Study on Utilization of Mobile Big Data(MBD) for Assistance for Formulation of Public Transportation Plan in Indonesia (Mamminasata Metropolitan Area)

Final Report

March 2023

International Policy Division, Policy Bureau,

Ministry of Land, Infrastructure, Transport and Tourism

Nippon Koei Co., Ltd., and Agoop Corp.

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Abbreviations

AJTP	ASEAN-JAPAN Transport Partnership
ASEAN	Association of Southeast Asian Nations
BRT	Bus Rapid Transit
CCTV	Closed Circuit Television
COVID-19	Coronavirus Disease 2019
F/S	Feasibility Study
GRDP	Gross Regional Domestic Products
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
JEXWAY	Japan Expressway International Company Limited
JOIN	Japan Overseas Infrastructure Investment Corporation for Transport & Urban Development
INDOBUS	Indonesia Bus Rapid Transit Corridor Development Project
MAU	Monthly Active Users
MBD	Mobile Big Data
MICE	Meeting, Incentive tour, Convention/Conference, Exhibition
MOT	Ministry of Transportation
MRT	Mass Rapid Transit
LRT	Light Rail Transit
NEXCO	West Nippon Expressway Company Limited
OD	Origin-Destination
ORGANDA	Organisasi Angkutan Darat
PDPL	Personal Data Protection Law
PIP	Politeknik Ilmu Pelayaran makassar
PNUP	Politeknik Negeri Ujung Pandang
PPP	Public Private Partnership
QRIS	Quick Response Indonesia Standard
SDK	Software Development Kit
SECO	State Secretariat for Economic Affairs
TIU	Technical Implementation Unit

1. Study Overview

1.1 Study Objective

In the Association of Southeast Asian Nations (ASEAN), the lack of efficient and economical public transportation has led to traffic congestion and environmental problems. In addition, traffic analysis methods are not widely used in the ASEAN transportation sector, and several issues have been observed in the accuracy of demand forecasting and other aspects of public transportation development.

On the other hand, in recent years, there has been progress in the development of methods to collect location information from mobile phones and smartphones, known as mobile big data (MBD), and using it for analyzing population and traffic flow.

In response to the demand for harnessing MBD in transport planning, the "ASEAN and Japan Transport Ministers Meeting" held in November 2018 approved a new initiative "Utilization of Mobile Data for Transport Planning" under ASEAN-Japan Transport Partnership.

Based on the existent of COVID-19, it would be beneficial for the export of Japanese high quality infrastructure entities to cooperate from the planning stage of efficient and effective public transportation planning by monitoring the amount of travel of citizens and their means of public transportation to accurately assess travel demand. The results can also contribute to the maintenance of sustainable socioeconomic activities.

The Ministries of Transport of Indonesia are considering the use of MBD in preparing their transportation policies and have requested Japan's cooperation for the same, and this study proposes to conduct research and study to support the formulation of public transportation plans utilizing MBD in Indonesia as a part of the above initiative.

1.2 Study Overview

1.2.1 Study Name

Study on Utilization of Mobile Big Data (MBD) for Assistance for Formulation of Public Transportation Plan in Indonesia (Mamminasata Metropolitan Area).

1.2.2 Study Period

From October 28 in 2022 to March 24 in 2023

1.2.3 Work Order Issuing Organization

International Policy Division, Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism

2-1-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8918

Tel: 03-5253-8111 (ext. 25904) 03-5253-8319 (direct)

Fax: 03-5253-1561

1.2.4 Work Order Receiving Organizations

- Nippon Koei Co., Ltd.

5-4 Kojimachi, Chiyoda-ku, Tokyo 102-8539

Tel: 03-5276-7770 Fax: 03-5276-3356

- Agoop Corp.

3-35-8 Jingumae, Shibuya-ku, Honey Building Aoyama 6F, Tokyo 150-0001

Tel: 03-6682-9349 Fax: 03-6679-1711

1.3 Tasks

The tasks to be performed are shown in the table below.

Table 1-1 List of Tasks

Item	Unit	Quantity	Remarks
Proposal for acquiring traffic flow data using MBD and the possibilities of using traffic flow data for transport planning	Set	1	
Collection of basic information in the surveyed countries/regions	Set	1	
Understanding of the system and implementation Structure for Utilization of MBD	Set	1	
Understanding the needs for the use of MBD	Set	1	
Conducting field surveys	No.of times	3	
Summary of survey results and preparation of reports	Set	1	
Drafting explanatory material (English)	Set	1	
Providing survey briefings to the surveyed country	Set	1	
Reporting at the 16th ASEAN-Japan Experts Group Meeting on Information Platform	No.of times	1	
Communication and coordination with the surveyed countries	Set	1	
Meeting with the contracting agencies	No.of times	5	At the start, 3 times during the process, At the end

Source: Study Team

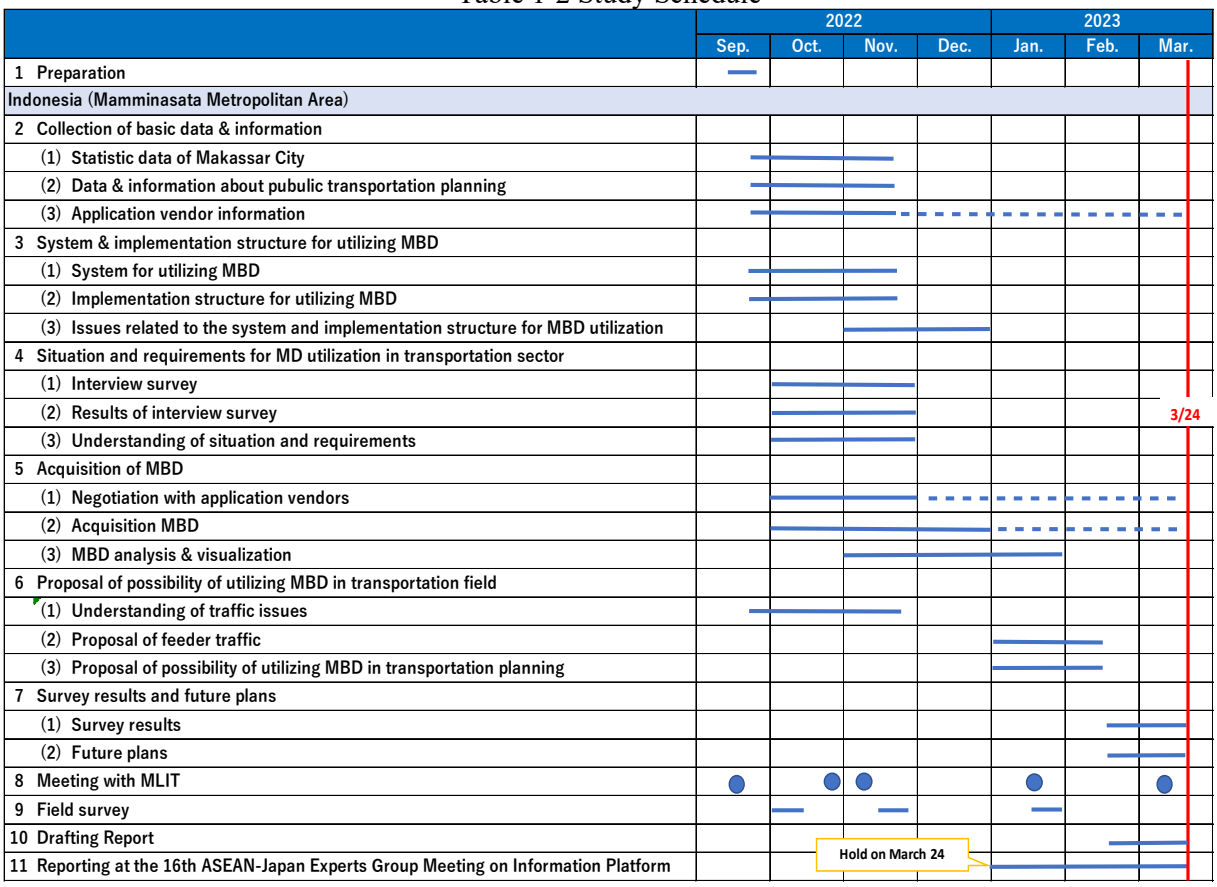
1.4 Target Country & Region

Indonesia (the Mamminasata Metropolitan Area, South Sulawesi Province)

1.5 Study Schedule

The study schedule is shown below.

