li>High maintenance cost</li> <li>Concern about the destruction of facilities.</li> </ul>
<b>Time Line</b>	<ul style="list-style-type: none"> <li>Short-term Project (2023-2025)</li> </ul>
<b>Expense</b>	<ul style="list-style-type: none"> <li>Middle-Low</li> </ul>

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## Catalogues of Public Transport Priority Measures

### 04 Comfortable Bus Stations

#### Bus Stop Urban Design

The project (source) identifies key goals for the design of a good bus stop. It also describes several technical methods, some of which are excerpted below.



#### Safety

Crime prevention through environmental design measures and accessible design reduce the risk for crime and accidents.



#### Thermal Comfort

Thermal condition is the most important factor determining comfort. Passive and active controls can be used to maintain a desired temperature range.



#### Visual Comfort

Sufficient lighting should be provided for safety and to conduct productive activities at a bus stop. Excessive light such as glare should be minimized.



#### Accessibility

The bus stop should be easily accessible by all segments of the population, of all physical abilities, and through all travel modes.



#### Cover

Cover provides primary weather protection from precipitation and excessive solar exposure. Where possible, cover may be achieved by adjacent awnings or vegetation.



#### Amenities

Amenities such as public art, drinking fountains, and waste bins not only improve the experience of the bus user, but they also benefit the immediate neighborhood



#### Information

Transit information provided at a stop can greatly reduce rider anxiety in waiting. Extra space may be dedicated to displaying community information if the stop is in a high traffic area.

Source: BUS STOP URBAN DESIGN Kevin Jingyi Zhang 2012  
Nine Techniques for Enhancing Bus Stops and Neighborhoods and their Application in Metro Vancouver

The Project for Improvement of Public Bus Operation in Phnom Penh(PIBO)

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## Catalogues of Public Transport Priority Measures

### 05 Paratransit Service

Purpose	Transportation service that supplements larger public transit systems by providing individualized rides without fixed routes or timetable.
Outline	<ul style="list-style-type: none"> <li>• Originally paratransit contributed to encourage the mobility of vulnerable people.</li> <li>• Potential to carry people who live in not service area to public transportation.</li> <li>• The integration of paratransit as a feeder into public transportation is not only possibly to improve accessibility, but also to enlarge public transit catchment areas.</li> </ul>
Outcomes	<ul style="list-style-type: none"> <li>• Provision of transport services in harmony with public transport</li> <li>• Complementing non-bus operation routes and feeder roads</li> </ul>
Concerns	<ul style="list-style-type: none"> <li>• Not systematically / Unreliable</li> <li>• Coordination and demarcation with paratransit associations</li> </ul>
Time Line	• Short-term Project (-)
Expense	• Low



Photo : Motorcycle Taxi Management in Bangkok from Web site



Photo : Tuk tuk and Silor-lek in Thailand from Web site

The Project for Improvement of Public Bus Operation in Phnom Penh(PIBO)

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## Catalogues of Public Transport Priority Measures

### 05 Paratransit Service

#### Case Study : Comparison Paratransit Service in two cities.

##### What is paratransit?

- Complementary public transportation
- Vehicles are often small
- Routes and times are flexible
- Mainly used for short distance travel
- Sometimes used as a complement to buses, etc.

##### Characteristics of Paratransit in Developing Countries

- Small sized vehicles
- Complement areas not covered by existing traffic
- Competitive market
- Old, poorly maintained
- Low transport capacity (slow, dangerous, congested, uncomfortable)
- Disincentive to general traffic
- Provides high mobility for users
- Flexible, frequent service

##### Paratransit in the Philippines (Example)



##### Jeepney : Fixed route type (bus type)

- Capacity: 15 to 25 passengers
- Boarding and alighting through open rear doors
- You can get on and off anywhere.
- Operated by driver only
- Cooperative exists for each route
- Administrative notification is required for the route.

##### Tricycle : Demand response type (Taxi Type)

- Motorcycle coupled with sidecar
- Up to two passengers
- Manila restricts traffic on arterial roads
- Operation in a relatively small area

Photo : from Web site

##### Paratransit in Bangladesh (Example)



##### Rickshaw and Auto-Rickshaw : Demand response type

- Rickshaw rides are the most common form of transportation in Bangladesh.
- In urban areas, gasoline and CNG vehicles are used together, but in rural areas, EV vehicles are the mainstream.

Photo : from Web site

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## Catalogues of Public Transport Priority Measures

### 06 Park & Bus Ride

Purpose	Park-and-bus ride is a method of transferring to public transportation such as buses on the way to a destination, thus promoting the use of public transportation.
Outline	This is a system that uses both private cars and buses for transportation to destinations.
Outcomes	<ul style="list-style-type: none"> <li>By promoting park-and-ride, it is expected to reduce the inflow of traffic into the center of the city, thereby easing traffic congestion and improving the timeliness of bus routes due to traffic congestion.</li> <li>By parking the car you drove from home (Park) and using the bus to get to your destination (Bus Ride), you can reduce traffic volume, air pollution caused by exhaust gas, and carbon dioxide emissions.</li> </ul> <p>Passengers transfer from private vehicle to public transportation to go into the city center.</p>
Concerns	<ul style="list-style-type: none"> <li>Securing available parking lots</li> <li>Maintenance of operation and operation control</li> <li>Passenger car users may not be able to accept the new system because of the extra effort in changing vehicles.</li> </ul>
Time Line	<ul style="list-style-type: none"> <li>Short-Middle term Project (-)</li> </ul>
Expense	<ul style="list-style-type: none"> <li>High-Low</li> </ul>

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## Catalogues of Public Transport Priority Measures

### 06 Park & Bus Ride

#### Case Study: Park and Ride in Four Cities

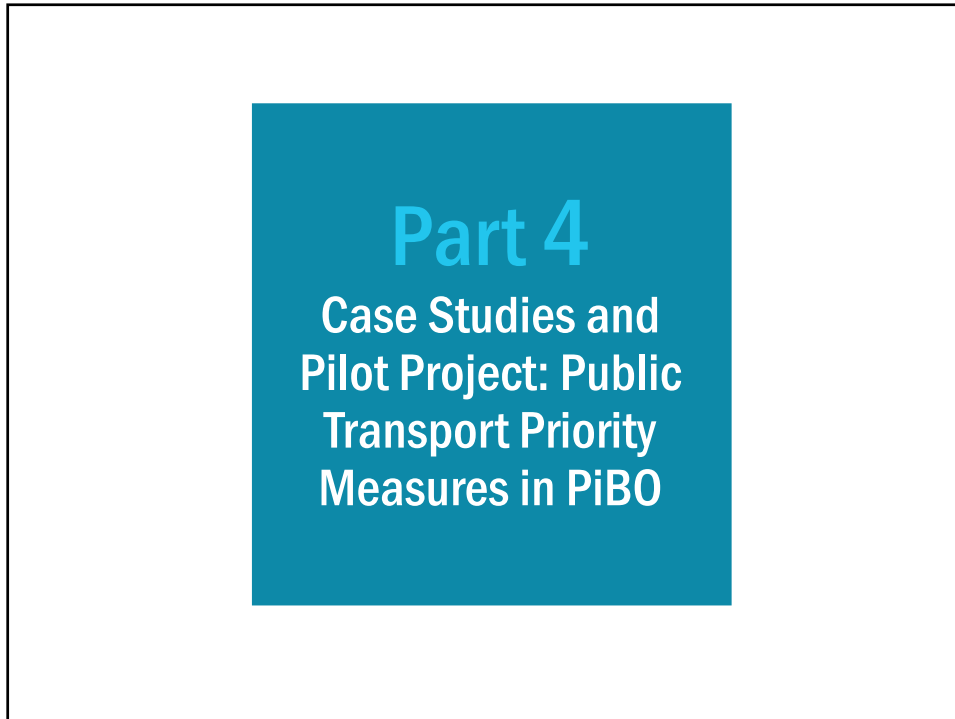
City	Outline	Photo
City of Oxford, Mississippi, U.S.A.	Oxford, a major city in the U.S., is implementing a large-scale park-and-ride. This park-and-ride system utilizes local buses to prevent the influx of cars into the city center, and as one would expect in the U.S., the parking lots for the park-and-ride system are quite large.	 <a href="https://continualgrowthatolemiss.wordpress.com/parking-and-transportation/">https://continualgrowthatolemiss.wordpress.com/parking-and-transportation/</a>
Strasbourg, France	In France, park-and-ride is implemented in the city of Strasbourg, which has a policy of encouraging the use of trams and carpooling by car by establishing large, undervalued parking lots in the suburbs and issuing round-trip tickets to tram users.	 <a href="https://www.jccca.org/download/13415">https://www.jccca.org/download/13415</a>
Freiburg, Germany	Freiburg Germany is also a city that actively carries out park and ride. Cars are not allowed to enter the city center, such as the city hall and the cathedral, which are about 700 meters in diameter. Only streetcars pass through, but there is a free parking lot at the last station of the tram, so you stop here and use the tram to the city.	 <a href="https://www.badsche-zeitung.de/freiburgs-park-und-ride-plaetze-sollen-nur-fuer-nutzer-des-oeffentlichen-verkehrsmittels-kostenlos-bis-180174348.html">https://www.badsche-zeitung.de/freiburgs-park-und-ride-plaetze-sollen-nur-fuer-nutzer-des-oeffentlichen-verkehrsmittels-kostenlos-bis-180174348.html</a>
Prague, Czech Republic	Parking lots have been set up at 10 subway stations and park-and-ride have been introduced. Prague is a city with a relatively good subway system, so it promotes the use of public transportation that doesn't rely on cars, but it has parking lots at stations to keep cars out of the center.	 <a href="https://www.wikiwand.com/en/Park_and_ride">https://www.wikiwand.com/en/Park_and_ride</a>

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**Part 4 in General**

This part summarizes the activities that were studied, designed, implemented and evaluated for the pilot project implemented in PiBO.

E-bike Sharing is mentioned in this part since the project is linked to public city buses.

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## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Pilot Project Plan

#### Actions taken by JICA and CBA/PPCA

- JICA PiBO and CBA/PPCA to implement 1) Traffic signal control; 2) Parking management;
- 3) Temporary bus lane; and, 4) Paratransit as a temporary and small-scale pilot project
- CBA/PPCA expected to expand the pilot project to the whole corridor/network and implement them as permanent measures

#### Location of the Pilot Project

- JICA PiBO proposes to implement a pilot project along Line 4 (5 km section along Monyreth Blvd), considering the impact and effectiveness derived
  - i) Number of passengers higher than other routes.
  - ii) Travel speed lower than other routes.
  - iii) JICA installed new traffic signals at major intersections

### Actual Studies and Pilot Project

- Traffic Signal Control
- Bus Priority Lane
- E-bike Sharing
- Steak holder Management

The Project for Improvement of Public Bus Operation in Phnom Penh(PiBO)

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## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Traffic Signal Control

#### Concept Plan

#### Consideration of Parameter Setting

- To establish and test a project implementation structure, involving DPWT, Traffic Police and JICA PiBO.
- To run the pre-set signal parameters and evaluate the impacts for bus operation and mixed-traffic flow for both target corridor and crossing corridor.
- To verify appropriate signal timing and to modify the signal parameters for the Pilot project.
- To identify any unexpected factors that influences operation and management of the Pilot project.

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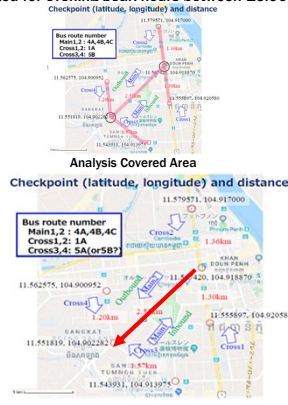
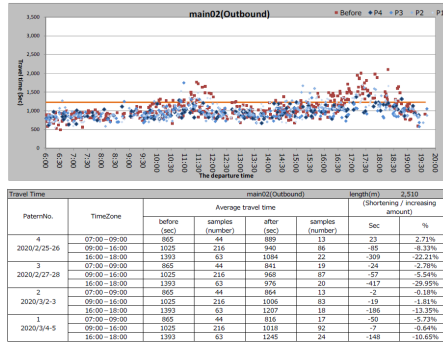
## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Traffic Signal Control

#### Preliminary findings of bus operation

- Bus travel time not affected during off peak hours/morning peak hours.
- Manual operation by traffic police frequently observed along Charles de Gaulle Blvd during morning peak and which might contribute to maximizing intersection capacity and improving traffic flow, including bus travel time during morning peak.
- Allowing manual operation during morning peak, pre-test suggested for evening peak hours between 16:00-19:00

#### Pre-test Result (Bus travel speed of Target corridor)



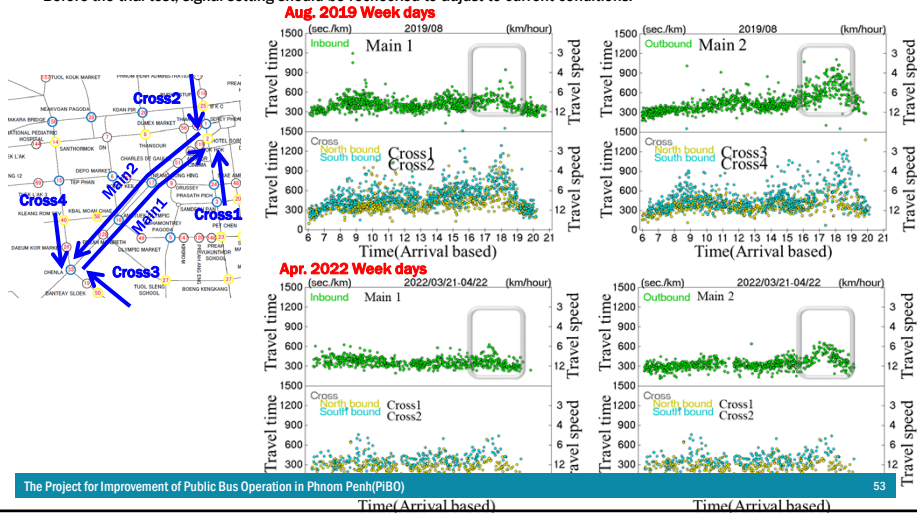
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## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Traffic Signal Control

#### Pre-test Result 2<sup>nd</sup> (Bus travel speed of Target corridor)

Probably due to COVID-19, the traffic situation in 2022 is slightly better than in 2019. Before the trial test, signal setting should be rechecked to adjust to current conditions.



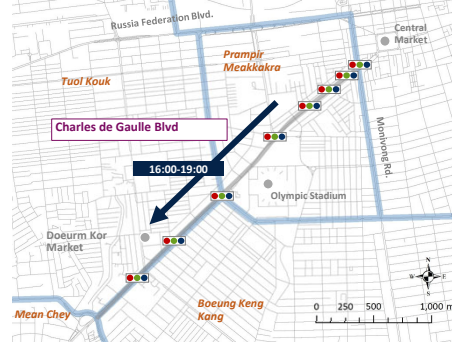
### Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

Traffic Signal Control

Implementation

Rapid Bus Project Stage

Signal Control for Rapid Bus



City Bus Line 4 become Rapid Bus!

Period (Previous): 16 March 2020 to 12 June 2020  
\* Postponed due to COVID-19

Period (Actual): 16 May 2022 to 1 June 2022  
Route : 2.5 km of Charles de Gaulle Blvd.  
Day : Monday to Friday (excluding Public Holiday)  
Hour : 16:00 to 19:00 Downstream direction

Measure:

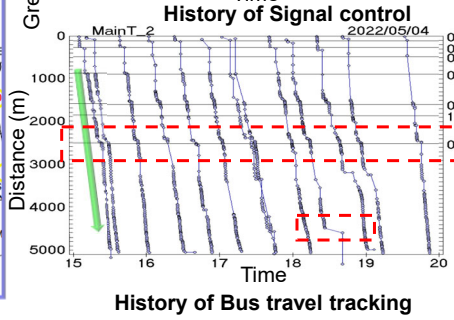
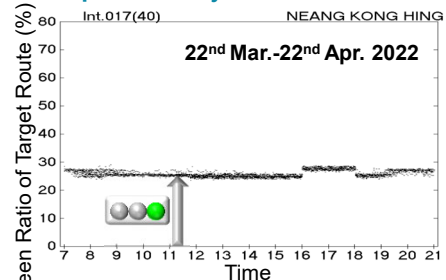
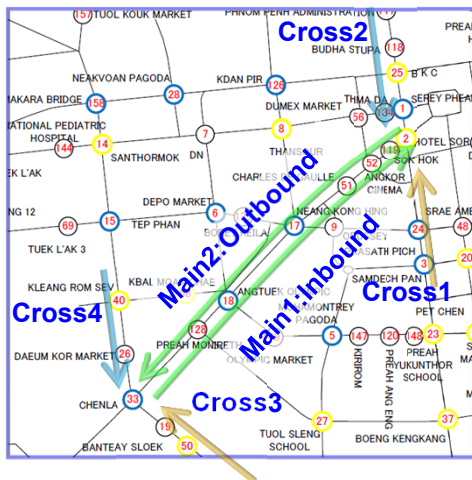
1. Signal cycle will be changed in evening peak hours
2. Green light with Rapid Bus direction will be longer
3. Crossing road might be congested due to shorter green light

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### Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

Traffic Signal Control

Result



The Project for Improvement of Public Bus Operation in Phnom Penh(PiBO)

### Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

#### Traffic Signal Control

#### Result

Term	16/May – 20/May, 2022	26/May – 1/June, 2022		
Parameter Plan	Regular (No priority control)	P1: #2, #17, #18 P2: #33		
	Average travel time (sec./km) {B}	Average travel time (sec./km) {A}	Difference (sec./km)	(A-B) / B
Main1	356sec.(42 probe data)	328sec.(37 probe data)	-28	-7.9%
Main2	449sec.(58 probe data)	370sec.(36 probe data)	-79	-17.6%
Cross1	304sec.(23 probe data)	460sec.(24 probe data)	+156	+51.3%
Cross2	433sec.(13 probe data)	419sec.(13 probe data)	-14	-3.0%
Cross3	No Data	No Data	-----	-----
Cross4	Ni Data	Ni Data	-----	-----

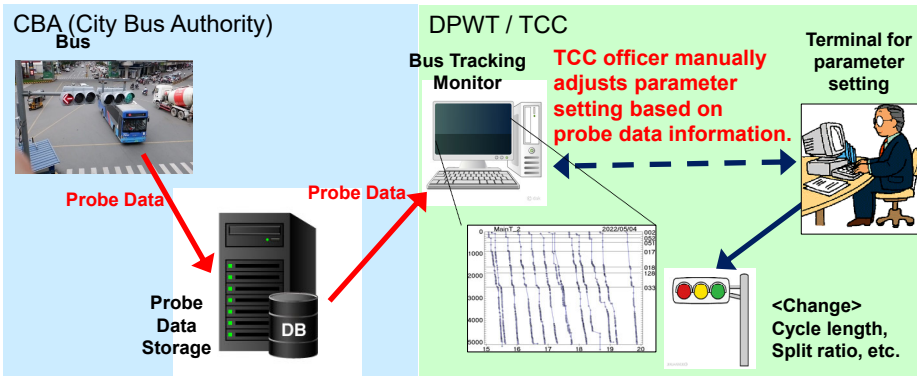
Main1: West to East, Charles-de-Gaulle Boulevard  
 Main2: East to West, Charles-de-Gaulle Boulevard  
 Cross1: South to North, Monibong Boulevard  
 Cross2: North to South, Monibong Boulevard  
 Cross3: South to North, Mao Tse-Tung Boulevard  
 Cross4: North to South, Mao Tse-Tung Boulevard

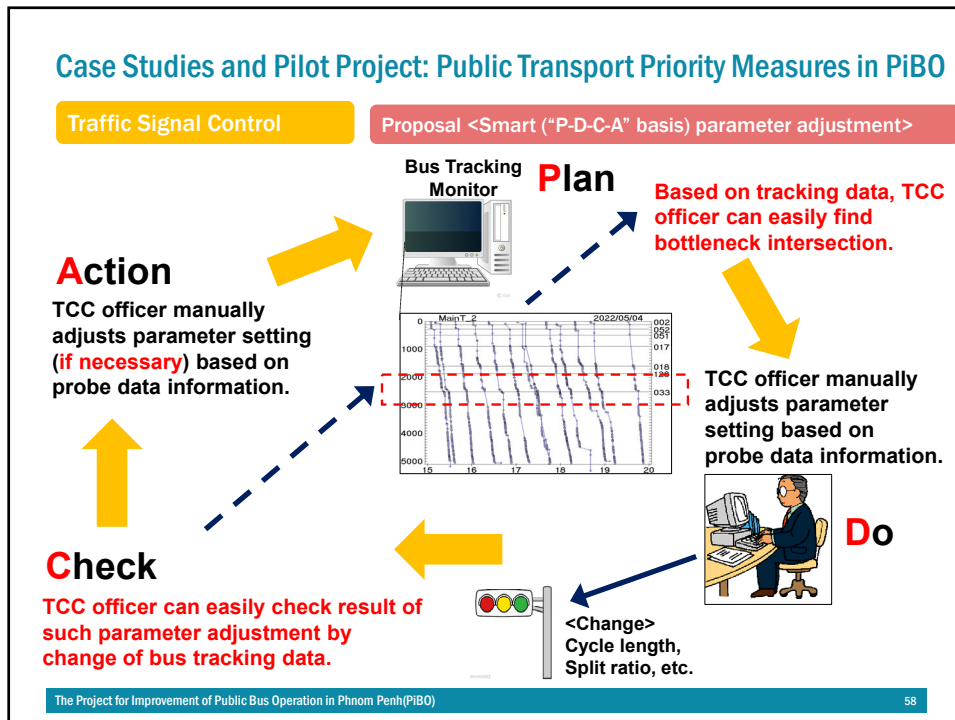
### Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

#### Traffic Signal Control

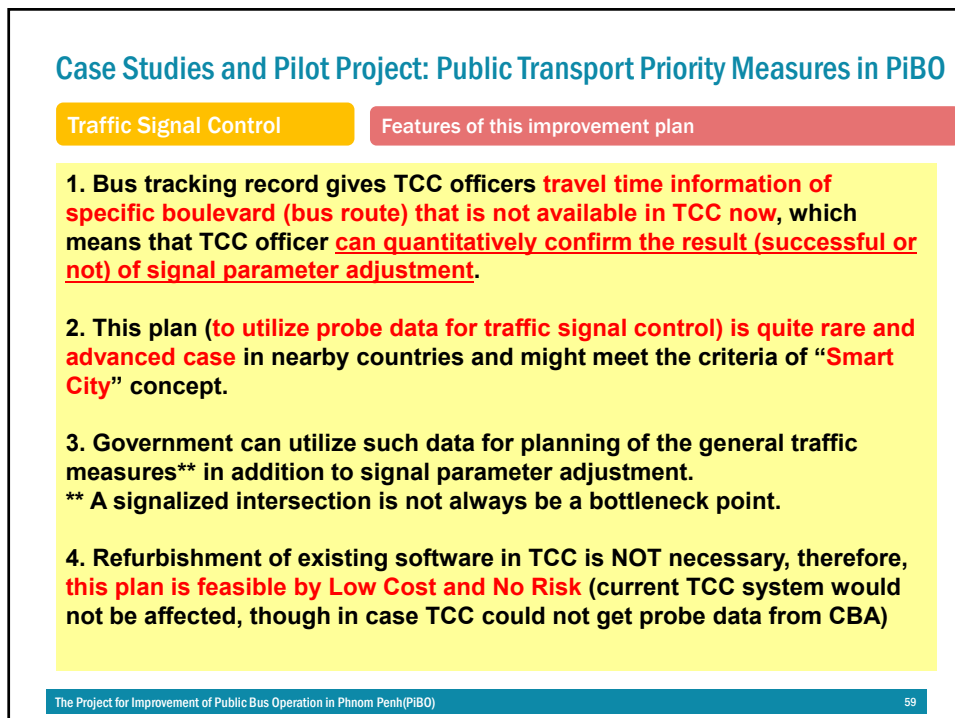
#### Proposal <Parameter adjustment based on bus probe data>

- (1) TCC obtains bus probe data from CBA (on real-time basis).
- (2) Travel tracking data of buses are shown on monitor in TCC.
- (3) TCC officer can adjust parameter setting of local controllers based on such tracking data in addition to CCTV image and detector data, which will resolve waiting time imbalance for each direction at intersection.





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## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Bus Priority Lane

#### Plan

Priority lanes are also proposed as candidates for pilot projects. However, Pibo has implemented only the conceptual design.

The detail design and implementation will be carried out by PPCA and ADB funds.

#### ● Subject Section

Approx. 5 km section of Samdech Monireth Blvd. and Charles de Gaulle Blvd. from Monivong to Steung Mean Chey



## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Bus Priority Lane

#### Concept Design

#### Scope of Works

##### ● Concept Design

- Lane operation planning (bus priority lane and ordinary lane)
- Bus stop relocation planning
- Typical cross section
- Intersection analysis
- Road marking and signage planning (excluding signage graphical design)
- Others

##### ● Brief construction cost estimation

##### ● Remarks

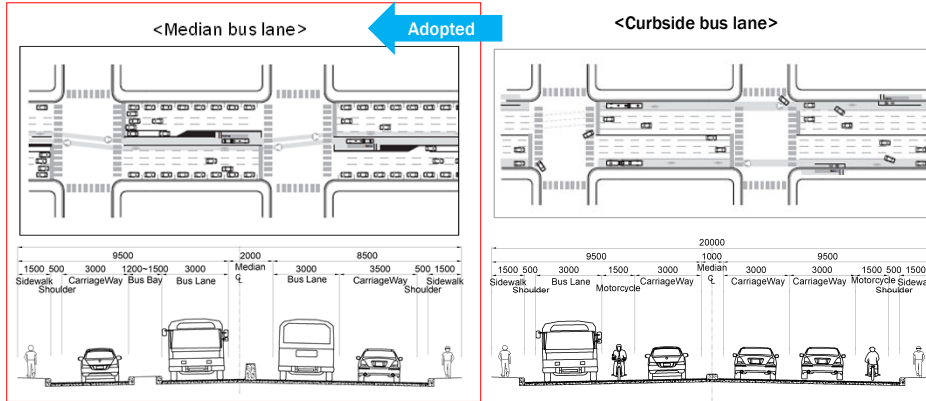
- Concept design was conducted mainly based on the rough measure results at the site without surveying.

## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Bus Priority Lane

### Concept Design

- Median bus lane is studied in this concept design



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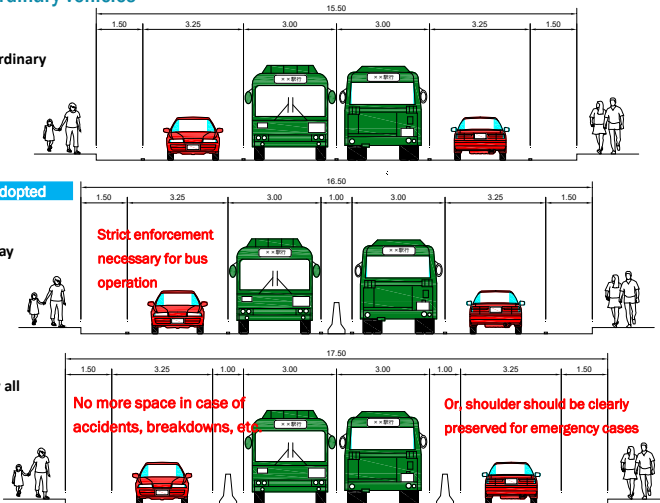
## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Bus Priority Lane

### Concept Design

#### Separation of buses and ordinary vehicles

- No separation
  - Allowing obstruction by ordinary vehicles
- Directional separation (Adopted)
  - Preventing obstruction by turning vehicles
  - Requiring more carriageway width
- Separation from ordinary traffic
  - Preventing obstruction by all ordinary vehicles
  - Requiring maximum carriageway width



The Project for Improvement of Public Bus Operation in Phnom Penh(PiBO)

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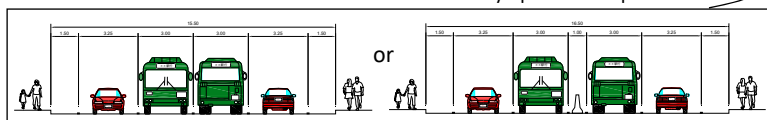
## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

**Bus Priority Lane** **Concept Design**

### Policy on Operation of Bus Priority Lane

	Bus only for 24 hours ***Proposed***	Bus only for bus operation hours (5:30am-8:30pm)	Bus only at peak hours (6:30am-9:30, 4:00pm-7:00pm)
Advantage	<ul style="list-style-type: none"> <li>Maximized bus operation and high level of bus service</li> <li>Easy to understand and use</li> <li>Reduced accident risk</li> </ul>	<ul style="list-style-type: none"> <li>Maximized bus operation and high level of bus service</li> </ul>	<ul style="list-style-type: none"> <li>Increased traffic capacity at off-peak hours due to maximization of lane use</li> </ul>
Disadvantage	<ul style="list-style-type: none"> <li>Reduced traffic capacity even at off-peak hours</li> <li>Complains from ordinary drivers</li> </ul>	<ul style="list-style-type: none"> <li>Reduced traffic capacity even at off-peak hours</li> <li>Complains from ordinary drivers</li> </ul>	<ul style="list-style-type: none"> <li>Reduced level of bus service</li> <li>Confusing for drivers due to complicated lane use</li> <li>Increased accident risk due to confusing lane operation</li> <li>Consideration of mixed traffic in designing traffic signal, marking, and signs</li> </ul>

No barrier or barrier in the median available for bus only operation at peak hours



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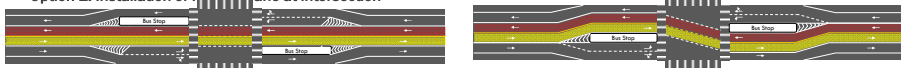
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## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

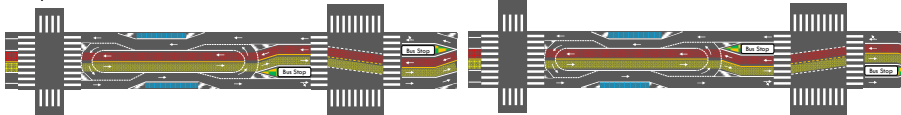
**Bus Priority Lane** **Concept Design**

### Options for Left-Turn Traffic

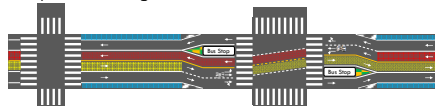
●Option 1: Installation of left-turn lane at intersection



●Option 2: Permission of U-turn between intersections without left-turn lane at intersection



●Option 3: Sharing the bus lane with left-turn traffic at intersection (mixed use)



	Option 1	Option 2	Option 3
Main feature	<ul style="list-style-type: none"> <li>Installation of left-turn lane</li> </ul>	<ul style="list-style-type: none"> <li>Permission of U-turn without installing left-turn lane</li> </ul>	<ul style="list-style-type: none"> <li>Sharing the bus lane with left-turn traffic (mixed use)</li> <li>Bus stop only available at the far side</li> </ul>
Advantage	<ul style="list-style-type: none"> <li>Natural traffic movement (no detour)</li> </ul>	<ul style="list-style-type: none"> <li>Narrowest carriageway width required among three options</li> </ul>	<ul style="list-style-type: none"> <li>Narrowest carriageway width required among three options</li> </ul>
Disadvantage	<ul style="list-style-type: none"> <li>Widest carriageway width required among three options</li> </ul>	<ul style="list-style-type: none"> <li>Detour necessary for left turn causing more travel time, fuel consumption and emission</li> <li>Drivers confused due to unnatural movement (detour)</li> <li>Increased accident risk due to unnatural movement</li> </ul>	<ul style="list-style-type: none"> <li>Decreased bus service due to the mixed use, which can adversely affect bus users</li> <li>Increased bus operation time due to no utilization of red time for boarding/alighting</li> </ul>
Evaluation	Recommended	Less recommended	Not recommended

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## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Bus Priority Lane

### Concept Design

#### Colored Pavement for Bus Priority Lane

Colored asphalt pavement for bus priority lanes is proposed for drivers to clearly distinguish the bus lanes and ordinary lanes.



Source: NYC, USA from Web site

● Usage of different colors for inbound and outbound is proposed to clearly guide the bus driver to the right travel lane.