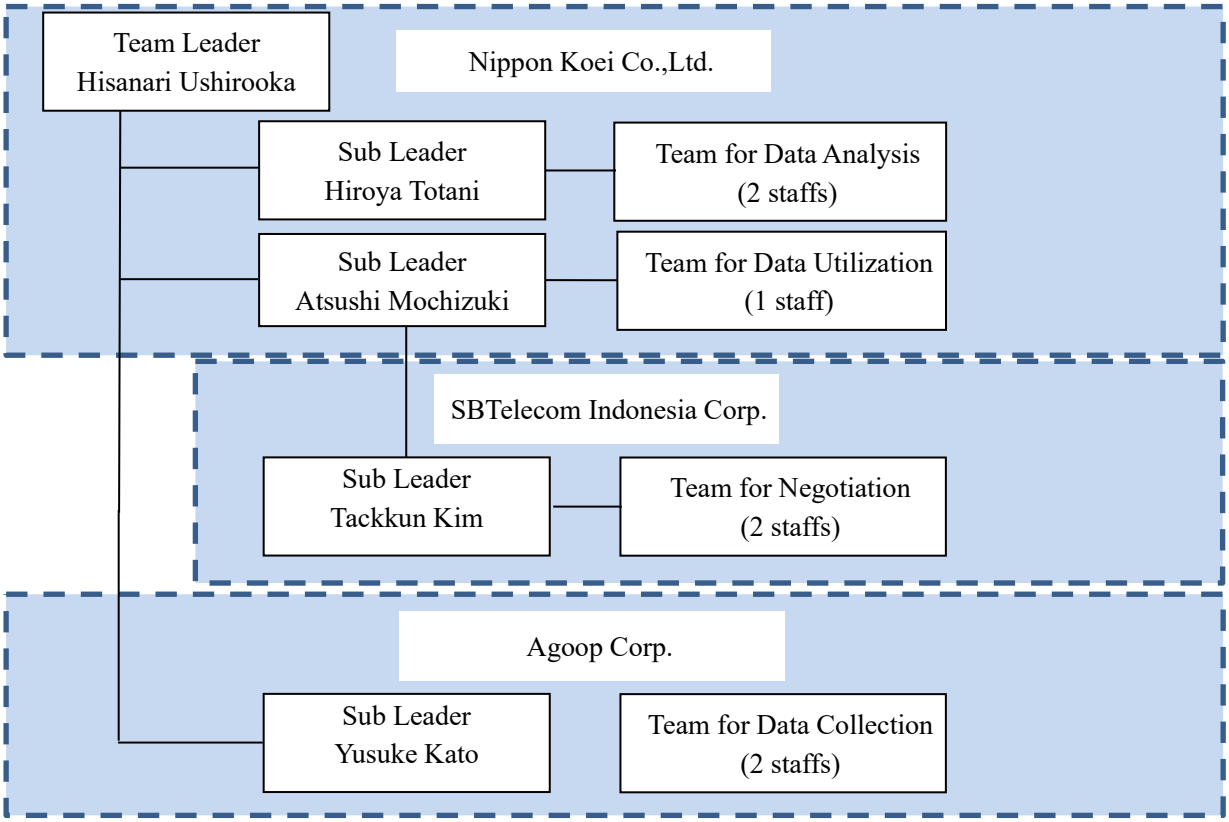
Table 1-2 Study Schedule



Source: Study Team

1.6 Study Team and Structure

The team structure shown below shall implement the specified tasks.



Source: Study Team

Figure 1-1 Study Team and Structure

2. Collection and Organization of Basic Information

2.1 Basic Information of Target Area(Mamminasata Metropolitan Area)

2.1.1 Geographic Information

As shown in Figure 2-1, the Mamminasata Metropolitan Area is metropolitan area with a population of approximately 2.9 million[1], consisting of one city (Makassar City) and three regencies (Gowa Regency, Maros Regency, and Takalar Regency) in South Sulawesi. The National Spatial Strategy has designated it as a region where socio-cultural conservation, economic development, natural resource development and environmental conservation should be specially promoted.

Makassar City is the capital of the province of South Sulawesi, located in the southwestern part of Sulawesi Island. In addition to being in proximity with the Sultan Hasanuddin International Airport in the neighboring Maros Regency, the city is home to the port of Makassar, making it the center of flow of people and logistics in eastern Indonesia. Makassar City comprises 15 districts and 153 wards, covering an area of 199.26 square kilometers[2].

Most of the area of Gowa Regency, approximately 72.3%, is in the highlands, and agriculture is a major activity in there. Gowa Regency comprises 18 districts and 121 wards, covering an area of 1,883 square kilometers[3].

Maros Regency is the northern gateway to the Mamminasata Metropolitan Area and is home to the Sultan Hasanuddin International Airport, the largest airport in eastern Indonesia. The distance from the center of Maros to Makassar City is about 30 km, which takes about one hour by car. Maros Regency comprises 14 districts and 80 wards, covering an area of 1,619 square kilometers.

The western part of the Takalar Regency belongs to the coastal region, which has a coastline of about 74 km, with three coastal tourist destinations along its coastline. Takalar Regency comprises 10 districts and 76 wards, covering an area of 567 square kilometers.

[1] South Sulawesi Province Statistics Bureau
[2] Makassar City Statistics Bureau
[3] South Sulawesi Province Statistics Bureau(Information on wards, administrative districts and areas of Gowa, Maros and Takalar Regencies)

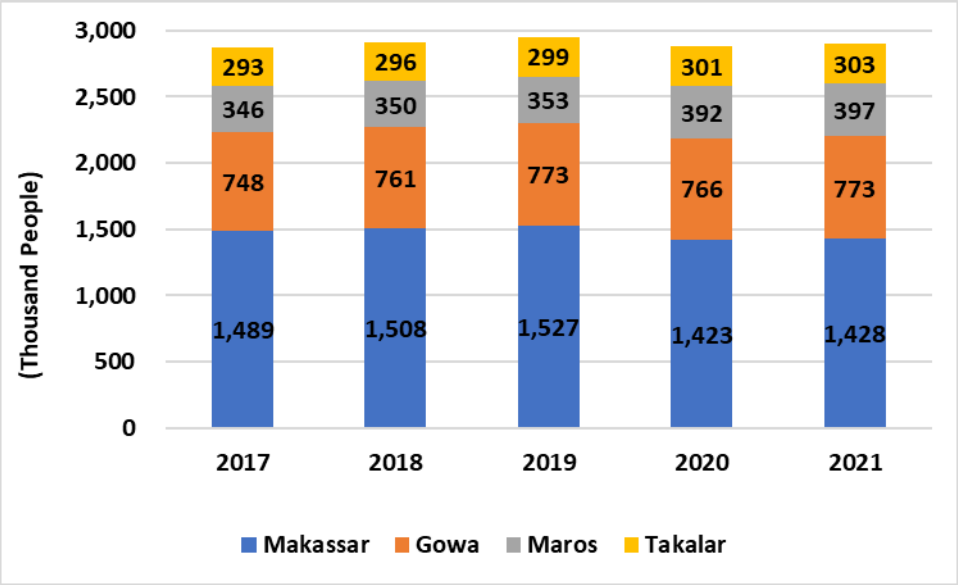
Source：Makassar, Indonesia – Climate Change Vulnerability Assessment（UN-HABItaT, 2014）

Figure 2-1 Location Map of Mamminasata Metropolitan Area

2.1.2 Population

The population of the Mamminasata Metropolitan Area is estimated to be approximately 2.9 million (in 2021). Although the population decreased from the previous year in 2020, when it might have been affected by the COVID-19, the population has remained almost unchanged in recent years.

The population of each region is shown in Figure 2-2, where the population in Makassar City is estimated to be approximately 1.43 million (2021), approximately 770 thousand (2021) in Gowa Regency, approximately 400 thousand (2021) in Maros Regency, and approximately 300 thousand (2021) in Takalar Regency. Approximately 49.2% of the metropolitan area's population, more than half, is concentrated in Makassar. Currently, the population is expected to continue to increase due to the expansion of Makassar Port and Sultan Hasanuddin International Airport, the construction of the Makassar-Parepare railway, as well as several large-scale urban development projects.



Source: South Sulawesi Province Statistics Bureau

Figure 2-2 Population Trend of Mamminasata Metropolitan Area

2.1.3 Industry

(1) South Sulawesi Province

Referring to the Gross Regional Domestic Product by Industry (hereinafter referred to as "GRDP") for South Sulawesi in 2022[4], the major industries in South Sulawesi are agriculture (22.6%), trade (14.6%), construction (14.4%), and processing (12.5%). In particular, the processing industry recorded a positive growth of 3% in 2021, with more than 330 thousand people employed in the processing industry. In terms of the contribution of cities in South Sulawesi to GRDP, Makassar City accounts for 34.9%, Gowa Regency for 4.3%, Maros Regency for 3.5%, and Takalar Regency for 2.0%.

(2) Makassar City

Referring to the GRDP for Makassar City in 2022, the major industries in Makassar City are wholesale and retail trade (20.1%), manufacturing (18.6%), construction (16.1%), and information and communication (13.6%) (Table 2-1). The industrial estate of "Kawasan Industri Makassar" is situated at the outskirts of the city and is spread over an area of 270 hectares. The estate has about 150 companies, mainly related to agricultural and marine product processing, construction materials, and distribution(Figure 2-3).

. In addition, the city's economic growth rate has been increasing in recent years and has maintained a growth rate of around 8% through 2019. However, due to the COVID-19, the economic growth rate dropped significantly to -1.27% in 2020, resulting in negative growth. But by 2021, the rate was 4.47%, showing a recovery trend (Figure 2-4).

[4] Source: Statistik Daerah Provinsi Sulawesi Selatan 2022

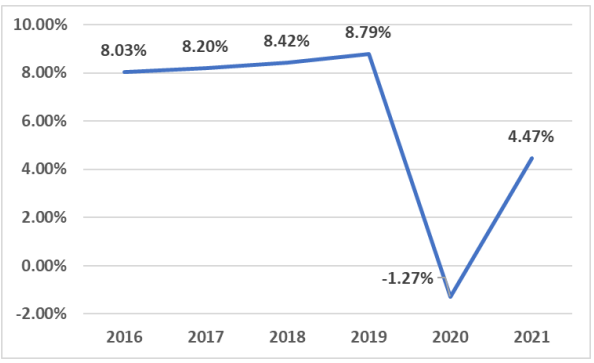
Table 2-1 Makassar GRDP by Industry (as of 2022)

Industry	GRDP(Billion IDR)	Proportion
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	26,748	20.1%
Manufacturing	24,727	18.6%
Construction	21,371	16.1%
Information and Communication	18,130	13.6%
Education Services	11,881	8.9%
Finance and Insurance	6,291	4.7%
Health Service and Social Activities	4,323	3.2%
Real Estate	4,101	3.1%
Government Administration, Defense, Mandatory Social Security	4,016	3.0%
Other Services	3,320	2.5%
Transportation and Storage	3,138	2.4%
Accommondation and Food Service Activities	2,792	2.1%
Coorporation Services	1,447	1.1%
Agriculture, Forestry, and Fishing	532	0.4%
Water Supply; Sewerage, Waste Management, and Remediation Activities	257	0.2%
Electricity and Gas	59	0.0%
Mining and Quarrying	0	0.0%
Total	133,133	100.0%

Source: Makassar City Statistics Bureau

Source：PT. Kawasan Industri BUMN

Figure 2-3 Makassar Industrial Estate



Source: Makassar City Statistics Bureau

Figure 2-4 Economic Growth Rate of Makassar City

(3) Gowa Regency

Referring to the GRDP for Gowa Regency in 2022, the main industries in Gowa are agriculture, forestry, and fishing (28.2%), information and communication (12.6%), wholesale and retail trade (12.2%), and construction (10.3%) (Table 2-2). In particular, the areas located in the highlands have become centers of vegetable production, with crops such as potatoes and cabbage being grown.