● Reference:

- In Nagoya, Japan, red and yellow are used for the bus priority lane.
- Blue is typical for bicycle in Japan.
- Green is typical for pedestrian in Japan



Source: Nagoya, Japan from Web site

## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### E-bike Sharing



#### Plan

- Motorbike Sharing refers to many users sharing one motorbike
- Each shared motorbike is used 5x more than a private motorbike
- One shared motorbike can therefore replace 5 private motorbikes
- Lead to a significant reduction in traffic and pollution



- Proposal to work with City Bus and PPCA to provide last mile transportation to bus passengers
- Encourage private motorcycle owners to switch to buses and shared motorcycles
- To be deployed at strategic City Bus interchanges and terminals
- Provide the cheapest form of transportation in Cambodia (other than buses) - 3 cents per minute
- Pilot to start in January 2020 with 40 motorbikes

#### By end 2020


- Provide last mile transportation from CBA bus stops to final destination
- Provide motorbikes to a minimum of 11 bus stops
- Introduce 110 electric motorbikes to Phnom Penh
- Educate the public with hands on electric motorbike experience

#### By end 2021

- Introduce 300-500\* electric motorbikes to Phnom Penh
- Replace 2 million petrol km with electric km
- Reduce CO2 and other GHG emissions by 100 tonnes
- Develop video series in Khmer in conjunction with NGO to educate users on electric motorbikes


## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

E-bike Sharing




Motorbike Design

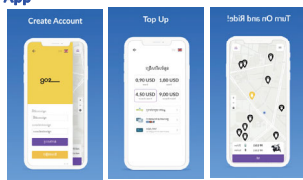
### OYIKA ELECTRIC MOTORBIKE



- Max speed limited to 40 km/hr for rider safety
- Range of 50 km to 60 km
- Charging -Instant through battery swap
- Water proof motor -capable of riding through floods
- 1.2 kWh Lithium ion battery with recycling plan
- GPS tracking (anti-theft) • Remote locking over the internet (anti-theft)
- Zero noise pollution
- Zero air pollution




App





Parking Design

- 11 locations are designed Example

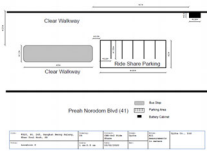


Monivong Boulevard





Norodom Boulevard




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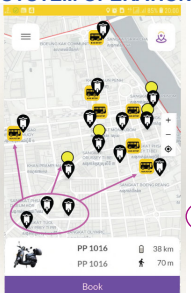
## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

E-bike Sharing



Implementation and Evaluation

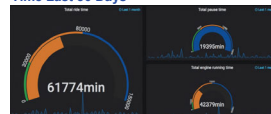
### SYSTEM OPERATIONS




- Bus Stop Locations
- Circle K Locations
- Motorbike Locations
- Geo Fence  
Bikes can be ridden & paused outside geo fence but must be returned inside to switch off
- Relocation  
Bikes outside of docks returned within 6 hours

USEFUL DATA

#### Total Ride Time Last 30 Days




#### Ride Time Comparison Last 30 Days to Last 100 Days




### USER UPTAKE


#### Weekly No. of Riders




#### Weekly Avg. Ride Time



#### Weekly Avg. Ride Distance



#### Daily Ride Times - Last 30 Days



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## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Paratransit Management

#### 1. Paratransit in Phnom Penh

##### Type of Paratransit in Phnom Penh

- Tuk Tuk (Khmer Tuktuk and Bajaj)
- Cicro, Motodop
- Taxi

##### Paratransit in Phnom Penh

- More than 30,000 Tuk Tuks and its drivers work in Phnom Penh
- 3 associations for paratransit services: CCBA, IDEA and TTCA
- Introduction of dedicated application enhances the convenience (PassApp, WeGo, and Grab)

#### 2. Issues of Paratransit in Phnom Penh

- Paratransit (Tuk Tuk) competes with Mass Transit (City Bus and Airport Rail)
- Poor-connectivity between Paratransit and Mass Transit
- Riding on/off of Paratransit in anyplace contributes traffic congestions

#### 3. Strategies for Paratransit Management

##### Increase of Safety and Reliability by System Improvement

- Improve the driving quality of Paratransit drivers
- Coordinate the competing routes of Paratransit and Mass Transit

##### Increase the Convenience by Facility Improvement

- Transit terminal improvement including Bus Stops

##### Increase of User-Friendliness by Providing Incentives for Passengers

- Incentives for Transit Passengers

Indian Tuk Tuk (Bajaj)



Khmer Tuk Tuk



Cyclo



## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

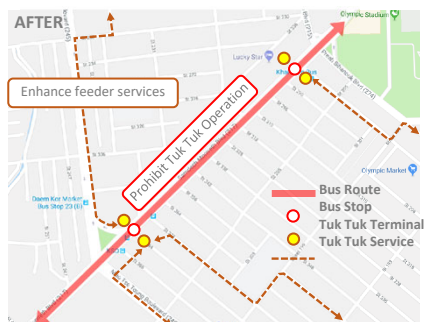
### Paratransit Management

#### 4. Preliminary Proposal for Paratransit Management



##### Existing Condition

- Duplication of service route
- Traffic congestion by many modes
- Poor connectivity between bus and tuk tuk

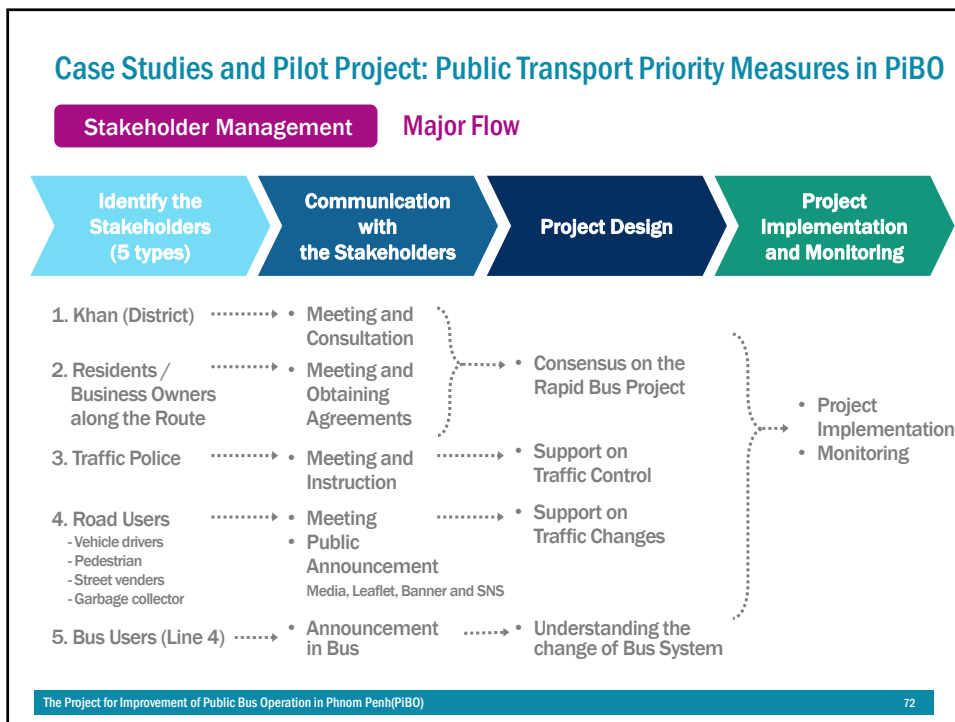


##### Desirable Condition

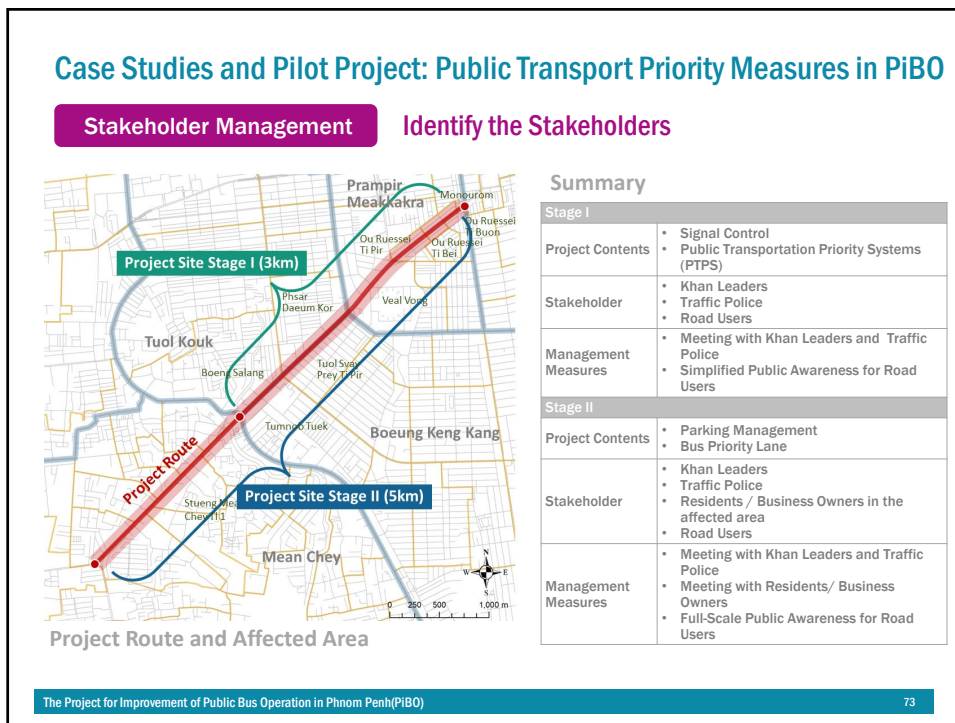
- Less duplication of service route
- Well connectivity between bus and tuk tuk
- Package fare of bus and tuk tuk

#### 5. Meetings with the Stakeholders for Paratransit Management

- Paratransit associations: CCDA, IDEA
- Paratransit service user: AEON Mall
- Paratransit application service providers: PassApp, Grab



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## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Stakeholder Management

### Communication with the Stakeholders

#### 1. Meetings with Khan Leader and Traffic Police

##### Stakeholders

- Leaders of Khan (Prampir Meakkakra, Tuol Kouk, Boeung Keng Kang, Mean Chey)
- Traffic Police

##### Meeting Agenda

- Explanation of Parking Control and Bus Priority Lane
- Public Awareness for Parking Control and Bus Priority Lane
- Opinion Exchange

#### 2. Meeting with Residents and Business Owners

##### Stakeholders

- Residents and Business Owners along the target route

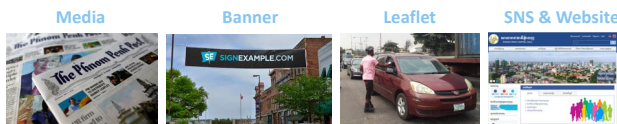
##### Meeting Agenda

- Explanation of Parking Control and Bus Priority Lane
- Public Awareness for Parking Control and Bus Priority Lane
- Opinion Exchange

#### 3. Public Awareness

##### Stakeholders

- Road Users
- Bus Users



## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Stakeholder Management

### Project Design

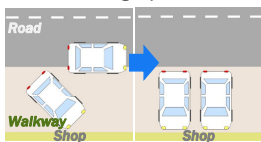
#### Signal Control: Consensus from Stakeholders

1. Signal cycle shall be changed during peak hours (congested period)
2. Green light with rapid bus direction shall be longer than ordinary time
3. Period of green light consists of three steps
4. Crossing road would be congested due to shorter period of green light



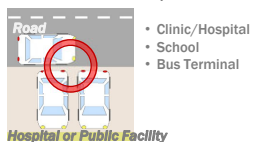
#### On-street Parking Control: Supports by Stakeholders

##### Pattern A: enough space



- Parking control during peak hours

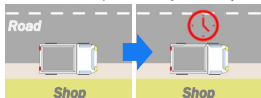
##### Pattern B: in front of public facilities



- Clinic/Hospital
- School
- Bus Terminal

- Parking is allowed near public facilities

##### Pattern C: no/limited space for parking



- Encourage short time parking during peak hours

##### Pattern D: in No Stopping area



- Parking ban in "No Stopping Area"

#### Priority Lane: Consensus from Stakeholders

1. Allocate "Priority Lane" in the existing road – one lane per direction during peak hours.
2. Basically no other vehicles could drive in the priority lane during peak hours
3. Priority lane shall be painted to distinguish it from other lanes



## Case Studies and Pilot Project: Public Transport Priority Measures in PiBO

### Stakeholder Management

### Project Implementation and Monitoring

#### Risk Analyses and Preparation of Countermeasures

- Potential risks should be analyzed prior to implement the project
- Countermeasures should be prepared for the potential risks
- Monitoring is necessary during and after the project in order to implement appropriately

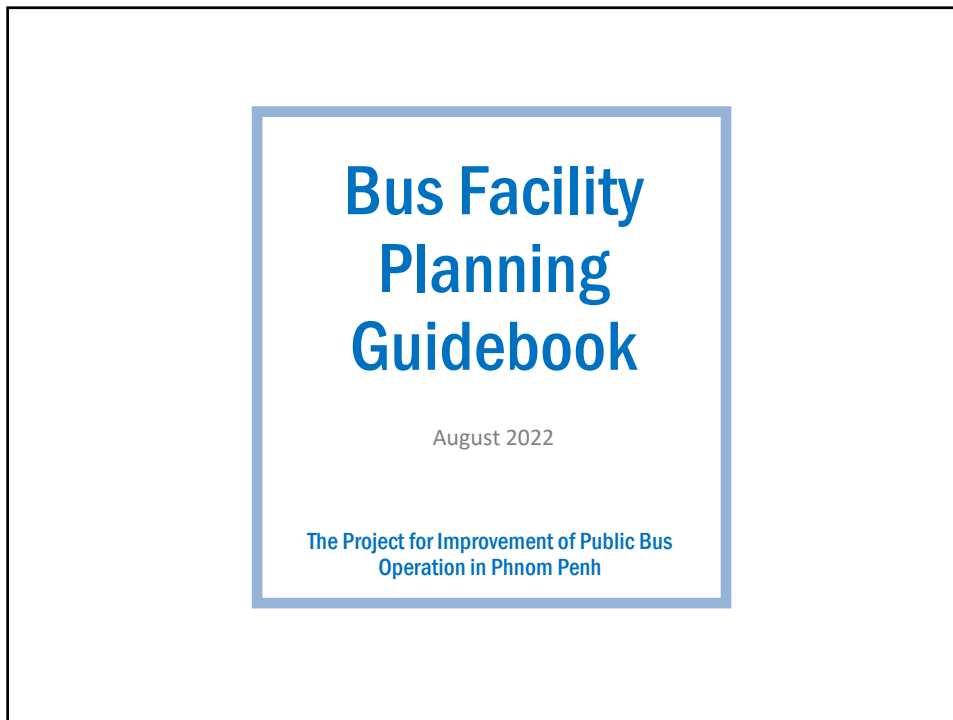
Activity	Potential Risks	Proposed Countermeasures
Traffic Signal Control	<ul style="list-style-type: none"> <li>• Reduce road capacity of crossing roads</li> </ul>	<ul style="list-style-type: none"> <li>• Setting maximum cycle and phase timing for bus priority</li> <li>• The signal control during only peak hours in weekdays</li> </ul>
Parking Management	<ul style="list-style-type: none"> <li>• Some residents and business owners on roadside buildings are affected by parking control</li> <li>• Some street vendors are affected</li> </ul>	<ul style="list-style-type: none"> <li>• Parking management during only the peak hours and direction in weekday</li> <li>• On street parking is approved partially where has no alternative space or/and in front of public facilities</li> <li>• Meetings with affected persons and obtaining an agreement from them</li> </ul>
Bus Priority Lane	<ul style="list-style-type: none"> <li>• Decrease travel speed of mixed traffic</li> <li>• Traffic accident by changing the traffic rules</li> </ul>	<ul style="list-style-type: none"> <li>• Bus priority lane during only the peak hours and in the peak direction</li> <li>• Sensitization campaign for road users by media, banner, leaflet and SNS</li> <li>• Cooperation and support of Traffic Police</li> </ul>

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### Aim of Bus Facility Planning Guidebook

Bus Facility Planning Guidebook was prepared as part of the deliverables of JICA-funded Project for Improvement of Public Bus Operation in Phnom Penh (JICA PiBO). The City Bus Authority (CBA) initially ran the limited bus service along three lines in 2016 and expanded the bus service to 13 lines by 2018 using the maximum of 235 bus fleets. In order to run the bus efficiently and achieve user-friendly service, CBA and JICA Experts are tasked to develop and improve the bus related facilities, including bus stops/shelters, bus terminals and bus depot/workshops.

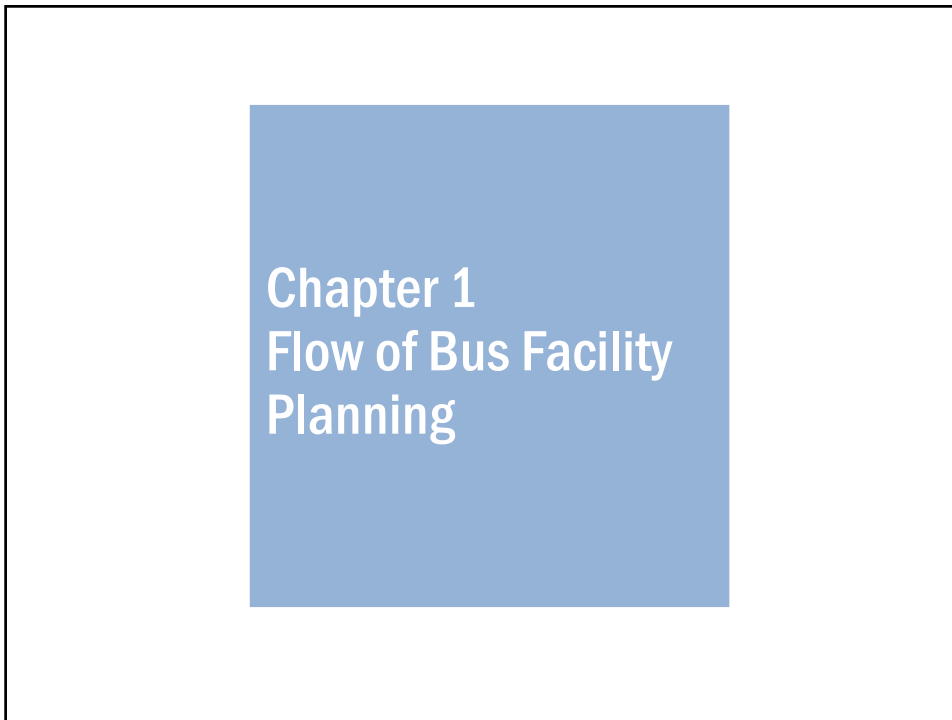
This Guidebook aims at providing a guidance to CBA management and technical staffs to plan and develop essential bus related facilities, including bus stops/shelters bus terminals/depot. The Guidebook also discusses the design of bus route map and bus wrapping design as a supplement material. The contents explored in this Guidebook have been discussed with CBA management in the course of JICA PiBO and some of the bus related facilities including bus stop design and bus depot were developed following the guidance proposed in the Guidebook.

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**Index**

<b>Chapter 1. Flow of Bus Facility Planning</b>	<b>Chapter 4 . Other Important Facilities</b>
<b>Chapter 2. Bus Stop Installation</b>	4.1 Bus Depot
2.1 Bus Stop Spacing	4.2 Bus Priority Lane
2.2 Bus Stop Location	<b>Chapter 5 Support for Bus Transfer</b>
2.3 Bus Stop Dimension	5.1 Basic Policy
2.4 Bus Stop Marking and Coloring	5.2 Issues Raised in the Past
<b>Chapter 3 . Bus Stop Facility</b>	5.3 Recommendation
3.1 Installation Criteria	<b>Chapter 6. Others</b>
3.2 Bus Stop Sign	6.1 Bus Line Number and Color
3.3 Bus Stop Shelter	6.2 Route Map Design
3.4 Motor-Bike/Bicycle Parking	6.3 Bus Wrapping Design

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## Chapter 1. Flow of Bus Facility Planning

### Introduction

Bus facilities explored in this guidebook include bus stop, bus depot/terminal, bus stop facilities/amenities installed at each bus stop, facilities between bus stops, and other important facilities required or recommended for better City Bus service.

The planning of bus facility starts when bus lines are determined or at the same time with the bus line planning. The determination of the spacing/location of bus stops is as important as the determination of bus lines. Bus depot does not directly influence the bus service but greatly affect the bus operation and management. When a bus priority lane is studied, planning of bus lines, bus stop location, bus stop facilities, etc. should be re-examined and revised upon necessity.

It should be emphasized that CBA should always monitor the conditions of bus facilities whether they are compliant with the proposed standards explored in the Guidebook and improve them where necessary.

The flow of bus facility planning in general is indicated in the next page.

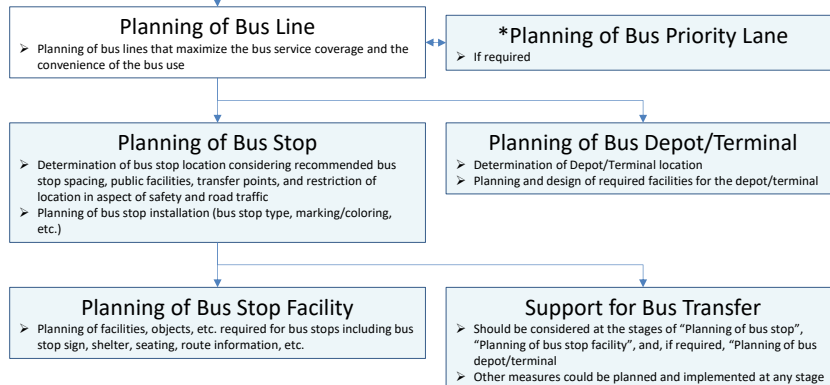
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## Chapter 1. Flow of Bus Facility Planning

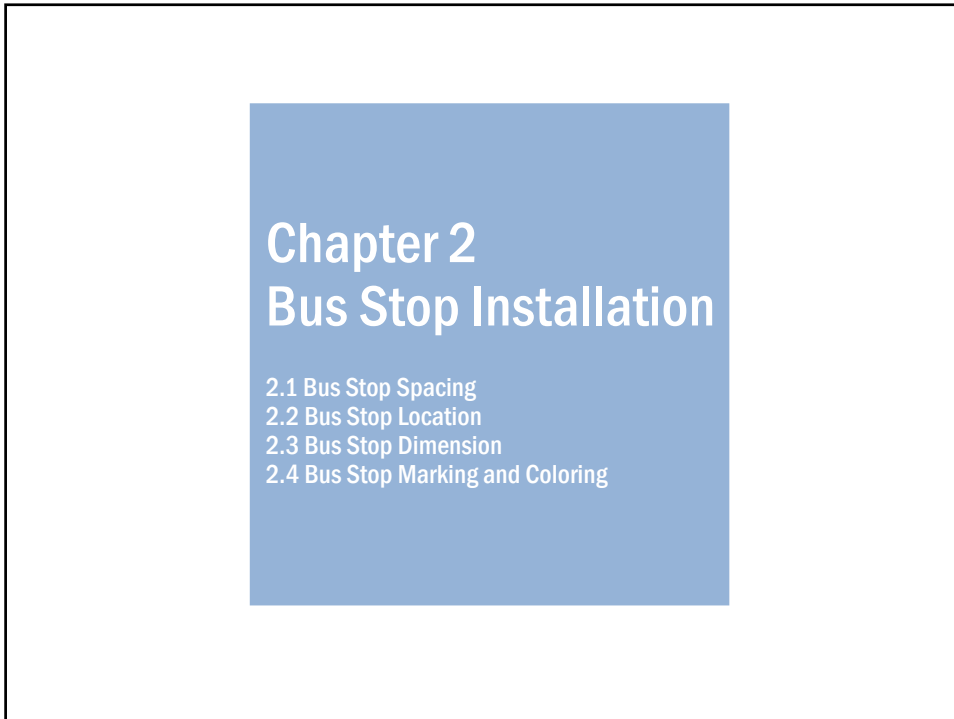
### Collection of Baseline Information for the Planning

- Social indicators (Population, density, etc.) and land use
- Road/traffic condition (road class, road width, sidewalk, traffic volume, etc.)
- Urban development condition including building features (area/building/floor size, building type, number of residents/workers/students, etc.)
- Public facilities (government offices, hospitals, schools, markets, parks, important transport facilities such as airport, ferry terminal, railway station, and long-haul bus terminal, etc.)

Items described in this Bus Facility Planning Guidebook



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## 2.1 Bus Stop Spacing

### Introduction

Shorter spacing of bus stops would reduce the walking distance to/from bus stops but increase the bus travel time due to frequent stops and, consequently, decrease the bus operation speed and the level of bus service. Shorter spacing would also increase the number of bus stops and the construction/maintenance cost.

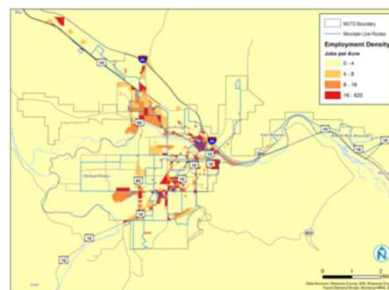
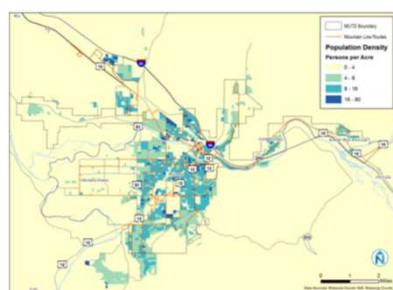
Recommended values of bus stop spacing are given in this guidebook. However, the spacing should be carefully studied when applied and determined so that it maximizes the bus user's convenience and the economy. Special consideration should be taken for the access to public facilities, such as hospital, market, etc.

It should be noted that during the course of PiBO, CBA tried to follow the bus spacing standards proposed by the Guidebook, however, due to resistance by the property owners, CBA faces difficulties to install the bus stops in an appropriate spacing manner. To address these local resistance, CBA hosted a number of dissemination workshops at all Khans.

## 2.1 Bus Stop Spacing

### Recommended standards

Density Classification	Recommended Spacing
High Density (over 40 pax/ha)	Approximately 250 m
Moderate Density (10~40 pax/ha)	250 ~ 500 m
Low Density (less 10 pax/ha)	As needed



Source: Montana, USA\_Bus Stop Master Plan, 2015 Aug

## 2.1 Bus Stop Spacing

### Special Consideration for Public Spaces/Facilities

Installation of bus stops at public spaces or facilities should be studied that generally generate more bus demand. Examples of those spaces and facilities are as follows:

- Government offices
- Important transport facilities, such as airport, ferry terminal, railway station, long-haul bus terminal, etc.
- Hospitals
- Schools
- Commercial facilities, such as markets, shopping centers, etc.
- Other attractions, such as famous sightseeing points/areas, parks, etc.

## 2.2 Bus Stop Location

- 2.2.1 Type of Bus Stop Location
- 2.2.2 Design Standard of Bus Stop Location

## 2.2.1 Type of Bus Stop Location

### Introduction

Bus stops are located near an intersection or at the midblock between intersections. Also, bus stops near an intersection are located at near-side (before crossing the intersection) or far-side (after crossing the intersection).



Each type of bus stop location has advantages and disadvantages. In general, the detailed bus stop location is determined by site condition or the opinion of residents. However, those characteristics of bus stop location should be examined wherever the bus stop is located, and countermeasures should be implemented.

## 2.2.1 Type of Bus Stop Location

### Bus Location Types and the Comparison (Advantages)

Far-side stop	Near-side stop	Midblock stop
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>▶ Minimizes conflicts with right-turning vehicles.</li> <li>▶ Minimizes sight line conflicts for drivers and pedestrians.</li> <li>▶ Encourages pedestrians to cross more safely behind the bus.</li> <li>▶ Stopping at the far-side of the intersection creates a shorter deceleration zone for the stop area because the intersection absorbs some of the space requirement.</li> <li>▶ The gap in traffic flow created by the signal allows the driver room to pull back into the travel lane.</li> <li>▶ Most effective stop location for Transit Signal Priority (TSP): preferential treatment for transit vehicles at traffic signals (typically extended green or shortened red phases).</li> </ul>	<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>▶ Minimizes traffic interference during peak traffic flow hours.</li> <li>▶ Passengers are able to board the bus closer to the crosswalk.</li> <li>▶ Bus can use the intersection for acceleration space.</li> <li>▶ Avoids double stopping for both signal and passenger movements.</li> <li>▶ The driver has the advantage of full view of intersection activity.</li> <li>▶ Can be coordinated with a far-side stop for a crossing route to allow passengers to transfer without crossing the street.</li> </ul>	<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>▶ Minimizes sight line obstructions for both driver and passengers.</li> <li>▶ Because the stop is located away from intersection activity, conflicts with intersection traffic are minimized.</li> <li>▶ A more spacious waiting area may be provided because the stop is located outside intersection sidewalk congestion.</li> <li>▶ Works well when a high volume of passengers board and alight, or the bus has an extended dwell time.</li> <li>▶ Greater passenger convenience at key midblock trip generators.</li> </ul>

Source: SEPTA Bus Stop Design Guidelines, Oct. 2012

## 2.2.1 Type of Bus Stop Location

### Bus Location Types and the Comparison (Disadvantages)

	Far-side stop	Near-side stop	Midblock stop
Disadvantages	<ul style="list-style-type: none"> <li>▶ If the bus is unable to fully pull through the intersection during peak hours, traffic conflicts may occur ("blocking the box").</li> <li>▶ A bus stopped near the intersection may block sight lines for pedestrians and vehicles crossing the intersection.</li> <li>▶ Can cause the bus to double stop (once for the light and once for passenger activity).</li> <li>▶ Rear-end incidents may be more frequent if distracted drivers do not realize the bus is stopping beyond the intersection.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Conflicts between the bus and right-turning vehicles may arise.</li> <li>▶ The bus can physically obscure general traffic sight lines for both intersection movements and signals.</li> <li>▶ Multiple buses queuing during peak hours may obstruct traffic.</li> <li>▶ Crossing pedestrian sight lines are obstructed.</li> <li>▶ May present a conflict between pedestrians crossing the intersection and passengers waiting to board the bus.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Can present safety concerns if a midblock crosswalk is not provided.</li> <li>▶ Requires more physical space for the bus to accelerate and decelerate.</li> <li>▶ Reduces space available for on-street parking because this stop type requires a longer bus zone.</li> </ul>

Source: SEPTA Bus Stop Design Guidelines, Oct. 2012

## 2.2.2 Design Standards of Bus Stop Location

### Introduction

Intersection is a complicated place where vehicular movements of various directions and even crossing pedestrians intersect. This is the reason why many traffic accidents occur at intersections and why intersections are bottlenecks of traffic congestion in general in urban areas. Therefore, bus stops at intersections should be installed a specific distance apart from the intersection.

Crosswalk is also a place where traffic accidents frequently occur. To prevent accidents from occurring between crossing pedestrian and vehicles due to insufficient sight distance caused by stopped bus at the bus stop, even between the bus and crossing pedestrian, bus stops should be installed a specific distance apart from the cross walk.

Bridge is one of the risky road sections where fatal accidents occur. To prevent accidents on the bridge caused by queue or shockwave formulated or generated from the bus stop at the downstream, bus stops at the downstream of a bridge should be installed a specific distance apart from the bridge.

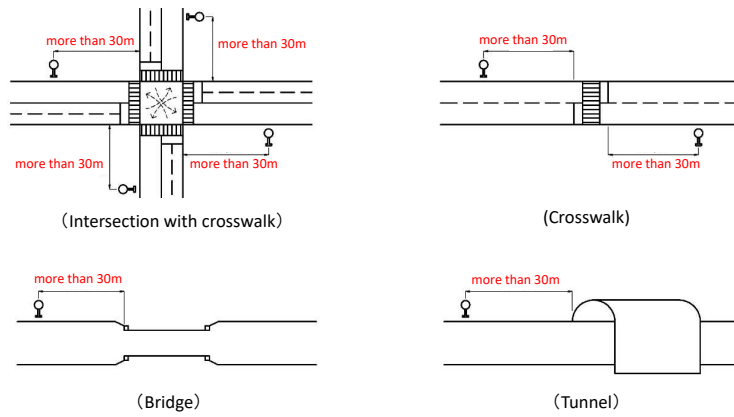
Due to the similar reason above, bus stops at the downstream of a tunnel should be installed a specific distance apart from the exit of tunnel. Some restrictions on the bus stop location are given in this section to increase the traffic safety and decrease the interruption to traffic flow.



### 2.2.2 Design Standard of Bus Stop Location

#### Bus stops near an intersection (with crosswalk), a crosswalk, a bridge, and a tunnel

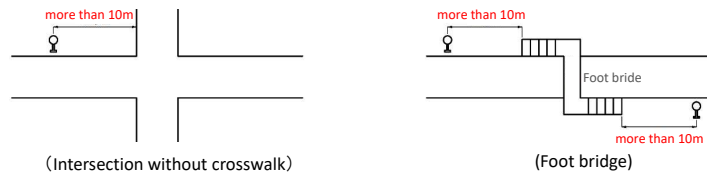
- Should be located more than **30 m away** from Intersection, Crosswalk, Bridge, Tunnel
- Recommended to be located at the downstream of a crosswalk for safety reason



### 2.2.2 Design Standard of Bus Stop Location

#### Bus stop near an intersection (without crosswalk) and a foot bridge

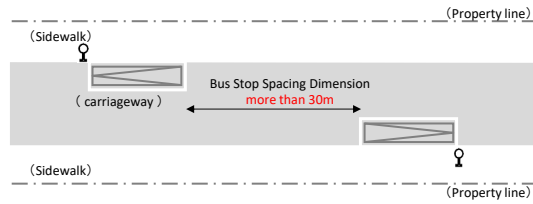
- Should be located more than **10 m away** from an intersection (without crosswalk) or a foot bridge



## 2.2.2 Design Standard of Bus Stop Location

### Bus stops of each direction

- Should be located more than **30 m away** from the other of the opposite direction **on a two-lane street or where required** to enable other vehicles to pass the stopped buses safely.



## 2.3 Bus Stop Dimension

- 2.3.1 On-Street Bus Stop
- 2.3.2 Off-Street Bus Stop (Bus Bay)

## 2.3 Bus Stop Dimension

### Introduction

Standard values of bus stop dimension are given in this section. However, the length of bus stop should be examined in accordance with the bus dimension, frequency of bus arrival, average duration of stopping at the bus stop, etc.

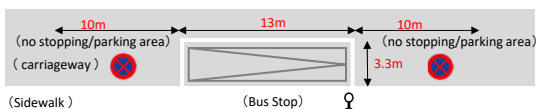
It should be noted that during the technical discussion with CBA, the standards proposed in this section were appreciated by CBA, and CBA emphasized the importance of engagement of DPWT as road administrator to implement bus bay and no parking restrictions.

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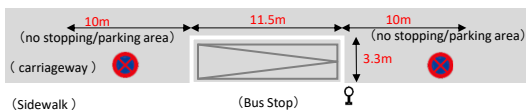
### 2.3.1 On-Street Bus Stop

#### Standards

- Large size bus (Vehicle length:12.0 m) **13.0 m × 3.3 m** (Including paved shoulder)



- Medium size bus (Vehicle length:10.5 m) **11.5 m × 3.3 m** (Including paved shoulder)



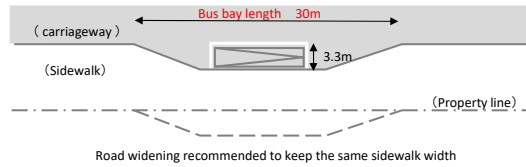
- ◆ No other vehicles including Tuktuk and motor-bike allowed for stopping/parking at the bus stop
- ◆ 10 m-section of each of the upstream and the downstream should be designated as No Stopping Area

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### 2.3.2 Off-Street Bus Stop (Bus Bay)

#### Standards

- Typical layout of Bus bay requires **30 m** bus bay length.



- ◆ No other vehicles including Tuktuk and motor-bike allowed for stopping/parking at the bus stop

## 2.4 Bus Stop Marking and Coloring

## 2.4 Bus Stop Marking and Coloring

### Introduction

The road surface marking of bus stop is to clearly indicate the area where the bus should stop for boarding and alighting. The color of marking should be easily perceptible to drivers. Illegal parking and stopping including those of Tuk-tuk are frequently observed. They make buses stop out of the bus stop or apart from the curb, which can cause serious traffic accidents.