Table 2-2 Gowa GRDP by Industry (as of 2022)

Industry	GRDP(Billion IDR)	Proportion
Agriculture, Forestry and Fishing	4,432	28.2%
Information and Communication	1,981	12.6%
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycle	1,913	12.2%
Construction	1,616	10.3%
Real Estate	1,131	7.2%
Manufacturing	1,049	6.7%
Government Administration, Defense, Mandatory Social Security	786	5.0%
Education Services	711	4.5%
Mining and Quarrying	534	3.4%
Accommondation and Food Service Activities	382	2.4%
Finance and Insurance	340	2.2%
Health Service and Social Activities	330	2.1%
Transportation and Storage	246	1.6%
Other services	217	1.4%
Electricity and Gas	29	0.2%
Water Supply, Waste Management, Waste and Recycling	22	0.1%
Coorporation Services	18	0.1%
Total	15,735	100.0%

Source: Gowa Regency Statistics Bureau

(4) Maros Regency

Referring to the GRDP for Maros Regency in 2022, the main industries in Maros are transportation and storage (25.8%), agriculture, forestry, and fishing (19.2%), manufacturing (18.5%), and mining and quarrying (11.6%) (Table 2-3).

Table 2-3 Maros GRDP by Industry (as of 2022)

Industry	GRDP(Billion IDR)	Proportion
Transportation and Storage	3,485	35.6%
Agriculture, Forestry and Fishing	2,604	16.5%
Manufacturing	2,505	15.6%
Mining and Quarrying	1,566	7.7%
Construction	1,165	10.5%
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycle	533	3.2%
Government Administration, Defense, Mandatory Social Security	518	3.7%
Education Services	237	1.4%
Real Estate	235	1.4%
Information and Communication	231	1.3%
Finance and Insurance	202	1.5%
Health Service and Social Activities	112	0.8%
Other services	60	0.4%
Accommondation and Food Service Activities	47	0.3%
Water Supply, Waste Management, Waste and Recycling	18	0.1%
Electricity and Gas	12	0.1%
Coorporation Services	4	0.0%
Total	13,533	100.0%

Source: Maros Regency Statistics Bureau

(5) Takalar Regency

Referring to the GRDP for Takalar Regency in 2021, the main industries in Takalar are agriculture, forestry, and fishing (47.7%), whole sale and retail trade (14.1%), construction (6.7%). and government administration, defense, and social security (6.5%) (Table 2 4).

Table 2-4 Takalar GRDP by Industry (as of 2022)

Industry	GRDP(Billion IDR)	Proportion
Agriculture, Forestry and Fishing	3,298	47.7%
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	975	14.1%
Construction	465	6.7%
Government Administration, Defense, Mandatory Social Security	450	6.5%
Real Estate	388	5.6%
Manufacturing	366	5.3%
Information and Communication	314	4.5%
Transportation and Storage	204	3.0%
Mining and Quarrying	110	1.6%
Education Services	101	1.5%
Finance and Insurance	97	1.4%
Health Service and Social Activities	87	1.3%
Accommondation and Food Service Activities	22	0.3%
Other services	15	0.2%
Electricity and Gas	12	0.2%
Water Supply, Waste Management, Waste and Recycling	4	0.1%
Coorporation Services	0	0.0%
Total	6,908	100.0%

Source: Maros Regency Statistics Bureau

2.1.4 Airports/Ports/Road Infrastructure

(1) Sultan Hasanuddin International Airport

The airport has two runways, a passenger terminal for both domestic and international flights, and a cargo terminal on a site of about 7.6 km^2. The Indonesian army has a base on the east side of the airport. Prior to the COVID-19 outbreak, the airport operated many domestic flights connecting Jakarta, Surabaya, and other Indonesian cities, as well as several international flights including Singapore Airlines. About 2.17 million[5] passengers used the airport service in the first Quarter of 2022(January-March). However, according to a web news, the number of passengers of the airport on March 2022 has decreased approximately 40 % compared with before COVID-19 (Before COVID-19: 36,000 ~ 40,000 passengers / day, March 2022: 19,000 ~ 24,000 passengers / day)[6]

In addition, the airport is currently undergoing expansion work to increase its capacity in anticipation of increased passenger and cargo demand. Construction work was suspended in 2021 due to COVID-19, but is expected to resume by the end of 2023 [7](Figure 2-5).

The airport is operated by the state-owned airport management company (Angkasa Pura I).

[5] https://ap1.co.id/en/information/news/detail/angkasa-pura-airports-serves-97-million-passengers-in-the-first-quarter-of-2022

[6] https://sulsel.idntimes.com/news/sulsel/ashrawi-muin/pergerakan-penumpang-dan-pesawat-di-bandara-sultan-hasanuddin-menurun/3

[7] https://sulawesi.bisnis.com/read/20221116/539/1598922/bandara-sultan-hasanuddin-diusulkan-tambah-kapasitas-jadi-15-juta-penumpang

Source：https://datakita.co/proyek-pelebaran-bandara-sultan-hasanuddin-rampung-oktober-2021/

Figure 2-5 Image of the Airport after Expansion

(2) Port of Makassar (Soekarno-Hatta Port)

The Port of Makassar is one of Indonesia's four primary ports and a logistic hub for Eastern Indonesia. In addition to cargo, the port has several passenger ferries in service. The port is currently under expansion, wherein a new port is being constructed to cope with the increase in the volume of cargo and passengers. The construction of the new Makassar Port, which is expected to become the largest port in eastern Indonesia, is divided into two phases (Phase I and Phase II), with Phase I work (Stages A, B, C, and D) currently underway. The construction of Phase IA has already been completed, and the progress of construction of Phases 1B and 1C has reached 84% and 87%, respectively, as of June 6, 2022[8].

It is operated by a state-owned port management enterprise, PT PELINDO IV.

(3) Roads

Roads in Mamminasata Metropolitan Area are roughly divided into three categories: national highways, provincial roads, and city roads (Table 2-5). The regional highway development bureau of the Directorate General of Highway, Ministry of Public Works and Housing is mainly in charge of the construction and maintenance of the national highways. Public Works Office of South Sulawesi Province is in charge of the construction and maintenance of the provincial roads (and is also in charge of the maintenance and management of some national highways). The construction and maintenance of the city road and regency road is under the jurisdiction of Public Works Office of City/Regency.

Table 2-5 Total Length of Each Road Type (2022)

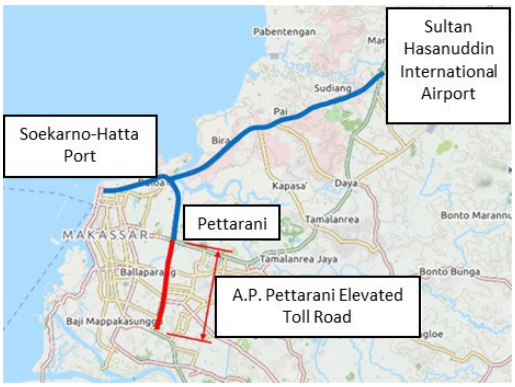
Region	National highway	Provincial road	City/Regency road
Makassar City	34.66 km	34.07 km	712.45 km

[8] https://www.clapeyronmedia.com/blog/majalah-online/menuju-indonesiasentris-lewat-makassar-new-port/

Region	National highway	Provincial road	City/Regency road
Gowa Regency	22.91km	270.45km	2,466.74km
Maros Regency	-	-	1032.14km
Takalar Regency	11.50km	31.80km	754.49km

Source: Makassar City/Gowa Regency/Maros Regency/Takalar Regency Statistics Bureau

In March 2021, a 4.3 km long elevated highway (A.P. Pettarani Elevated Toll Road), the first of its kind on Sulawesi island, was built on A.P. Pettarani street in the heart of the city, which dramatically improved the access from the city to Sultan Hasanuddin International Airport (Figure 2 6 and Figure 2 7). The construction work began in May 2020 and was undertaken by PT Makassar Metro Network, a subsidiary of PT Margautama Nusantara, whose shares have been acquired by West Nippon Expressway Co., Ltd., Japan Expressway International Company Limited (hereinafter referred to as "JEXWAY") and Japan Overseas Infrastructure Investment Corporation for Transport & Urban Development (hereinafter referred to as "JOIN").



Source: West Nippon Expressway Co., Ltd.

Figure 2-6 Location of A.P. Pettarani Elevated Toll Road

Source: West Nippon Expressway Co., Ltd.

Figure 2-7 A.P. Pettarani Elevated Toll Road

2.1.5 Status of Smart City Development

(1) South Sulawesi Province Medium-term Development Plan

"South Sulawesi Province Medium-Term Development Plan (2021-2023)" sets the direction for the development of South Sulawesi Province for the period 2021-2023. The Development Plan sets forth a development vision of "an innovative, productive, competitive, inclusive, and unique province of South Sulawesi ("Sulawesi Selatan yang Inovatif, Produktif, Kompetitif, Inklusif dan Berkarakter")". Based on the development vision, the following development goals and regional strategic priority project plans have been established.