It should be noted that during the course of PiBO, the bus stop markings have been installed together with replacement to new bus shelters and bus stops along Line 1 to Line 4.

## 2.4 Bus Stop Marking and Coloring

### Example:

- A rectangular box parallel to the curbside and words "BUS STOP" in **yellow**
- Carriageway color inside the rectangular box in **red**

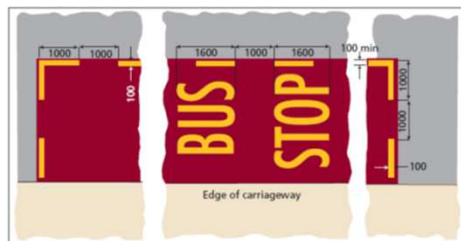


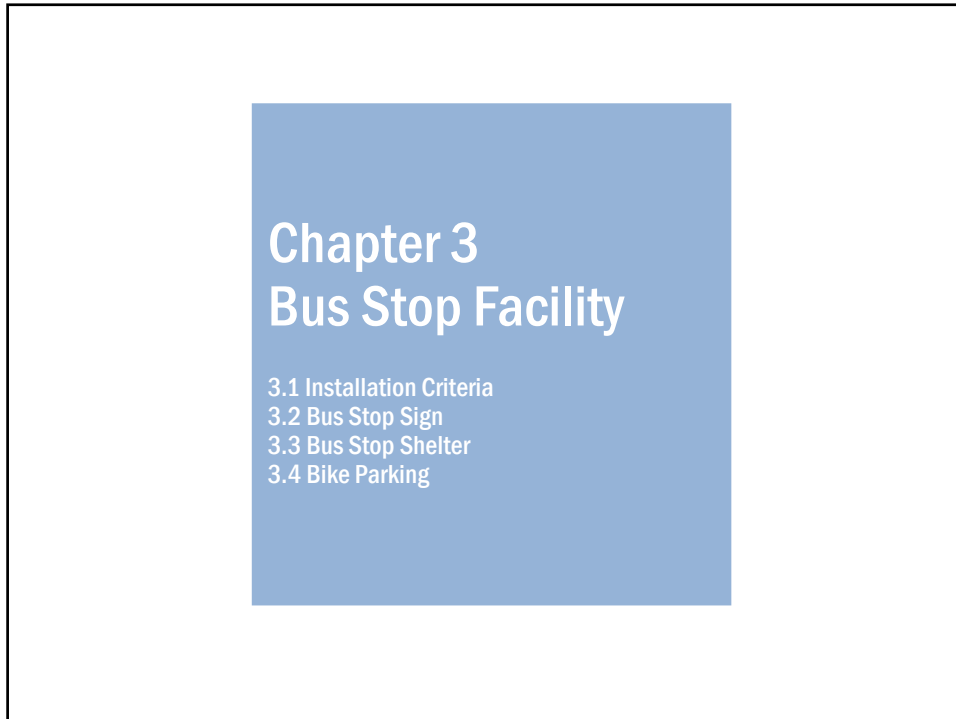
Diagram 8b – Bus bay carriageway markings

<sup>11</sup>Traffic Sign Regulations (Northern Ireland), 1997



Photo 8f – Typical NI carriageway markings

Source: Queensland Australia, Bus Stop Design Guide



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### 3.1 Installation Criteria

#### Introduction

This section describes bus stop facilities that are generally installed at bus stops.

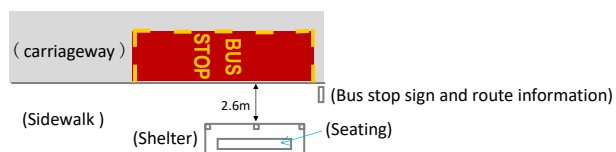
#### Installation criteria of bus stop amenities

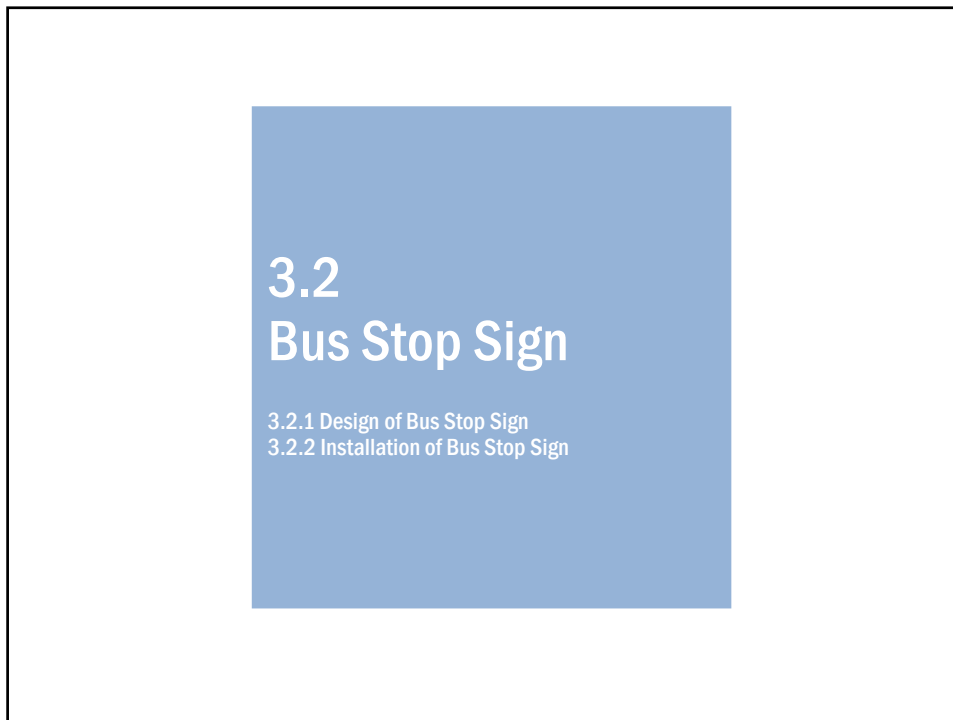
Amenity	Criteria
Bus stop sign	Installed at all bus stops
Bus stop shelter	Installed at bus stops meeting specific qualifying criteria (e.g., bus stops with 40 or more boarding passengers per day)
Seating	Installed at bus stops meeting specific qualifying criteria. (e.g., bus stops with 10 or more boarding passengers per day)
Route Information	Installed at all bus stops
Lighting	Basically, at all bus stops

### 3.1 Installation Criteria

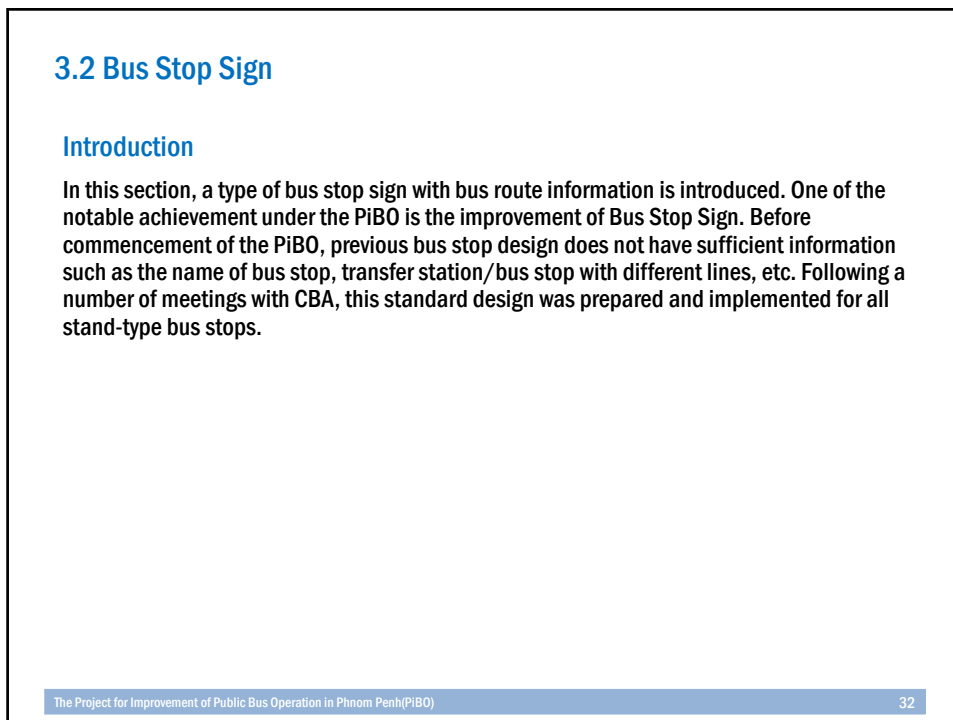
#### Bus Stop Amenities layout

- The sign should be placed at far end of the stop and indicate the stopping point of the bus.
- Amenities should be placed near the sign to minimize the distance to bus doors and reduce dwell time.





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### 3.2.1 Design of Bus Stop Sign

#### Design principle

- Should be easily understood by bus users
- Should be designed with the consistency of the usage of colors
- Information in two languages (Khmer and English) recommended

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### 3.2.1 Design of Bus Stop Sign

#### Example for Bus Stop with Multiple Bus Lines

Previous design	Bus stop with 1 line	Bus stop with 2 lines	Bus stop with 3 lines

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### 3.2.1 Design of Bus Stop Sign

#### Recommendation for the Front Side

- 1.The words “Bus Stop” & Bus pictogram
- 2.Location Number & Name
- 3.Route number & Street name
- 4.Destination
- 5.Route map [Simple version, Main stops]
- 6.Network map
- 7.Operating Info.
  - Time schedule
  - Fare
- 8.Call center number& Web site QR code
- 9.Transfer information
- 10.Advertisement / Others

**Bus Stop**  
No. 3  
មជ្ឈមណ្ឌលសុខភាពសម្ពុចឌី  
Samdach Ouh Health Center

1 [្រ] Monivong St.  
[្រ] Towards Beoung Chhouk

Route 1 Network Map

Transfer Operation info.

Advertisement or Others

Destination  
1 គីឡូម៉ែត្រលេខ 9  
Kilometer No.9  
មជ្ឈមណ្ឌលសុខភាពសម្ពុចឌី  
Samdach Ouh Health Center

present location

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66

ST.273 ត្រី ត្រី  
Old Stadium round about

ST.128 ត្រី ត្រី  
Central Market

ST.217 ត្រី ត្រី  
White Hotel

ST.214 ត្រី ត្រី  
Monivong/Road214

ST.245 ត្រី ត្រី  
Monivong/Mao Tse Tong

ត្រី ត្រី  
Chbar Ampov

xxx Beoung Chhouk  
Origin

[្រ] - Operation 5:30 AM - 8:30 PM  
Every 15 minutes\*  
\* It may be changed due to traffic conditions  
- Flat Fare: 1500 Riel  
- Fare Exemption: Monk, Old-age person, Handicaps, Garment factory worker\*, Student, Athlete and Child under one meter  
\*\* ឆ្នាំ 20១៤  
- Bus location -CBA Facebook  
- Call centre number:xxx-xxx-xxxx

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### 3.2.1 Design of Bus Stop Sign

#### Recommendation for the Rear Side

- 1.The words “Bus Stop” & Bus pictogram
- 2.Location Number & Name
- 3.Route number & Street name
- 4.Destination
- 5.Route map [detail version, all stops]

**Bus Stop**  
No. 3  
មជ្ឈមណ្ឌលសុខភាពសម្ពុចឌី  
Samdach Ouh Health Center

1 [្រ] Monivong St.  
[្រ] KM9 to Bong chuk

Destination  
1 គីឡូម៉ែត្រលេខ 9  
Kilometer No.9  
មជ្ឈមណ្ឌលសុខភាពសម្ពុចឌី  
Samdach Ouh Health Center

present location

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66

ST.273 ត្រី ត្រី  
Old Stadium round about

ST.128 ត្រី ត្រី  
Central Market

ST.217 ត្រី ត្រី  
White Hotel

ST.214 ត្រី ត្រី  
Monivong/Road214

ST.245 ត្រី ត្រី  
Monivong/Mao Tse Tong

ត្រី ត្រី  
Chbar Ampov

xxx Bong Chuk  
Origin

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### 3.2.1 Design of Bus Stop Sign

Examples of bus stops with no shelter but the bus stop sign:



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### 3.2.1 Design of Bus Stop Sign

Examples of bus stops with no shelter but the bus stop sign:

Sign without lighting

Sign with lighting  
(Commercial power)

Sign with lighting  
(Solar power)

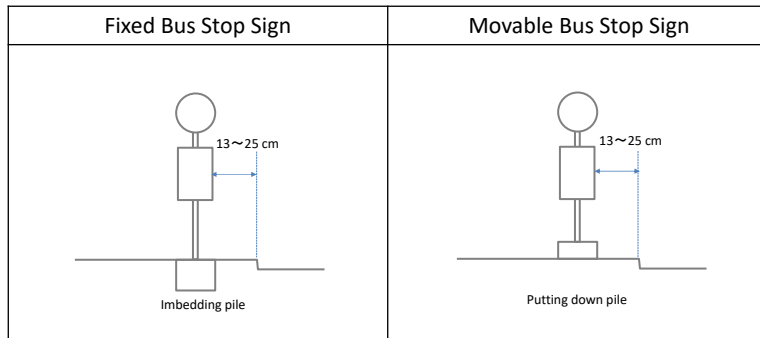


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### 3.2.2 Installation of Bus Stop Sign

#### Installation principle

- Should be installed typically 13~25 cm apart from the curb.
- Should be fixed on the ground basically using foundation, but movable type might be usable for temporary installation or other reasons.



## 3.3 Bus Stop Shelter

### 3.3 Bus Stop Shelter

#### Introduction

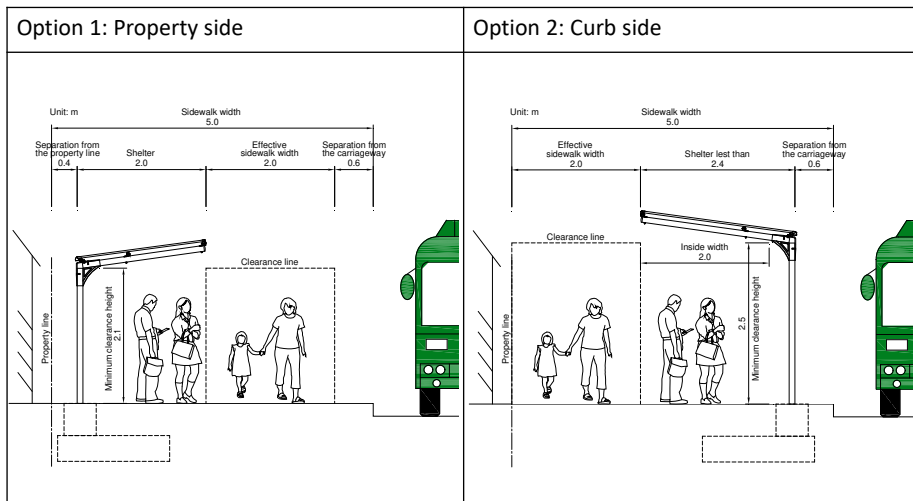
Bus stop shelters can be installed at the curbside (facing carriageway) or the property-side. However, curbside shelter has various advantages that bus users are not disturbed by other pedestrians and can easily recognize approaching buses and that bus drivers can easily recognize the bus users waiting for buses. Wherever the shelter is located, it should be close to the bus stop, and the effective sidewalk width that might be reduced by installing the shelter should be 2.0 m or greater.

It should be noted that at the initial stage of the PiBO, PPCA/CBA and advertisement company has signed a contract without proper bus shelter design and business model for the promotion of advertisement at the bus shelter. Accordingly, the current bus shelters are not user friendly and less security without any proper lighting and hence underutilized for advertisement business. The bus shelter design should be examined and improved to attract the passengers and promote the advertisement business.

Examples of bus stop shelters abroad are presented.