Table 2-6 Development Goals and Regional Strategic Priority Project Plans of South Sulawesi Province Medium-term Development Plan

No.	Development Goals and Regional Strategic Priority Project Plans	Budget Source				Implementation year
		APBN[9]	APBD[10]	KPBU[11]	SWASTA/ BUMN[12]	
III	Development Goal: Improve accessibility of local infrastructure					
1	South coastal toll road construction	○	○		○	2022-2023
2	Construction of the Mamminasata Bypass toll road	○	○	○		2022-2023
3	Construction of roads and bridges in isolated areas	○	○			-
4	Construction and Rehabilitation of Type B Passenger Terminals in Jeneponto, Bantaeng, Wajo, Parepare and Palopo		○			2018-2023
5	Construction and Rehabilitation of Bira; Bajoe; and Jampea Ports	○	○			2021-2023
6	Development of power generation infrastructure in Strategic Areas and Small Islands	○	○			2022-2023
7	Development of natural gas network infrastructure for households	○		○		2023
8	Construction of a waste processing installation into electrical energy	○	○		○	2022-2023
9	Construction of Makassar-Parepare railway line	○		○		2021-2023
10	Development of rail-based and road-based urban mass public transportation	○	○	○		2021-2023
11	Buntu Kunik airport development	○	○			2021-2023
12	Sultan Hasanuddin Airport development	○		○		2021-2023

[9] APBN: Anggaran Pendapatan dan Belanja Negara
[10] APBD: Anggaran Pendapatan dan Belanja Daerah
[11] KPBU: Kerjasama Pemerintah dengan Badan Usaha
[12] SWASTA/BUMN: SWASTA/Mulai dari Badan Usaha Milik Negara

No.	Development Goals and Regional Strategic Priority Project Plans	Budget Source				Implementation year
		APBN[9]	APBD[10]	KPBU[11]	SWASTA/ BUMN[12]	
13	Seko and Rampi Airport Development	○				2021-2023
14	Makassar port development	○		○	○	2021-2023
15	Mamminasata Regional SPAM[13] Development	○	○			2021-2023
16	Community-based fulfillment of drinking water needs of coastal and small island communities	○	○			2020-2023
17	Construction of multi-purpose reservoirs and improvement of irrigation networks in Saddang and Pammukkulu districts	○			○	2022-2023

Source：The South Sulawesi Province Medium-Term Development Plan (2021-2023)

(2) Makassar City Medium-term Development Plan (2021-2026)

"Makassar City Medium-Term Development Plan (2021-2026)" sets the direction for the development of Makassar from 2021 to 2026. The development vision of that is "Accelerate the realization of Makassar as a world-class city, a "Sombere[14] & Smart City" for all, with strong urban immunity ("Percepatan Mewujudkan Makassar Kota Dunia Yang "Sombere' dan Smart City" dengan) Imunitas Kota Yang Kuat untuk Semua"). Based on the development vision, the following missions and strategic programs are set forth

Table 2-7 Vision/Mission/Strategic Program of Makassar City Medium-Term Development Plan (2021-2026)

Vison "Accelerate the realization of Makassar as a world-class city, a "Sombere & Smart City" for all, with strong urban immunity"		
Mission 1 "Accelerate excellent city human resources reforms with world-class public services free of corruption"	Mission 2 "Rebuilding health, economy, society and culture towards a prosperous society with strong urban health and economic immunity for all"	Mission 3 "Comprehensive restoration of urban space toward a world-class comfortable city that is "Sombere & Smart City" for all"
Strategic Program for Mission 1 ・ Improving the quality of education	Strategic Program for Mission 1 ・ Strengthen public health facilities	Strategic Program for Mission 1 ・ Overall flood management system

[13] SPAM means Drinking Water Supply System
[14] Sombere(Indonesian)≒Kindhearted(English)

through the “Every Person Should Go to School Movement” ・ Eliminate corruption by accelerating governance of "Sombere" and "Smart," etc.	and services ・ Strengthen city branding and increase domestic and international events and MICE, etc.	construction and handling of traffic congestion ・ Development of "Waterfront City" area and infrastructure based on environmental adaptation and mitigation ・ Accelerate the development of comprehensive "Sombere & Smart City" infrastructure and systems ・ Construction of a new city hall and city council building in the "Sombere & Smart City" style, etc.

Source：Makassar City Medium-Term Development Plan (2021-2026)

(3) Makassar City Strategic Program 20

At the Makassar City Coordination Meeting held in March 2022, the Mayor presented the following 20 specific priority programs for the development of Makassar City.

Table 2-8 Makassar City Strategic Program 20

No.	Program	No.	Program
1	Extension of elevated highways in the city	11	Creation of women's organizations and local craft councils
2	Construction of LRT	12	Creation of a food court area
3	Construction of roundabouts	13	Construction of "Karebosi Field" (soccer field)
4	Introduction of smart intersections	14	Renovation of the current City Hall
5	Development of "Green Corridors”	15	Waste power generation
6	Introduction of “Tettere”(commercial EV bikes)	16	Construction of New City Hall and New City Council Chambers
7	Introduction of “Co’mo”(tourist feeder)	17	Construction of the circuit
8	Creation of tourist paths	18	Creation of Makassar City Core Area
9	Development of coastal areas and islands	19	Construction of public service malls
10	Education revolution	20	Construction of elevated sidewalks in the coastal area

Source：Information and Communication Department of Makassar City

2.2 Public Transportation in Makassar City

2.2.1 Major Public Transportation Means

(1) Pete Pete

Pete Pete is a traditional Indonesian public transportation system, known as “Angkot” elsewhere in Indonesia (Figure 2-8 and Table 2-9). Only the pick-up and drop-off points on the route are

decided, and there are no designated stops or schedules. Passengers can get on and off anywhere along the route by informing the driver of their intended destinations.

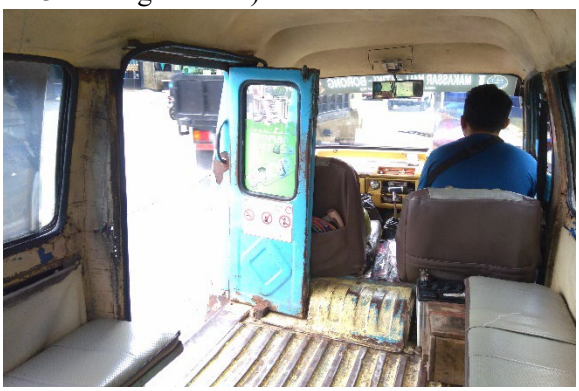
Currently in Makassar City, 16 operation routes are set up to cover almost the entire area of Makassar City (Figure 2-10), and about 4,000 of these vehicles are registered with Makassar City Transportation Office. "ORGANDA", which is an association of Pete Pete drivers, coordinates and negotiates route changes and fare revisions with Makassar City Transportation Office.

In addition, there are 13 operating routes[15] in the Gowa Regency and 12 in Maros Regency as shown in Figure 2-11 through Figure 2-12. Pete Pete routes in Takalar Regency was not available due to the lack of organized operating routes.

The fare is basically uniform and cheap at IDR 7,000 (about 55 yen); however, the vehicles are old and many of them are not even equipped with air conditioning. The number of users is decreasing due to the poor conditions of the vehicles and due to the rising popularity of ride-hailing services (pick-up service by car, etc.) which have increased rapidly in recent years. A survey of Pete Pete users in the city conducted in 2019 showed that women and people with relatively low-income groups are more likely to use the service, and that it is a means of transportation for those who do not own their own cars or motorcycles. (Figure 2-13 and Figure 2-14).

Source: Study Team

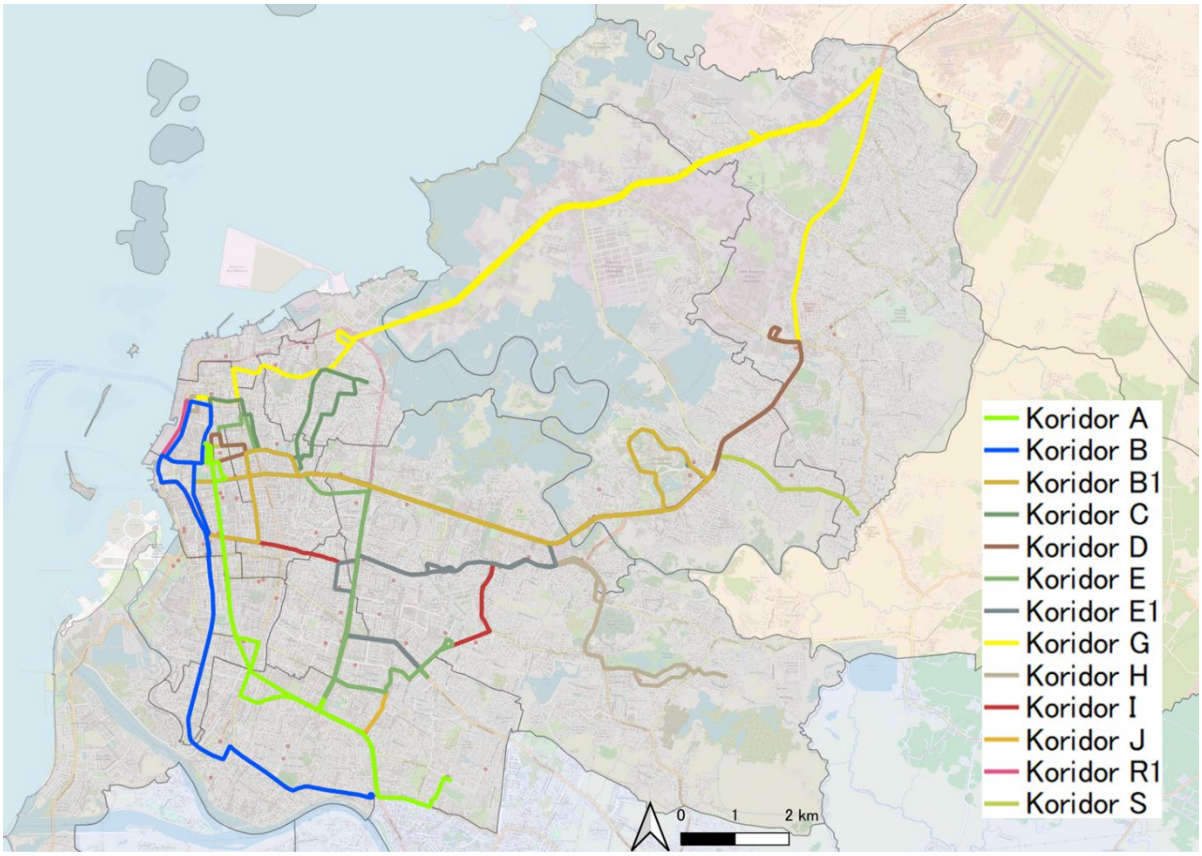
Figure 2-8 Pete Pete parking the terminal