### 3.3 Bus Stop Shelter

#### Standard for shelter bus stop



### 3.3 Bus Stop Shelter

Examples:



Cambodia



Japan

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### 3.3 Bus Stop Shelter

Examples:

Europe and America



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# 3.4 Motor-Bike/Bicycle Parking

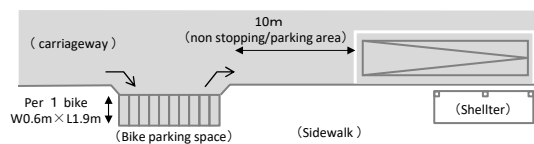
45

## 3.4 Motor-Bike/Bicycle Parking

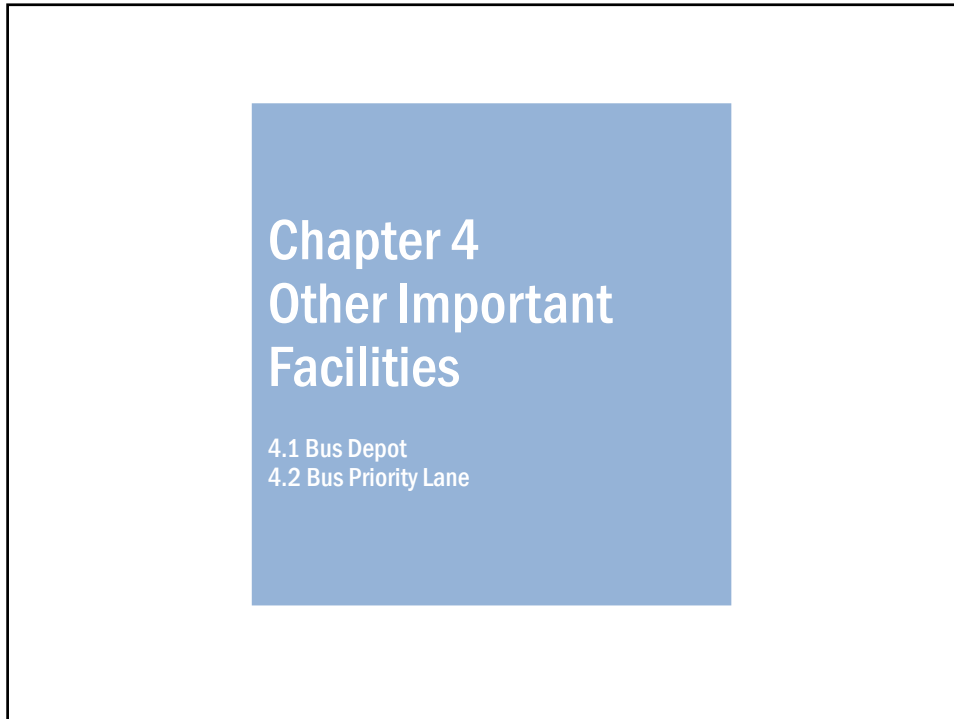
### Introduction

Motor-bike/bicycle parking at the bus stop is a good solution for promoting the bus use, which provides last-one-mile transport. However, in aspect of traffic safety, it is recommended to install the parking facility (or the entrance/exit) separated from the bus stop

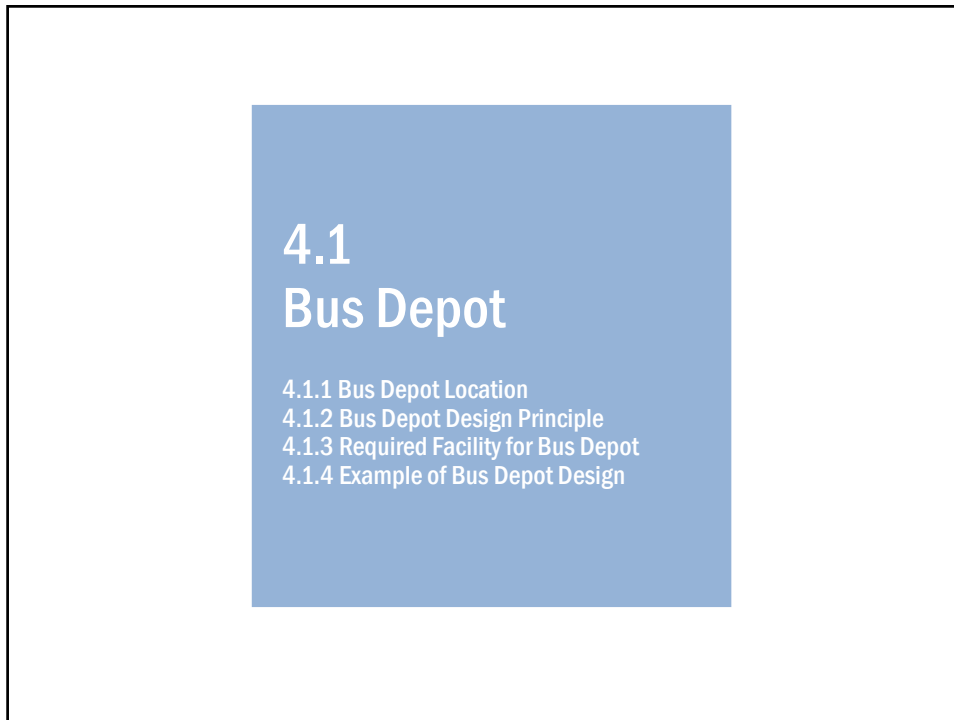
### Design standards



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## 4.1 Bus Depot

### Introduction

Bus depot is one of essential facilities for bus operation, maintenance, and management. Bus depot should be located where a sufficient space can be obtained. In many cases, that results in the location at suburban areas, but it should also be noted that the long travel distance of out-of-service could increase unnecessary drive and fuel consumption. Bus depot should be recognized as an important urban transport facility, and the security issues should be emphasized.

One of notable achievement of PiBO is the design and construction of the existing bus depot realized through a number of discussions among PPCA, CBA and PiBO experts.

### 4.1.1 Bus Depot Location

#### Principle:

- Recommended along the bus route or within 3 km from a terminal (origin or destination) of the bus line
- Accessible by arterial road from the bus route
- Large enough to accommodate all required buses and facilities
  - Approximately 230 m<sup>2</sup> per one bus required including office building, maintenance building, fuel station, bus-wash, and all other facilities for the bus operation and management (40% of the depot area assumed as the area for those except the bus parking)
  - Small depots accommodating a few buses might not require all those facilities above

### 4.1.2 Bus Depot Design Principle

#### Design Principle

- The layout of the depot should enable the efficient bus operation and maintenance and be designed considering the typical flow of bus operation in the depot: refueling, bus washing, maintenance, and parking.
- The dimension and shape of the depot should be examined and determined considering required facilities and the dimension of each facility.
- Bus passages in the depot should have sufficient width, especially at the corners, and be designed considering the safety and the trajectory of the design vehicle.
- Design vehicle should be determined with the largest vehicle that is considered to drive in the depot.

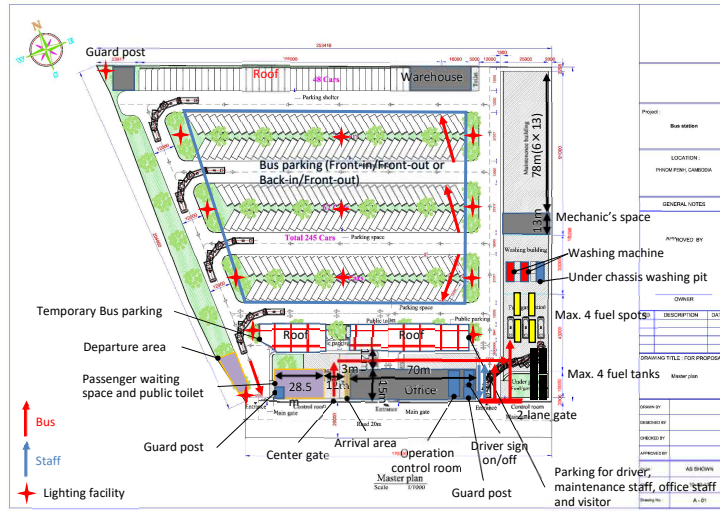
### 4.1.3 Required Facility for Bus Depot

#### Required Facility

- Office building (including bus operation center, security center, server room, etc.), driver and mechanic's room/building, underground fuel tank, water tank, fuel station, bus washing machine maintenance building (workshop), warehouse, outside toilet, guard post, bus parking, ordinary vehicle/motor-bike parking, canteen, lighting, CCTV, etc.
- Facilities for passengers should be also designed, if necessary.
- Number of berths in the maintenance workshop should be carefully examined and determined.
- Water tanks for bus washing machines required.
- Facilities for anti-crime, such as guard post, lighting, required.
- The passages in the depot should be paved with asphalt/cement concrete, and the drainage system for not only the sewage from the office building, toilet, bus washing, maintenance building, etc. but also the depot surface drainage should be facilitated.
- Physical structure for dividing parking and maintenance areas recommended to easily identify buses requiring maintenance
  - E.g., traffic island, barrier, planting strip, etc.
- Emergency power supply for the operation room and other mechanical devices

### 4.1.4 Example of Bus Depot Design

#### Example of Bus Depot Layout



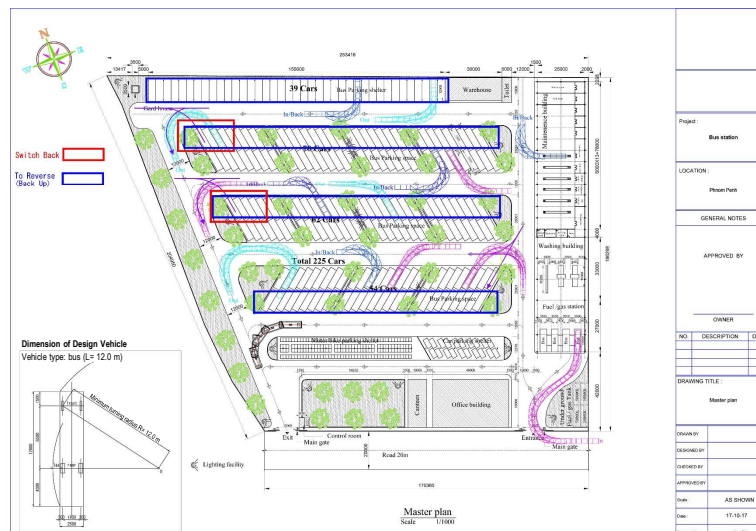
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### 4.1.4 Example of Bus Depot Design

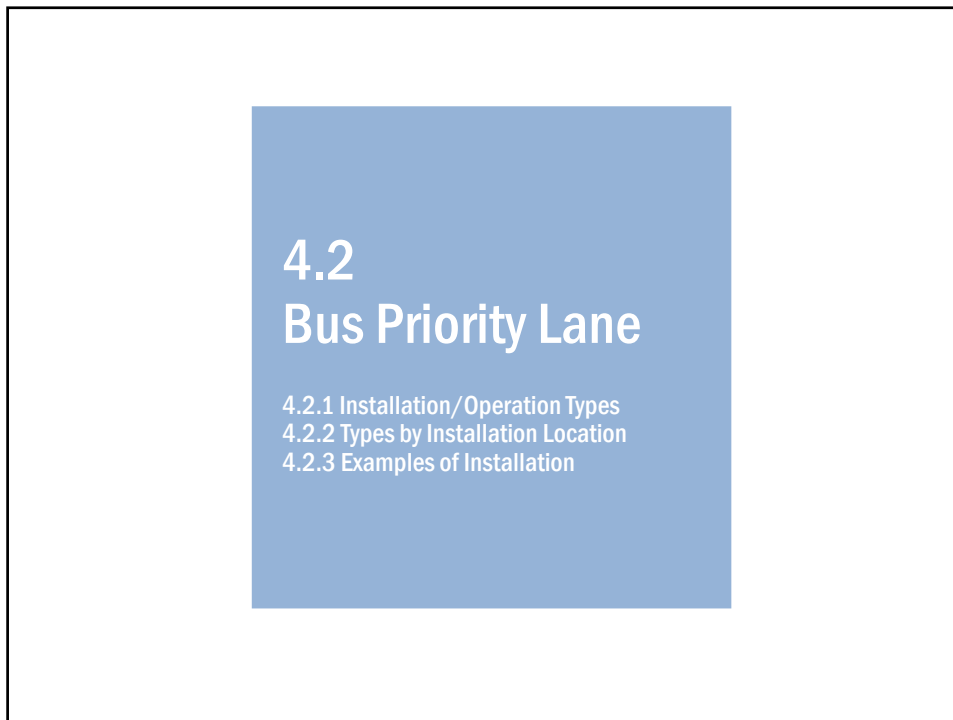
#### Example of Vehicle Trajectory Check



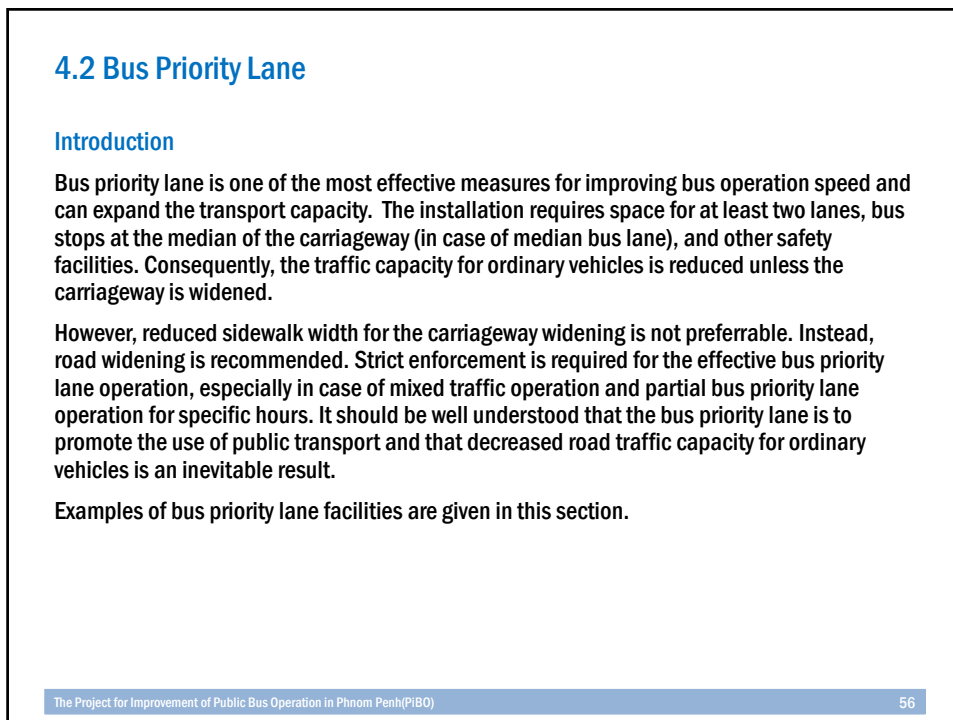
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### 4.2.1 Installation/Operation Types

#### Types by installation location

- Median bus priority lane
- Curbside bus priority lane
- Others

#### Types by allowed vehicles

- Bus only (exclusive bus lane) \*Emergency vehicles allowed
- Mixed traffic: e.g., bus + motorbike, bus + left-turn vehicle, etc.

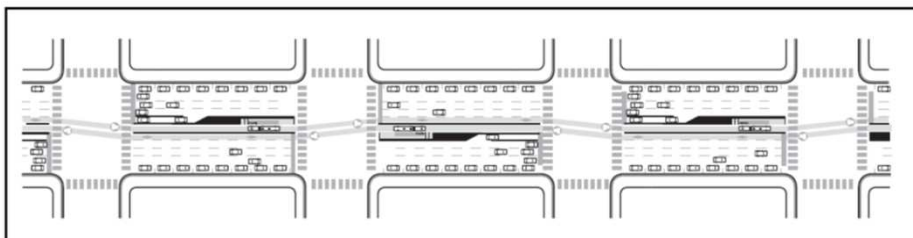
#### Types by operation time

- 24-hour operation
- During the bus operation time
- During the peak hours

### 4.2.2 Types by Installation Location

#### Median Bus Priority Lane

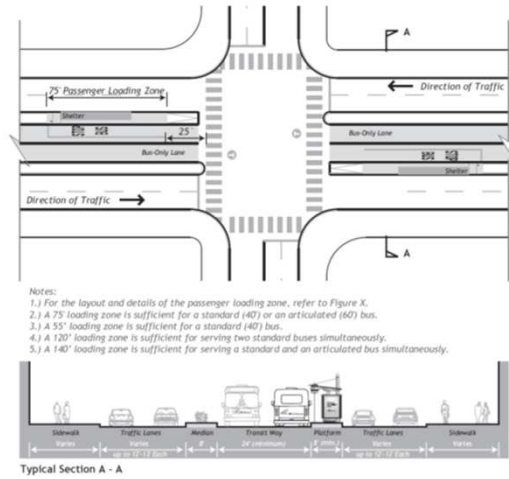
- Bus Priority Lane



### 4.2.2 Types by Installation Location

#### Median Bus Priority Lane

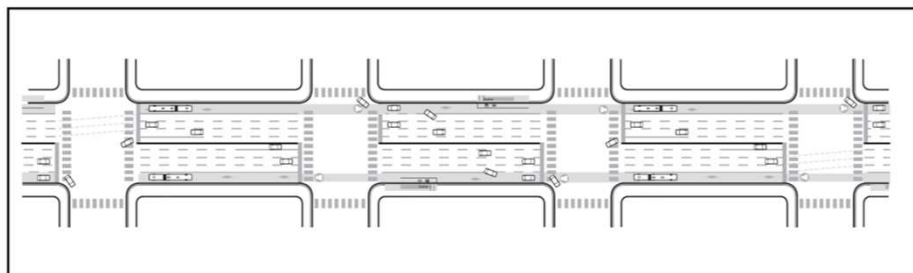
- Bus Stop



### 4.2.2 Types by Installation Location

#### Curbside Bus Priority Lane

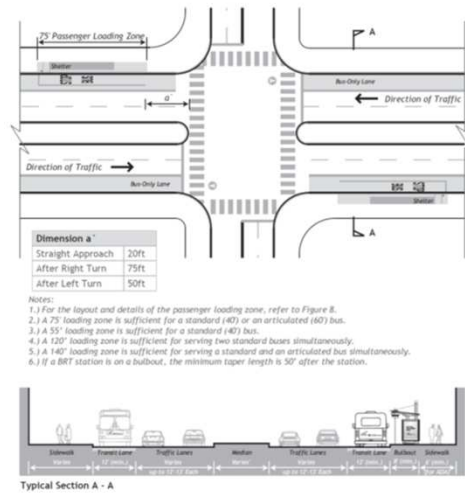
- Bus Priority Lane



## 4.2.2 Types by Installation Location

### Curbside Bus Priority Lane

- Bus Stop

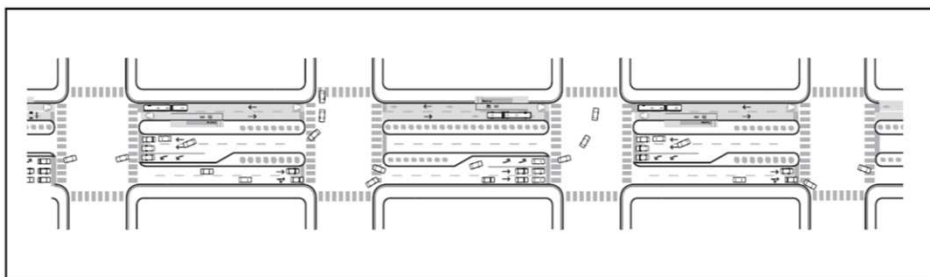


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## 4.2.2 Types by Installation Location