Source: Study Team

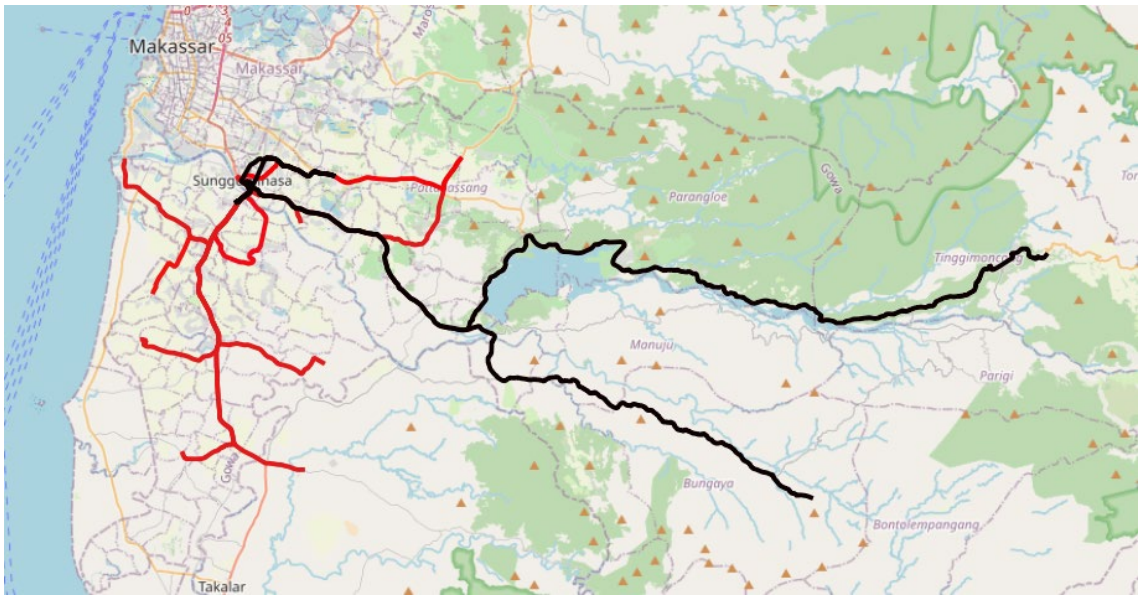
Figure 2-9 Inside of Pete Pete

[15] 10 of 13 routes are out of service (as of March 23, 2023)



Source: Study Team

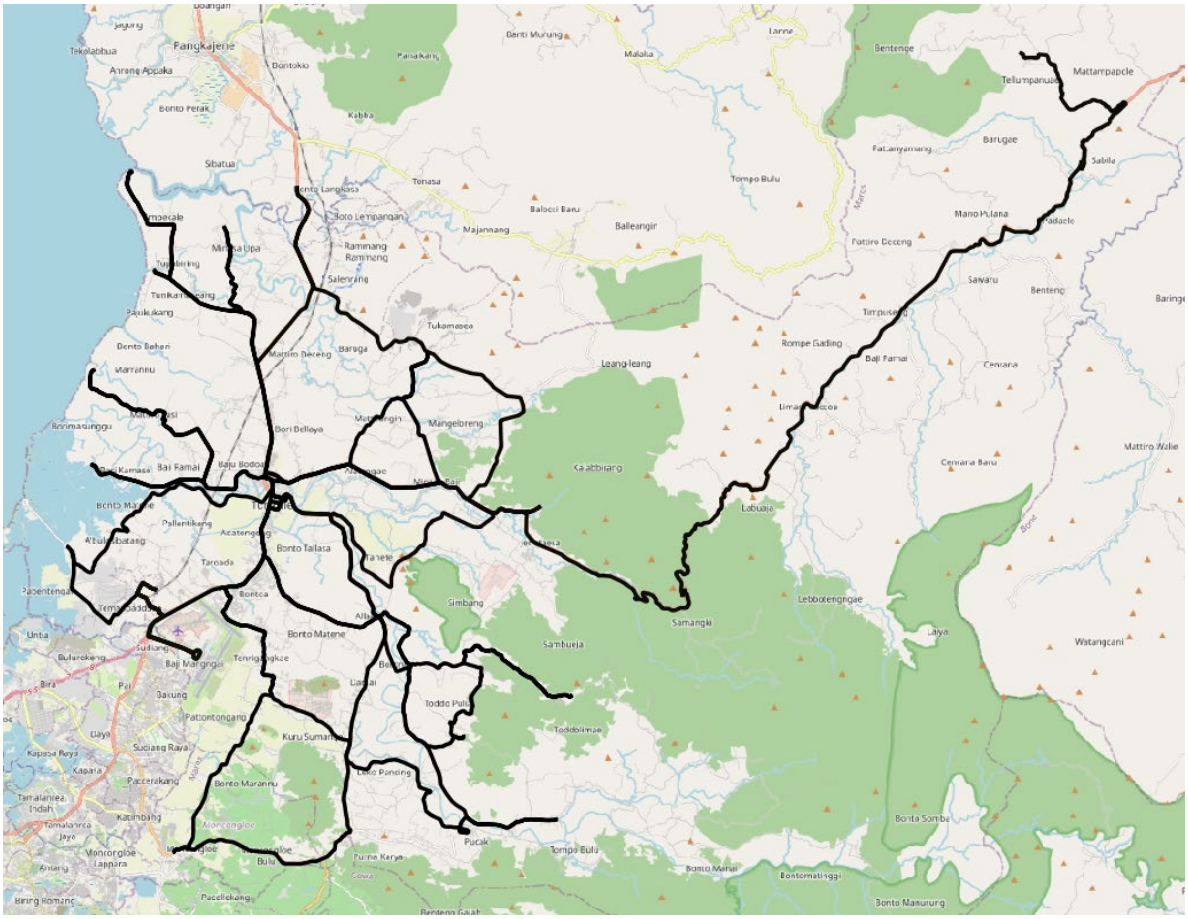
Figure 2-10 Pete Pete Network in the Makassar City



※1：Red lines indicate suspended operations (as of March 23, 2023)

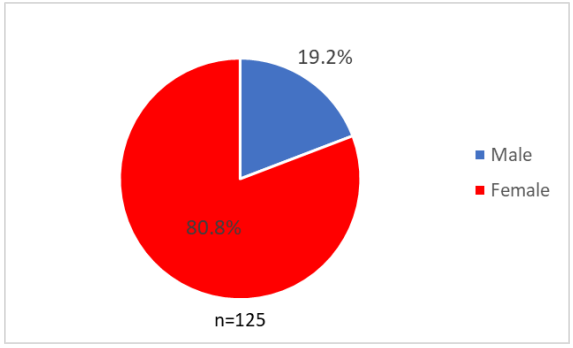
Source: Study Team

Figure 2-11 Pete Pete Network in the Gowa Regency



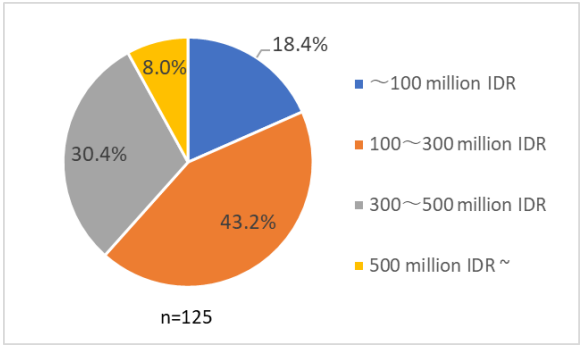
Source: Study Team

Figure 2-12 Pete Pete Network in the Maros Regency



Source：Far East Mobility

Figure 2-13 Types of Pete Pete Passengers (Gender)



Source：Far East Mobility

Figure 2-14 Types of Pete Pete Passengers (Monthly income)

(2) Teman Bus

"Teman Bus" is a system that was introduced in some local cities in 2020 under the initiative of the Ministry of Transportation (MOT) of Indonesia as a service based on the concept of "a service with a buy the service". The name 'Teman' Bus is derived from the Indonesian phrase "Transportasi Ekonomis Mudah Andal dan Nyaman" (economical, cheap, reliable and comfortable public

transportation). Test runs were initiated in five Indonesian cities (Medan, Palembang, Surakarta, Yogyakarta and Denpasar) in 2020, and were then initiated in five more cities including Makassar (Bandung, Surabaya, Makassar, Banjarmasin and Banyumas) in 2021.

In the target areas, the service currently operates on four corridors (Corridor 1: Mall Panakkukang - Galesong Port, Corridor 2: Mall Panakkukang - Sultan Hasanuddin International Airport, Corridor 3: PIP Campus 2 - PNUP Campus 2, Corridor 4: Mall Panakkukang - Hasanuddin University Gowa Campus) (Figure 2-17).

In addition, a ride faire of IDR.4,600 per person has imposed from October 31, 2022. The only payment methods are IC card payment, e-wallet registered in Bank Indonesia's QRIS, or QR code payment using the M-Banking application[16]. However, the ride is free for students, senior citizens, and passengers with disabilities if the following conditions are met.

- High school students, junior high school students, elementary school students and younger (must wear uniforms or show proof of student ID)
- Elderly persons over 60 years of age as certified by Indonesian authorities
- Persons with physical, mental, or intellectual disabilities with limitations

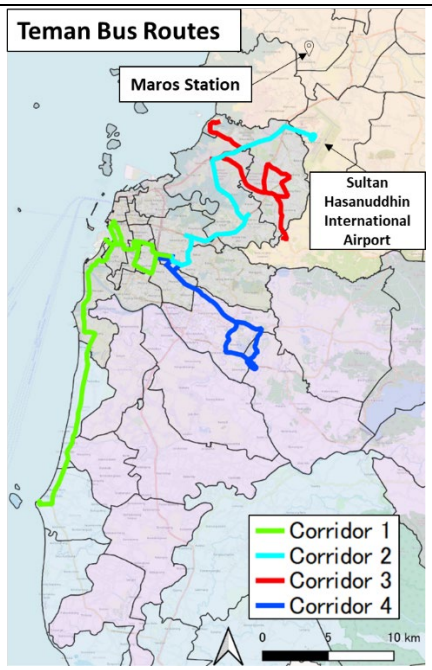
Source: Study Team

Figure 2-15 Teman Bus

Source: Study Team

Figure 2-16 Bus Stop

[16] https://www.detik.com/sulsel/berita/d-6382295/tarif-teman-bus-trans-mamminasata-makassar-cara-cek-jadwal-rute-dan-koridor



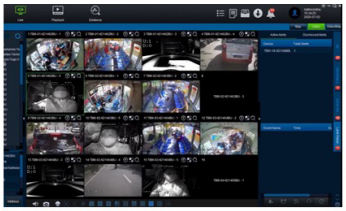
Source: Study Team

Figure 2-17 Teman Bus Corridors

In addition to the latest systems and equipment such as CCTV camera monitoring systems and electronic payment compatible devices, as shown in Figure 2-18 and Figure 2-19, an application has been developed that allows passengers to search for information such as bus location and routes (Figure 2-20).

◯Vehicular Systems in Teman Bus

- Small cameras are mounted on multiple parts of the vehicle body and the image from the cameras can be checked in the driver's seat.
- A camera that monitors the driving status of the driver is mounted near the driver's seat, and it is possible to monitor the driving status.
- A wide-angle CCTV camera is installed in the vehicle.
- External monitoring is possible for all images from small in-vehicle cameras, CCTV cameras, and driver surveillance cameras.
- Equipped with device for electronic payment, it supports eight electronic payment services.
- A device that automatically counts the number of passengers is installed at the top of the door.
- The vehicle body inspection before the start of operation is carried out using the inspection table (digital checker) on the tablet.

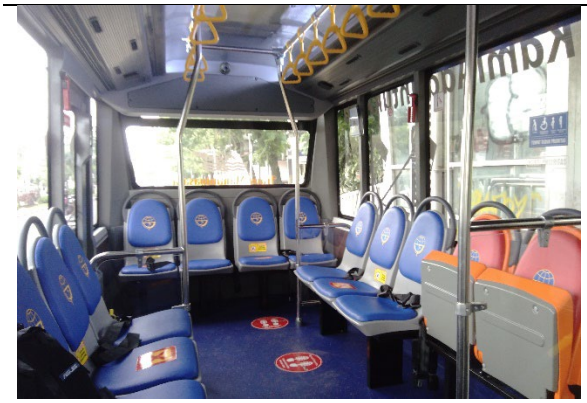


Monitoring by installed cameras

Payment by an electronic payment service

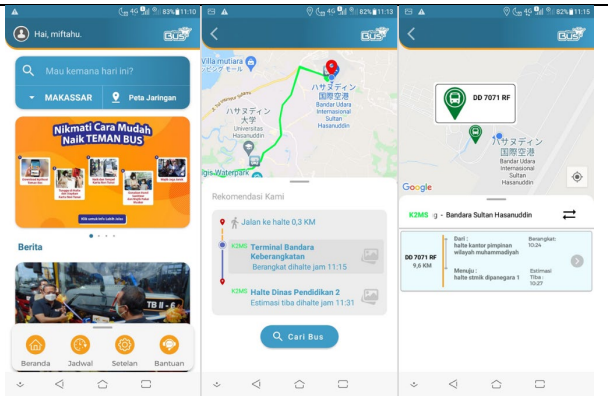
Source: Study Team

Figure 2-18 Vehicular Systems in Teman Bus



Source: Study Team

Figure 2-19 Inside a Teman Bus



Source: Teman Bus app

Figure 2-20 UI of Teman Bus Application

(3) Bentor

Bentor is a relatively short-distance transportation vehicle with a two-wheeled cart attached to the front a motorcycle. The passenger informs the driver of the destination before boarding and negotiates the fare. Fares vary depending on the distance, but are approximately between IDR 10,000 to 30,000.

Source: Study Team

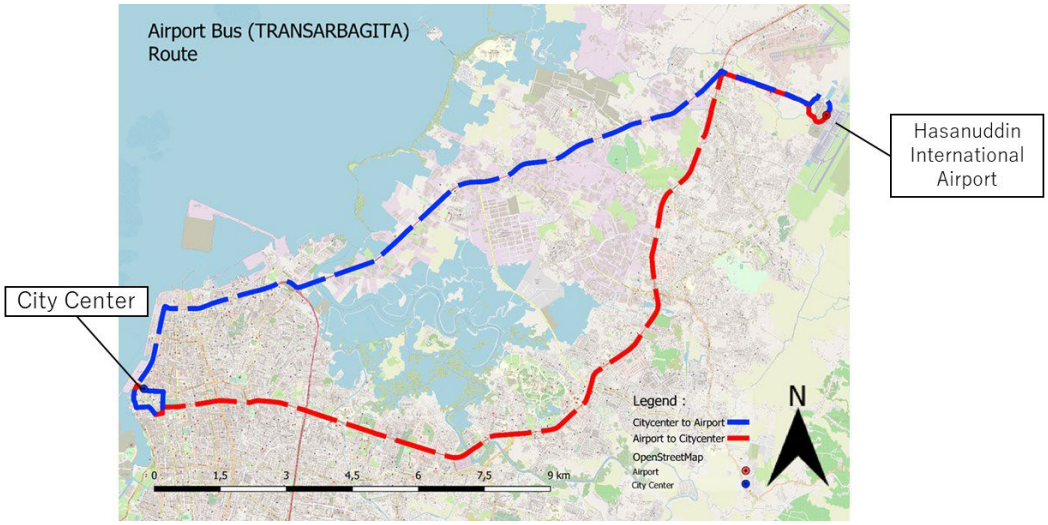
Figure 2-21 Bentor in the City

(4) Ride-hailing

Ride-hailing services have exploded in Indonesia since around 2015. Grab, Gojek, and Maxim are the three major ride-hailing services in Makassar. Both apps allow the users to choose between motorbikes and passenger cars for pick-up and drop-off services.

(5) Airport Bus

Airport buses run between Sultan Hasanuddin International Airport and Makassar City center (Figure 2-22). The frequency of airport buses is one bus every hour from 8 a.m. to 8 p.m., and the ride costs IDR 30,000.



Source: Study Team

Figure 2-22 Airport Bus Network

2.2.2 Ongoing Projects and Future Plans to Promote Public Transportation

(1) INDOBUS

"Indonesia Bus Rapid Transit Corridor Development Project (INDOBUS)", a technical cooperation project by GIZ[17] (Table 2-9), is currently being implemented in Indonesia. The purpose of this project is to develop and implement BRT systems in accordance with the international standards in five pilot cities. Makassar City is one of the pilot cities. As part of the INDOBUS project, a pre-feasibility study (October 2019 to June 2020) and feasibility study (December 2020 to December 2021) were conducted in Makassar City to understand the feasibility of introducing BRT in the surrounding area. Both the studies were conducted by Far East Mobility, a Chinese consultancy company commissioned by GIZ. Some of the pre-feasibility results are available on https://makassarbrt.net/. 15 routes (for small, medium, and large buses) around the city were considered in the pre-feasibility stage as shown in Figure 2-23.

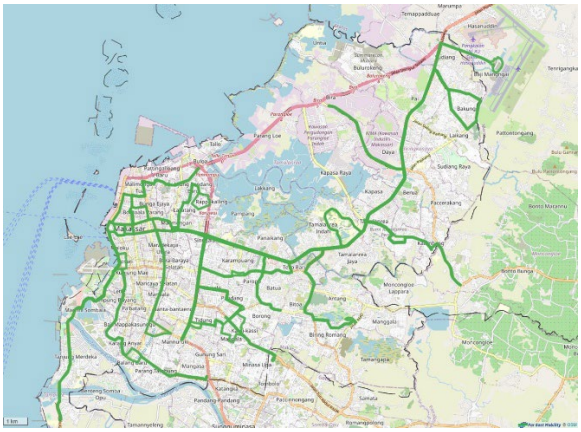
Table 2-9 Overview of INDOBUS

Item	Details
Project duration	2017 to 2022
Funding	7.1 million euros
Funding source	Swiss State Secretariat for Economic Affairs (SECO)
Objective	To develop and implement BRT systems in five pilot cities in accordance with the international standards
Scope	National level ・Creation of a steering committee ・Formulation of integrated multimodal transportation policies ・Creation of a government agency for public transportation (BRT) ・Development of a framework for BRT system

[17] Deutsche Gesellschaft für Internationale Zusammenarbeit(GIZ) is the main German development agency. It provides services in the field of international development cooperation and international education work.

	Quasi-state level ・Development of BRT lanes and concepts in pilot cities

Source: GIZ



Source: Far East Mobility

Figure 2-23 BRT Route Network Plan in Pre-F/S

Source: GIZ

Figure 2-24 Image of BRT Station

(2) Makassar-Parepare Railway

The Makassar-Parepare Railway is a 142 km long railway connecting Makassar City and Parepare City in central South Sulawesi (Figure 2-25). The construction is funded by the PPP Scheme. This will be the first railway on Sulawesi Island and will cater to passengers as well as serve as a freight railway for transporting cement and other material produced along the railway lines.

Limited test operations began on October 29, 2022. During the test period, the Ministry of Transportation and Indonesian Railways are operating one up and one down train per day between Garongkong and Mangilu stations.Construction work on the section within Makassar City has not yet begun[18]. According to the plan, the terminal station will be built in the Taro area near the new port of Makassar.

Source：Indonesia Investment Coordinating Board

Figure 2-25 Rail Route Plan for Makassar-Parepare Railway

[18] https://www.pwc.com/id/en/media-centre/infrastructure-news/january-2023/transportation-minister-boosts-acceleration-of-maros-mandai-railway-line-project.html

Source：https://travel.kompas.com/image/2023/01/28/100500227/kereta-api-pertama-di-sulawesi-rute-makassar-parepare-resmi-beroperasi?page=1

Figure 2-26 Railway Vehicles

Source：Survey Team

Figure 2-27 Maros Station

(3) MRT Introduction Plan

Currently, the governor of South Sulawesi Province is leading a study to introduce MRT in the Maminasata Metropolitan Area. MRTJ (PT MRT Jakarta), which already operates the MRT in the Jakarta metropolitan area, is cooperating in this study. This cooperation is based on a Memorandum of Cooperation between the Special Capital Region of Jakarta and the South Sulawesi Province[19].The MRT under consideration will be connected to the Makassar-Parepare railway, which is being developed separately and is expected to connect Maros Regency to Gowa Regency via Makassar City[20].