### Both directions of bus priority lane at either side of road

- Bus Priority Lane

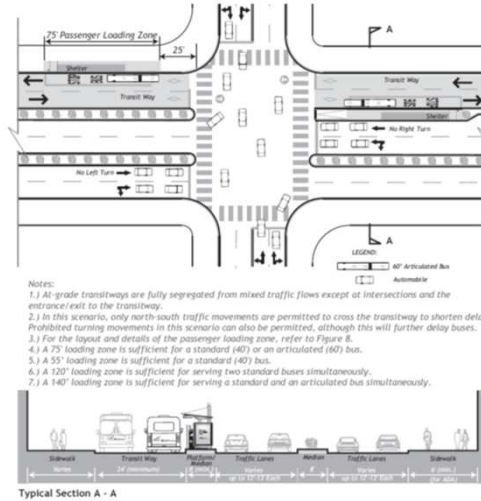


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### 4.2.2 Types by Installation Location

#### Both directions of bus priority lane at either side of road

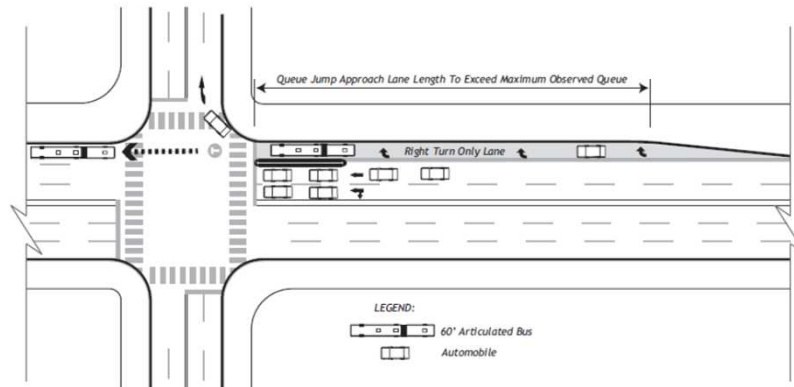
- Bus Stop



### 4.2.2 Types by Installation Location

#### Queue Jump Lane

- Right-turn Only Lane as Queue Jump Lane with Bus Exemption

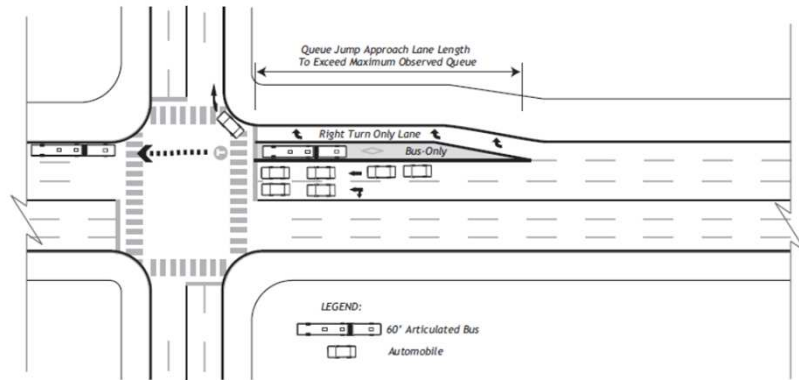




## 4.2.2 Types by Installation Location

### Queue Jump Lane

- Queue Jump Lane Adjacent to Right-Turn Only Lane



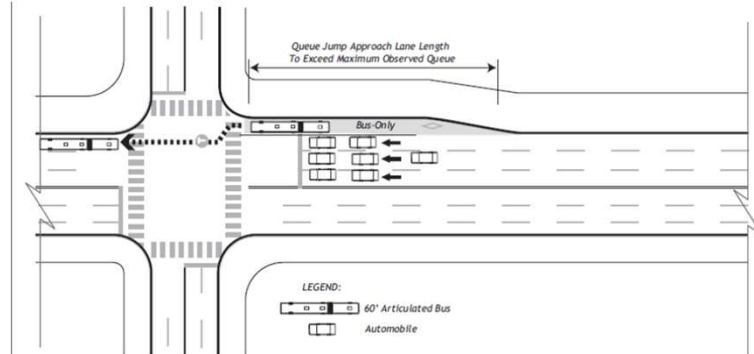
**Notes:**

- 1.) The length of the queue jump approach shall exceed the maximum observed queue length in the adjacent mixed traffic lanes.
- 2.) Only buses are allowed in the queue jump lane.
- 3.) Effectiveness will be improved if the queue jump lane is integrated with transit signal priority.

## 4.2.2 Types by Installation Location

### Queue Jump Lane

- Queue Jump Lane with Advanced Stop Bar



**Notes:**

- 1.) Right-turn movements are prohibited in this scenario.
- 2.) This type of queue jump lane may also be employed with a curbside bus-only lane.
- 3.) Effectiveness will be improved if the queue jump lane is integrated with transit signal priority.

### 4.2.3 Examples of Installation

#### Examples of median bus stop



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### 4.2.3 Examples of Installation

#### Examples of traffic sign for Bus Priority Lane



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### 4.2.3 Examples of Installation

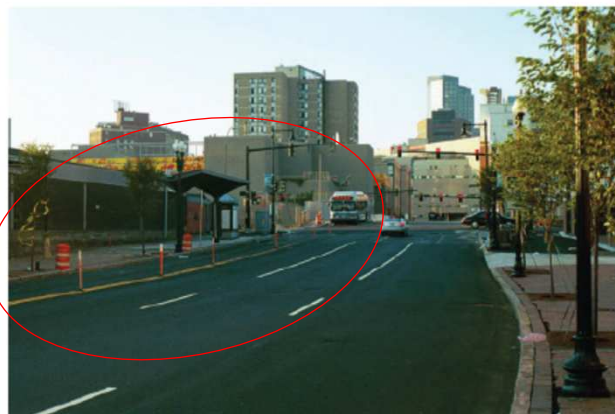
#### Examples of road surface marking

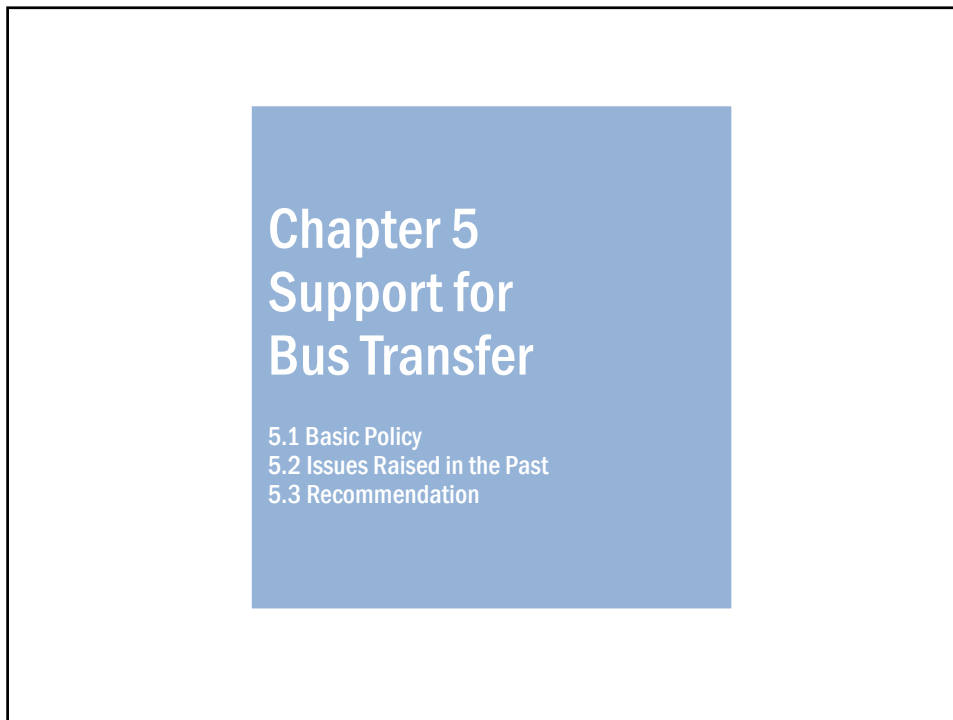


Note: In the United Kingdom, vehicles drive on the left side of the street.

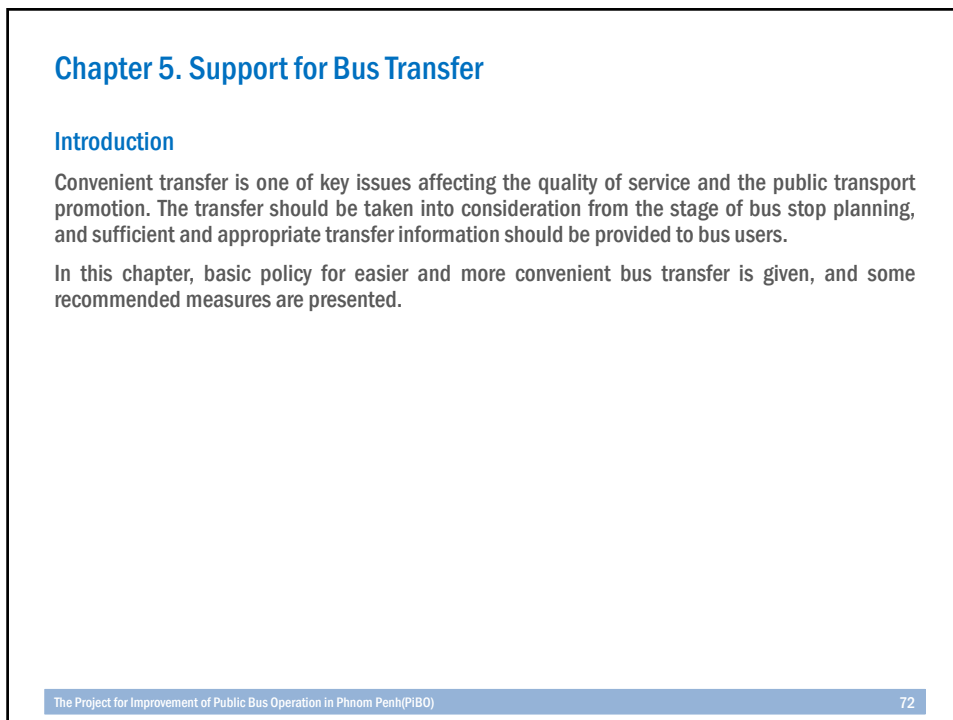
### 4.2.3 Examples of Installation

#### Examples of objects for the separation from ordinary traffic lanes





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## 5.1 Basic Policy

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### 5.1 Basic Policy

#### Basic Policy for Easier and More Convenient Bus Transfer

- In principle, bus stops should be installed at the intersection point of two or more bus lines.
- Easy accessibility between those bus stops should be considered, including providing sidewalk and others.
- The transfer distance should be as short as possible.
- Safety during the transfer should be considered.
- Sufficient transfer information should be provided to bus users
- Bus stop should be found easily

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# 5.2 Issues Raised in the Past

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## 5.2 Issues Raised in the Past

### Issues about transfer raised in Phnom Penh in the past

**Issues at SANTHOR MUK PRIMARY SCHOOL:**

- Bus stops far from each other
- Difficulty to recognize signs
- Heavy traffic
- Only partial shelter facilities

**Issues at OLD STADIUM ROUNDABOUT:**

- Bus stops far from each other
- Heavy traffic
- Difficulty to recognize signs
- Bus stops are spatially dispersed

**Issues at CENTRAL MARKET:**

- No shelter facilities
- Difficulty to identify bus stops

**Issues at MONIVONG-SIHANOUK:**

- Bus stops far from each other
- Possibility of alternative transfer points
- Difficulty to recognize signs

▶ **Extracted issues at transfer points:**

- Issue 1: Difficulty to identify the transferring bus stops
- Issue 2: Difficulty for access (heavy traffic, no pedestrian sidewalk)
- Issue 3: Spatial distance between bus stops
- Issue 4: Lack of shelter facilities
- Issue 5: Need for review of alternative transfer points

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## 5.2 Issues Raised in the Past

### Issue 1 about transfer raised in Phnom Penh in the past

- Difficulty to identify the transferring bus stops



- There are no guide at bus stops despite spatial dispersion (Central Market)
- Bus stop sign difficult to identify from other side (Old Stadium Roundabout)



- Some bus stops do not have bus stop signs (Old Stadium Roundabout)
- Bus stop signs do not have distinctive feature (Central Market)

## 5.2 Issues Raised in the Past

### Issue 2 about transfer raised in Phnom Penh in the past

- Difficulty for access (heavy traffic, no pedestrian sidewalk)

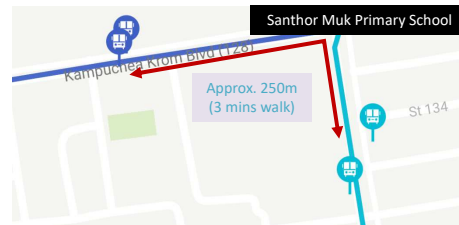
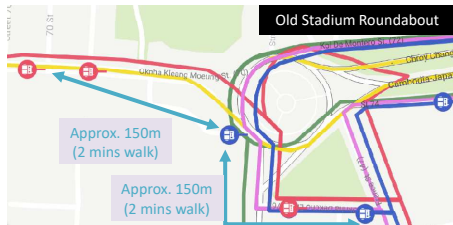


- Heavy traffic road on the way of transfer (Old Stadium Roundabout)
- No pedestrian sidewalks (Old Stadium Roundabout, Line3-5 crossing point)

## 5.2 Issues Raised in the Past

### Issue 3 about transfer raised in Phnom Penh in the past

- Spatial distance between bus stops

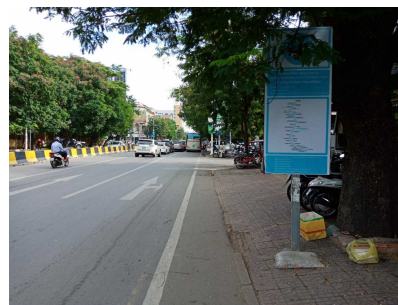


- There is significant distance between some of the bus stops (Old Stadium Roundabout)
- There is significant distance between some of the bus stops (Santhor Muk Primary School)

## 5.2 Issues Raised in the Past

### Issue 4 about transfer raised in Phnom Penh in the past

- Lack of shelter facilities



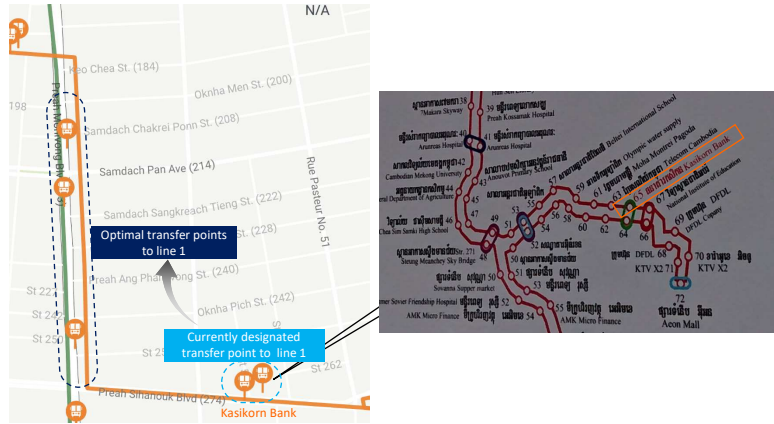
- It is preferable to have shelters for people who is waiting for transfer buses
- However, there are some bus stops with “natural” shelters



## 5.2 Issues Raised in the Past

### Issue 5 about transfer raised in Phnom Penh in the past

- Need for review of alternative transfer points



- There is a need to review some of the currently designated transfer points

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## 5.3 Recommendation

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## 5.3 Recommendation

### Recommended measures

- **Short term:**
  - Transfer information provision to bus users
    - At the bus stops where the transfer is available: bus transfer guide map
    - On the bus: announcement by driver/conductor before arrival using onboard audio device
- **Middle term:**
  - Relocation of bus stops
  - Installation of the bus shelter
  - Installation or improvement of sidewalk between bus stops
- **Long term:**
  - Construction of transfer center where the transfer to multiple bus lines are available (Olympic stadium, Old stadium RA)
  - Construction of pedestrian bridge or underpass where both pedestrian safety and traffic congestion are concerned

## 5.3 Recommendation

### Examples of recommendation

- **Announcement by driver/conductor**

The next is Central Market.  
Transfers are available to Line 3  
Kampuchea Krom Blvd. and Line 4  
Charles de Gaulle Blvd.