(4) LRT Introduction Plan

Introduction of LRT is one of the strategic programs which was developed by the Mayor of Makassar City. The Government of Korea expressed interest in implementing pre F/S at grant aid[21] at a meeting between the Mayor of Makassar City and the Korean Trade-Investment Promotion Agency in August 2022, although it is still in the conceptual stage and specific studies have not yet been conducted.

2.2.3 BRT System Implemented in the Past

A BRT system known as Trans Mamminasata was introduced around Makassar City in the past. 11 BRT routes were planned for Trans Mamminasata, and the first route (Route 2) began operating in March 2014. Three more routes were put into service in 2015 (routes 3, 4, and 8), however, the remaining seven routes were never put into service. The operations of the system were suspended around 2018(Table 2-10).

Makassar City Transportation Office cited the following two reasons as the cause of suspension of operations. 1) The passengers disliked the waiting time of BRT because of insufficient operation

[19] https://jakartamrt.co.id/id/info-terkini/pt-mrt-jakarta-perseroda-siap-bantu-kembangkan-mrt-di-sulawesi-selatan

[20] https://upeks.co.id/2022/10/atasi-kemacetan-mrt-mamminasata-segera-dibangun/

[21] https://mediawarta.com/2022/11/09/mif-2022-korea-selatan-lirik-proyek-lrt-kota-makassar/

time management and the lack of location information of BRT; 2) The users drifted away due to the emergence of ride-hailing services which provide easy and convenient access to information such as waiting times. These two reasons may have contributed to the suspension of BRT service as the growth in the number of passengers remained sluggish and the operating company was unable to secure enough fare revenue to cover the expenses required to keep the BRT service in operation.

Source：https://www.jawapos.com/jpg-today/03/04/2019/bus-cepat-makassar-perlahan-mati/

Figure 2-28 Trans Mamminasata

Source：Study Team

Figure 2-29 Site of Trans Mamminasata Station

Table 2-10 Trans Mamminasata Operation Routes and Operation Record

No.	Operation route	Operation record
1	Bandara-Tol-Jl.Nusantara-Jl . Ahmad Yani-Jl. Jenderal Sudirman-JlHaji Bau-Jl Metro tanjung Bunga-Trans Studio-Mal GTC (go). Mal GTC-Trans Studio-Jl. Metro tanjung Bunga-Jl Penghibur-Jl Pasar Ikan-Jl Ujung Pandang-Jl Nusantara-Tol-Bandara (back).	No operation record (plan only)
2	Mal GTC-Trans Studio-Jl Metro tanjung Bunga-Jl Penghibur-Jl Pasar Ikan-Jl Ujung Pandang-Jl Ahmad Yani-Jl Bulusaraung-Jl Masjid Raya-Jl Urip Sumoharjo-Jl AP Pettarani-Jl Boulevard-Mal Panakkukang (go). Mal Panakkukang-Jl Boulevard-Jl AP Pettarani-Jl Urip Sumoharjo-Jl Bawakaraeng-Jl Jenderal Sudirman-Jl. Sam Ratulangi-Jl Kakatua-Jl Gagak-Jl Nuri-Jl Rajawali-Jl Metro tanjung Bunga-Trans Studio-Mal GTC (back)	From 2014 (currently out of service)
3	Terminal Daya-Jl. Perintis Kemerdekaan-Jl. Urip Sumoharjo-Jl. AP Pettarani-Jl. Sultan Alaudin-Jl. Gowa Raya-Terminal Pallangga (Roundtrip)	From 2015 (currently out of service)
4	Terminal Daya-Jl Perintis Kemerdekaan-Bandara-Jl Poros Makassar Maros-Terminal Maros (Round trip)	From 2015 (currently out of service)
5	Untia-Terminal Panampu-Jl. Tinumbu-Jl Ujung-Jl Bandang-Jl Veteran Utara-Jl Veteran Selatan-Jl.Sultan Alaudin-Jl Gowa Raya-Terminal Pallangga (Round trip)	No operation record (plan only)
6	Terminal Pallangga-Jl.Poros takalar-Jl Raya Bontomanai-Barombong-Mal GTC (Round trip).	No operation record (plan only)
7	Terminal Pallangga-Jl Poros takalar-Terminal takalar (Round trip).	No operation record (plan only)
8	Terminal takalar-Galesong Selatan-Galesong Utara-Barombong-Mal GTC (Round trip).	From 2015 (currently out of service)
9	Terminal Daya-Jl Lingkar Tengah-Bontomanai-Jl Poros takalar-Terminal Pallangga (Round trip).	No operation record (plan only)
10	Terminal Daya-Jl Lingkar Luar-Bontomanai-Jl Poros takalar-Terminal Pallangga (Round trip).	No operation record (plan only)
11	Terminal Maros-Jl By Pass Mamminasata– Bontomanai-Barombong (Round trip).	No operation record (plan only)

Source: Study Team

3. System and Implementation Structure for the Utilization of MBD

3.1 System for Utilization of MBD

In this study, Study team proposes to acquire the location information of a smartphone through Agoop SDK and use it for transportation scheduling. Study team consulted a lawyer and confirmed that the location information would be handled in accordance with relevant laws and regulations such as Indonesia's Personal Data Protection Law.

3.1.1 Indonesia's Personal Data Protection Law

In Indonesia, Law No. 27 of 2022 on Personal Data Protection, a unified law on personal data protection, came into effect on October 17, 2022.

But, there was no unified law and regulation regarding the protection of personal data in Indonesia prior to the Personal Data Protection Law (hereinafter referred to as “PDPL”). Particular individual laws and regulations according to each industry sector were applied. The followings are major laws and regulations.

① Law No. 11/2008 concerning electronic information and transactions (and law No. 19/2016, collectively hereinafter referred to as” Law No. 2008”)

② Government Regulation No. 71/2019 concerning electronic system and transaction operation (amendment of electronic system and transaction operation No. 82/2012, hereinafter referred to as "Government Regulation No. 2019")

③ The protection of personal data in electronic system, 2016 Issue 20 (hereinafter referred to as “2016 Regulation”).

However, even after the enforcement of the PDPL, the above individual laws and regulations are still considered valid as long as they do not conflict with the PDPL. So it is basically necessary to comply with the previous individual laws and regulations.

(1) Personal Data Protection Law

1) Definition of personal data

Personal data is defined according to the PDPL as follows.

“Personal data is any data related to an individual (natural person) or “Data Subject” that is identified or identifiable independently or in combination with other information, directly or indirectly, through the use of an electronic system and/or non-electronic means.”

The PDPL classifies personal data into " Specific Personal Data" and "General Personal Data" as follows

Article 4 (2) Specific Personal Data a. Health data、b. Biometric data、c. Genetic data、d. Crime records、e. Child data、f. Personal financial data、 g. Other data in accordance with the provisions of laws and regulations; and

Article 4 (3) General Personal Data a. Full name, b. Gender, c. Citizenship, d. Religion, e. Marital status; and/or, f. Combined personal data to identify a person

2) Eligibility

The eligibility is described in Article 2 of the PDPL as follows:

The PDPL applies to individuals, companies, public authorities, and international organizations that process personal data if they meet the following requirements

Article 2 a. within the jurisdiction of the Republic of Indonesia; and/or b. outside the jurisdiction of the Republic of Indonesia but with a legal consequence: (i) within the jurisdiction of the Republic of Indonesia; and/or (ii) on the personal data subjects of Indonesian citizens outside the jurisdiction of the Republic of Indonesia.

3) Overseas transfer

The Overseas transfer is described in Article 56 of the PDPL as follows:

Article 56 a. The country in which the personal data controller/processor receives the personal data has protection provisions that exceed the level of personal data protection stipulated in the PDPL. b. If (a) is not satisfied, there must be adequate and binding personal data protection c. If (a) and (b) are not satisfied, obtain the consent of the individual

(2) Individual laws and regulations

Individual laws and regulations also stipulate the handling of personal data in Indonesia,. Some requirements to protect data are contained in Law No. 2008, Government Regulation No. 2019 and 2016 Regulation. In these regulations, security, confidentiality, obligations, etc. when electronic system operators handle personal data obligation is stipulated.

1) Definition of personal data

The definition of personal data is described in Government Regulation No. 2019 and 2016 Regulation as follows:

It is difficult to judge because abstract statements can be interpreted in a variety of ways although there is no explicit indication that the location data corresponds to specific personal information.

Government Regulation No. 2019 Article 1.27 27. Specific personal data that is stored, managed, and maintained in order to ensure its accuracy and confidentiality.

2016 Regulation Article 1.2 2. "Specific personal data" means "any precise and factual information that can directly or indirectly identify a specific individual".

2) Overseas application

The overseas application is described in Article 2 of Law No. 2008 and Government Regulation No. 2019, Article 1.33 as follows.

The application of laws and regulations related to Law No. 2008 is assumed to extend overseas. However, operation and regulation by external applications are currently difficult because there are no specific procedures or supervisory bodies in place.

Article 2 of Law No. 2008 This law applies not only to legal acts performed in Indonesia/or by Indonesian citizens, but also to all legal acts performed outside the jurisdiction of Indonesia that have legal implications and are performed by both Indonesian/foreign citizens or Indonesian legal organizations. In Indonesia, the use of information technology for electronic information and electronic transactions can be cross-regional or universal.
Government Regulation No. 2019 Article 1.33 An individual is defined as a person who is either an Indonesian citizen, a foreign citizen, or a legal organization.

3) Consent acquisition

Overseas transfers are described in Article 15 of Government Regulation No. 2019 as well as Article 1.4 and Article 6 of 2016 Regulation as follows.

The acquisition of personal data requires the consent of the individual. Signing the approval form in Indonesian is very simple.