### 5.3 Recommendation

#### Examples of recommendation

- Improvement of existing sidewalk with shade



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### 5.3 Recommendation

#### Examples of recommendation

- Construction of pedestrian bridge/underpass



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## 5.3 Recommendation

### Examples of recommendations

- Transfer center (station)

Portland, USA



Singapore



Leeds, UK



Torino, Italy



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# Chapter 6 Others

- 6.1 Bus Line Number and Color
- 6.2 Route Map Design
- 6.3 Bus Wrapping Design

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## Chapter 6. Others

### Introduction

This chapter presents bus line numbering/coloring, route map design, and bus wrapping design. These issues do not have the best solution, and the evaluation could be totally different depending on evaluators. The key point of bus line numbering and coloring is how easily the bus line can be imagined from the number and the color. Each bus line should have its own color, and the same color should be used for the design of all kinds of facilities and materials expressing the bus line.

It should be noted that all the bus lines and their representative colors, bus mapping, bus exterior design have been discussed among CBA and PiBO experts and all been realized through the course of PiBO.

## 6.1 Bus Line Number and Color

6.1.1 Numbering and Coloring Principle  
6.1.2 Bus Line Color

### 6.1.1 Numbering and Coloring Principle

#### Proposed numbering principle for City Bus

- Numbering that enables clear identification of trunk and feeder lines
  - E.g., single-digit numbers for trunk lines, double-digit numbers for feeder lines , Line 0 for circulation line, etc.
- Grouping of similar lines that have the same origin
  - E.g., City Bus Lines 4A, 4B, and 4C

#### Proposed coloring principle for City Bus

- Coloring that enables clear identification of trunk and feeder lines and easy distinction of each line

### 6.1.2 Bus Line Color

#### Reference for line colors

- Recommended color select package for color universal design
  - By Tokyo University, JPMA, DIC, Institute of color universal design

**Accent Color**

赤	G08-50V	0.75, 95.0
黄	G27-45V	0.0, 100.0
緑	G47-40T	75.0, 65.0
青	G77-40V	100.45, 0.0
空色	G69-70P	55.0, 0.0
ピンク	G02-70T	0.55, 35.0
オレンジ	G15-45X	0.45, 100.0
紫	G89-40T	30.95, 0.0
茶色	G09-30L	55.90, 100.0

**Base Color**

















明るいピンク	G05-80L	0.25, 15.0
クリーム	G25-90H	0.0, 40.0
明るい黄緑	G32-80P	25.0, 80.0
明るい青	G69-80H	30.0, 0.0
ページオ	G19-75L	0.25, 45.0
明るい緑	G42-70H	45.0, 45.0
明るい紫	G82-70H	25.30, 0.0

Source : Color universal design book

### 6.1.2 Bus Line Color

#### Proposed line colors for City Bus

- Accent colors for trunk lines
- Base colors for feeder lines

Trunk line: Accent color	Feeder line: Base color
1ABC: 	20AB: 
2AB: 	21 : 
3: 	(22): 
4AB: 	(23): 
5AB: 	(24): 
(6): 	(25): 
7AB: 	(26): 
(8): 	
(9): 	

## 6.2 Route Map Design

- 6.2.1 Route Map Design principle
- 6.2.2 Route Map for Phnom Penh City Bus

### 6.2.1 Route Map Design Guideline

#### Design principle

- Should be easily and intuitively understood and not misunderstood by bus users
- Recommended to include detailed information but should be as simple as possible
  - Balance of Simplicity and volume of information is important.
- Specific color designated for each bus line should be applied to not only the route map but also the bus stop sign and other bus information for the consistency and better understanding of bus users
- Information in two languages (Khmer and English) and more recommended

### 6.2.2 Route Map for Phnom Penh City Bus

#### Khmer version, route map





## 6.2.2 Route Map for Phnom Penh City Bus

### Khmer version, bus stop list

**Phnom Penh City Bus Route Map**

Line 1A	Line 1B	Line 2	Line 3	Line 4A	Line 4B	Line 4C	Line 5
<ul style="list-style-type: none"> <li>១. បឹងកេងកង</li> <li>២. បឹងកេងកង</li> <li>៣. បឹងកេងកង</li> <li>៤. បឹងកេងកង</li> <li>៥. បឹងកេងកង</li> <li>៦. បឹងកេងកង</li> <li>៧. បឹងកេងកង</li> <li>៨. បឹងកេងកង</li> <li>៩. បឹងកេងកង</li> <li>១០. បឹងកេងកង</li> <li>១១. បឹងកេងកង</li> <li>១២. បឹងកេងកង</li> <li>១៣. បឹងកេងកង</li> <li>១៤. បឹងកេងកង</li> <li>១៥. បឹងកេងកង</li> <li>១៦. បឹងកេងកង</li> <li>១៧. បឹងកេងកង</li> <li>១៨. បឹងកេងកង</li> <li>១៩. បឹងកេងកង</li> <li>២០. បឹងកេងកង</li> </ul>	<ul style="list-style-type: none"> <li>១. បឹងកេងកង</li> <li>២. បឹងកេងកង</li> <li>៣. បឹងកេងកង</li> <li>៤. បឹងកេងកង</li> <li>៥. បឹងកេងកង</li> <li>៦. បឹងកេងកង</li> <li>៧. បឹងកេងកង</li> <li>៨. បឹងកេងកង</li> <li>៩. បឹងកេងកង</li> <li>១០. បឹងកេងកង</li> <li>១១. បឹងកេងកង</li> <li>១២. បឹងកេងកង</li> <li>១៣. បឹងកេងកង</li> <li>១៤. បឹងកេងកង</li> <li>១៥. បឹងកេងកង</li> <li>១៦. បឹងកេងកង</li> <li>១៧. បឹងកេងកង</li> <li>១៨. បឹងកេងកង</li> <li>១៩. បឹងកេងកង</li> <li>២០. បឹងកេងកង</li> </ul>	<ul style="list-style-type: none"> <li>១. បឹងកេងកង</li> <li>២. បឹងកេងកង</li> <li>៣. បឹងកេងកង</li> <li>៤. បឹងកេងកង</li> <li>៥. បឹងកេងកង</li> <li>៦. បឹងកេងកង</li> <li>៧. បឹងកេងកង</li> <li>៨. បឹងកេងកង</li> <li>៩. បឹងកេងកង</li> <li>១០. បឹងកេងកង</li> <li>១១. បឹងកេងកង</li> <li>១២. បឹងកេងកង</li> <li>១៣. បឹងកេងកង</li> <li>១៤. បឹងកេងកង</li> <li>១៥. បឹងកេងកង</li> <li>១៦. បឹងកេងកង</li> <li>១៧. បឹងកេងកង</li> <li>១៨. បឹងកេងកង</li> <li>១៩. បឹងកេងកង</li> <li>២០. បឹងកេងកង</li> </ul>	<ul style="list-style-type: none"> <li>១. បឹងកេងកង</li> <li>២. បឹងកេងកង</li> <li>៣. បឹងកេងកង</li> <li>៤. បឹងកេងកង</li> <li>៥. បឹងកេងកង</li> <li>៦. បឹងកេងកង</li> <li>៧. បឹងកេងកង</li> <li>៨. បឹងកេងកង</li> <li>៩. បឹងកេងកង</li> <li>១០. បឹងកេងកង</li> <li>១១. បឹងកេងកង</li> <li>១២. បឹងកេងកង</li> <li>១៣. បឹងកេងកង</li> <li>១៤. បឹងកេងកង</li> <li>១៥. បឹងកេងកង</li> <li>១៦. បឹងកេងកង</li> <li>១៧. បឹងកេងកង</li> <li>១៨. បឹងកេងកង</li> <li>១៩. បឹងកេងកង</li> <li>២០. បឹងកេងកង</li> </ul>	<ul style="list-style-type: none"> <li>១. បឹងកេងកង</li> <li>២. បឹងកេងកង</li> <li>៣. បឹងកេងកង</li> <li>៤. បឹងកេងកង</li> <li>៥. បឹងកេងកង</li> <li>៦. បឹងកេងកង</li> <li>៧. បឹងកេងកង</li> <li>៨. បឹងកេងកង</li> <li>៩. បឹងកេងកង</li> <li>១០. បឹងកេងកង</li> <li>១១. បឹងកេងកង</li> <li>១២. បឹងកេងកង</li> <li>១៣. បឹងកេងកង</li> <li>១៤. បឹងកេងកង</li> <li>១៥. បឹងកេងកង</li> <li>១៦. បឹងកេងកង</li> <li>១៧. បឹងកេងកង</li> <li>១៨. បឹងកេងកង</li> <li>១៩. បឹងកេងកង</li> <li>២០. បឹងកេងកង</li> </ul>	<ul style="list-style-type: none"> <li>១. បឹងកេងកង</li> <li>២. បឹងកេងកង</li> <li>៣. បឹងកេងកង</li> <li>៤. បឹងកេងកង</li> <li>៥. បឹងកេងកង</li> <li>៦. បឹងកេងកង</li> <li>៧. បឹងកេងកង</li> <li>៨. បឹងកេងកង</li> <li>៩. បឹងកេងកង</li> <li>១០. បឹងកេងកង</li> <li>១១. បឹងកេងកង</li> <li>១២. បឹងកេងកង</li> <li>១៣. បឹងកេងកង</li> <li>១៤. បឹងកេងកង</li> <li>១៥. បឹងកេងកង</li> <li>១៦. បឹងកេងកង</li> <li>១៧. បឹងកេងកង</li> <li>១៨. បឹងកេងកង</li> <li>១៩. បឹងកេងកង</li> <li>២០. បឹងកេងកង</li> </ul>	<ul style="list-style-type: none"> <li>១. បឹងកេងកង</li> <li>២. បឹងកេងកង</li> <li>៣. បឹងកេងកង</li> <li>៤. បឹងកេងកង</li> <li>៥. បឹងកេងកង</li> <li>៦. បឹងកេងកង</li> <li>៧. បឹងកេងកង</li> <li>៨. បឹងកេងកង</li> <li>៩. បឹងកេងកង</li> <li>១០. បឹងកេងកង</li> <li>១១. បឹងកេងកង</li> <li>១២. បឹងកេងកង</li> <li>១៣. បឹងកេងកង</li> <li>១៤. បឹងកេងកង</li> <li>១៥. បឹងកេងកង</li> <li>១៦. បឹងកេងកង</li> <li>១៧. បឹងកេងកង</li> <li>១៨. បឹងកេងកង</li> <li>១៩. បឹងកេងកង</li> <li>២០. បឹងកេងកង</li> </ul>	<ul style="list-style-type: none"> <li>១. បឹងកេងកង</li> <li>២. បឹងកេងកង</li> <li>៣. បឹងកេងកង</li> <li>៤. បឹងកេងកង</li> <li>៥. បឹងកេងកង</li> <li>៦. បឹងកេងកង</li> <li>៧. បឹងកេងកង</li> <li>៨. បឹងកេងកង</li> <li>៩. បឹងកេងកង</li> <li>១០. បឹងកេងកង</li> <li>១១. បឹងកេងកង</li> <li>១២. បឹងកេងកង</li> <li>១៣. បឹងកេងកង</li> <li>១៤. បឹងកេងកង</li> <li>១៥. បឹងកេងកង</li> <li>១៦. បឹងកេងកង</li> <li>១៧. បឹងកេងកង</li> <li>១៨. បឹងកេងកង</li> <li>១៩. បឹងកេងកង</li> <li>២០. បឹងកេងកង</li> </ul>

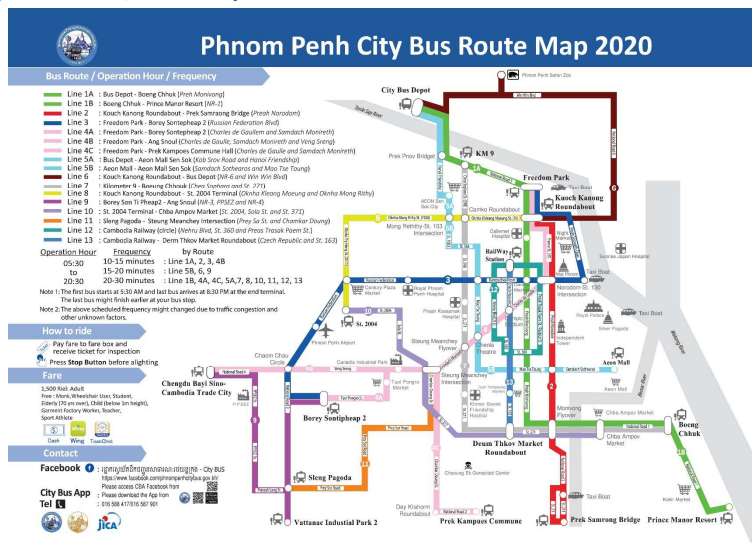
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## 6.2.2 Route Map for Phnom Penh City Bus

### English version, route map



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### 6.3.1 Bus Wrapping Design Principle

#### Proposed design principles for City Bus

- Easily recognizable: Especially from waiting passengers
- Proximity: Maintain margin between designs/illustrations (also allows advertisement)
- Unity: Not too many colors (2-3 different colors popularly used)
- Repetition: Use same/similar shapes/designs
- Shape: Visually friendly with circle/streamline, not too geometry
- Color: National color (Red/Blue)

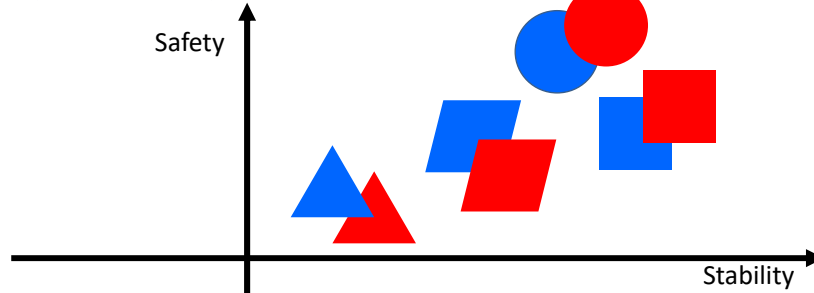
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### 6.3.2 Design Shape

#### Image of design shape

- 
- Infinity
  - Earth/Green
  - Peace
  - Safe
  - Sharp
  - Intelligence
  - Growth
  - Stable
  - Foundation

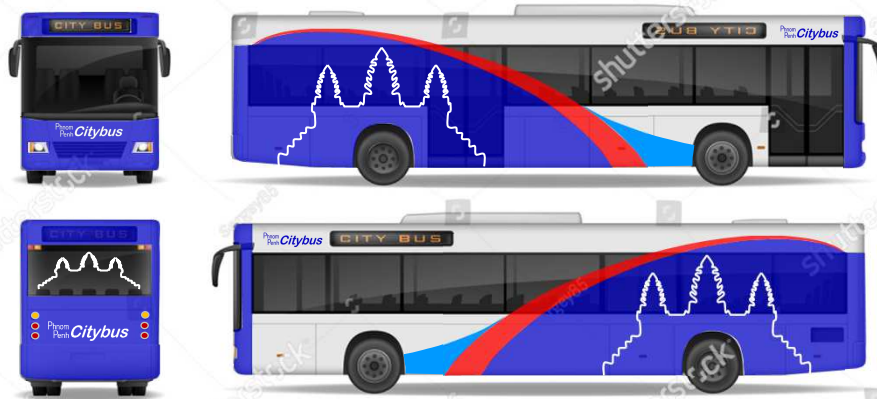
#### Design shape matching public transport



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### 6.3.3 Design for Phnom Penh City Bus

#### Proposed design

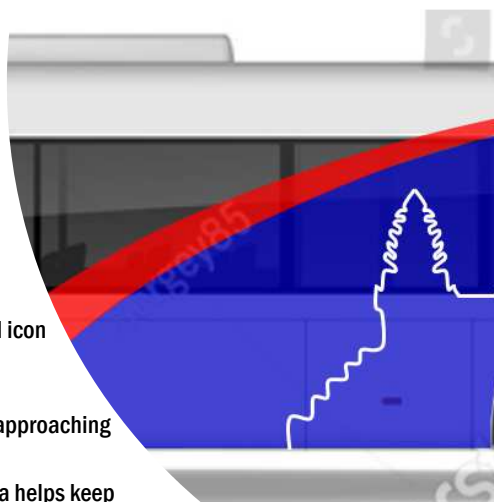


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### 6.3.3 Design for Phnom Penh City Bus

#### Logic for color scheme

- Flowing style (dynamic yet relaxing)
- National colors against a silver background (to soften contrast)
- Blue is a reliable and stable colour and red adds a dash of adventure
- Silver as a background color is regal and prestigious (as in 'silver service')
- Angkor Wat image a strong national icon in strong white contrast to blue background
- Blue front highly recognizable when approaching bus stop
- Vinyl wrap (see through) on glass area helps keep bus cool



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