Government Regulation No. 2019 Article 15(1) The electronic system organizer must: a. Maintain the confidentiality, integrity, and availability of the personal data they manage b. Obtain approval from the personal data owner for the acquisition, application, and utilization of the data unless otherwise determined by law and regulation. c. Obtain approval from the personal data owner for the use or disclosure of the data. Approval is subject to the purposes stated by the owner at the time of data acquisition.
2016 Regulation Article 1.4 After describing the acquisition, collection, processing, analysis, retention, display, publication, and transfer of the personal data, the approval of the personal data owner shall be obtained with their signature (manual or electronic). 2016 Regulation Article 1.6 For the approval of the personal data owner, electronic system operators must provide an approval

form in Indonesian.

(3) Lawyer's Opinion

1) Definition of personal information

Personal information is defined as extensive information that can identify an individual. The subject is considered ambiguous due to the lack of detailed guidelines.

(a) PDPL

The PDPL defines “personal data” as the data regarding individuals who are identified or can be identified separately or in combination with other information, either directly or indirectly, through an electronic or non-electronic system. Such definitions are similar to those in the previous individual laws and regulations discussed below.

The PDPL further classifies personal data into "specific personal data" and "general personal data.

(i) Specific personal data is considered to include the following

- Health data and information, e.g., individual records or information related to physical health, mental health, and/or health services;
- Biometric data, e.g., data related to an individual’s physical, physiological, or behavioral characteristics that enable unique identification of an individual, such as facial images or dactyloscopy data (biometric data also shall describe the uniqueness and/or characteristics of an individual that must be safeguarded and maintained, including but not limited to fingerprint records, eye/retina, and DNA samples);
- Genetic data, e.g., all data of any kind concerning the characteristics of an individual that are inherited or acquired during early prenatal development;
- Crime records, e.g., a written record of a person who has committed an illegal or unlawful act or is in the process of being judged for the committed act, including police records and inclusion in the prevention or deterrence list;
- Child data;
- Personal financial data, e.g., data on the number of deposits at banks including savings, deposits, and credit card data; and/or
- other data in accordance with the provisions of laws and regulations; and

(ii) General personal data is considered to include the following

- Full name
- Gender
- Citizenship
- Religion
- Marital status; and/or
- Combined personal data to identify a person, e.g., cellular phone numbers and IP

addresses.

(b) Individual laws and regulations

According to Government Regulation No. 2019 on the implementation of electronic system and transactions, personal information is defined as information that, alone or in conjunction with other information, directly or indirectly, through electronic systems or otherwise, is personally identifiable.

According to Regulation 2016 of the Ministry of Communications and Information on the protection of personal information in electronic systems, personal information is "data of a specific individual" that is stored, retained, maintained with accuracy, and protected for confidentiality. The term "specific personal data" refers to information that is accurate and factual, which can directly or indirectly identify an individual and is utilized in line with applicable laws and regulations. There are no further guidelines for these definitions.

Although specific examples are not given for what is included in "personal information", the definition of personal information is extensive in Indonesia. It is considered that "personal information" includes name, date of birth, address, telephone number, e-mail address, signature, videos or images (fingerprints, biometric information, etc.), ID number, etc.

2) Handling of location information

It is possible to argue that merely obtaining location information does not constitute personal information. It is assumed that it does not correspond to personal data because the information to be obtained consists solely of location information in this case.

If a specific individual cannot be identified from location information alone, there is room to say that it does not constitute "personal information". However, if location information is combined with information like 1) above, which can be used to identify a person, then location information becomes "personal information".

As a result, if simply location information is obtained, it is safe to presume that it does not correspond to personal information because it cannot identify a person on its own. However, if other information is also acquired at the same time, and if it can be used to identify an individual by combining it with location information, it is considered personal information. Therefore, it becomes vital to evaluate what sort of information is gathered by the mobile device in addition to the location information.

As described above, the statute's definition of "personal information" is broad, and it is not uncommon in Indonesia for authorities to provide interpretations going beyond reason. As a result, it shall be noted that in Indonesia, location information may be considered personal information.

3) Regulations concerning the acquisition of personal information

The study states that when acquiring location information using an application, it is safe to introduce a framework in which the user agrees to the acquisition and its expected use (including overseas transfer) when downloading the application.

(a) PDPL

Under PDPL, one of the following grounds of lawfulness is required in order to process personal data.

a. Consent: Explicit and valid consent from the personal data subject to one or more of the specific purposes that have been notified.
b. Contract: fulfillment of agreement obligations in the event that the personal data subject is one of the parties or fulfillment of the request from the personal data subject when entering into an agreement
c. Legal obligation: fulfilment of the legal obligations of the personal data controller
c Vital interests: fulfillment of the protection of the vital interests of the personal data subject
d. Public duty: carrying out duties in the context of the public interest, public service, or the exercise of the authority of the personal data controller based on laws and regulations; and/or
e. Legitimate interests: fulfillment of other legitimate interests by considering the purposes, needs, and balance of interests of the personal data controller and the rights of the personal data subject

PDPL also requires the following information to be provided to personal data subjects prior to processing personal data. In addition, the controller must notify the personal data subject in the event of any changes to these notices.

a. Legal justification for the processing
b. Purpose of the processing
c. The type and relevance of the personal data being processed
d. Period of retention of documents including personal data
e. Details of the information to be collected
f. Period of processing personal data
g. Rights of the data subject.

(b) Individual laws and regulations

Any personal information processing activities (hereinafter "processing"), including acquisition, collection, processing, analysis, storage, modification, distribution, display, publication, disclosure, update, transfer, deletion, or disposal, require the prior written consent of the information subject and must be conducted in Indonesian.

Furthermore, according to the 2016 Regulations, the purpose of processing personal information must be disclosed to the information subject, and the information must be handled in accordance with the original purpose.

These individual laws and regulations don’t stipulate any specific exceptions to the obligation to obtain consent. However, as stated in (a) above, the PDPL allows room for personal data to be obtained based on other grounds of legality even if the consent of the

subject of the information is not available. Therefore, the PDPL takes precedence over individual laws and regulations, and it is considered possible to acquire personal data on the basis of the legality grounds set forth in the PDPL. (However, please note that neither the Indonesian authorities nor the courts have explicitly stated a decision in this regard.)

4) Applicable laws and regulations governing the protection of personal information

PDPL applies to individuals, companies, public authorities, and international organizations that process personal data if they meet the following requirements. However, the interpretation of the "legal effect" requirement is unclear.

The individual laws and regulations apply to electronic system operators both inside and outside the Republic of Indonesia. However, they don't specify the scope of their application. Therefore, it is vital to act with caution.

(a) PDPL

PDPL applies to individuals, companies, public authorities, and international organizations that process personal data if they meet the following requirements.

a. within the jurisdiction of the Republic of Indonesia; and/or

b. outside the jurisdiction of the Republic of Indonesia but with a legal consequence:

(i) within the jurisdiction of the Republic of Indonesia; and/or

(ii) on the personal data subjects of Indonesian citizens outside the jurisdiction of the Republic of Indonesia.

However, it is not clear from the language of the statute what is meant by "legal effect," a requirement for the extraterritorial application of the PDPL, and how to determine its existence.

Unlike the GDPR, the PDPL does not require the appointment of an in-country representative even if the PDPL applies to an overseas controller or another person.

(b) Individual laws and regulations

In terms of subject to which individual laws and regulations apply, the Government Regulation No. 2019 applies to the electronic system operators, defined as individuals who prepare, manage, and operate electronic systems for themselves or for third parties, either alone or in collaboration.

The 2016 Regulation also applies to electronic system operators and is broadly defined as equivalent to the Government Regulation No. 2019.

It is unclear to what extent a person can be considered an electronic system operator if they use a computer or other means to store personal information.

Law No. 2008 explicitly states the scope of application, noting that it has a legal effect both inside and outside the territory of the Republic of Indonesia if it is detrimental to the interests of the Republic of Indonesia. However, as far as our Indonesian law attorneys

are aware, there have been no prosecutions for the acts of foreign corporations.

5) Overseas transfer of personal information

PDPL will likely make it unnecessary to obtain consent for overseas transfers, but no clear decision has been made by the Indonesian authorities or courts. Transferring personal information outside the country is considered as a form of "processing" in accordance with individual laws and regulations. Therefore it is deemed necessary to obtain the consent of the information subject, and it is desirable to examine it in this study.

(a) PDPL

According to the PDPL, a controller who transfers personal data overseas must ensure that the destination country has a level of personal data protection equal to or higher than the Personal Data Protection Act.

a. if the controller can ensure adequate and binding personal data protection
b. If a. cannot be satisfied, obtain the consent of the data subject.

(a) Individual laws and regulations

It is necessary to obtain the consent of the information subject in principle, as stated in 1) above since transferring personal information outside the country is considered as a form of "processing",.

However, the PDPL takes precedence to that extent, and obtaining consent for overseas transfers would not be necessary since the PDPL does not require the consent of the data subject in certain cases, as described in (a) above. (However, it shall be noted that neither the Indonesian authorities nor the courts have explicitly stated a decision in this regard.)

Furthermore, electronic system operators with Indonesian addresses must notify the Ministry of Communications and Information of their plans to transmit personal data and report after transfer according to the 2016 Regulation.

6) Studies under consideration

When downloading applications equipped with the SDK, it is presumed that it is safe to introduce a framework in which users' consent for obtaining location information, etc. is obtained, and it is desirable to follow this framework in this study.

In the case where only pure location information is acquired and transferred overseas, separated from information that can identify an individual when combined with location information, there is room for interpretation that the above laws and regulations on the protection of personal information do not apply. However, it can be difficult to clearly distinguish the extent to which information is personally identifiable information. Also, please note that it is unclear how the authorities will interpret this information.

When using applications as a means of acquiring location information via mobile terminals,

it would be safe to introduce a framework for obtaining consent from the user for the acquisition and assumed use (including overseas transfer) of location information when the application is downloaded. However, it shall be noted that the Indonesian courts have not provided an interpretation of the form of consent.

7) Examples of services using mobile phone location information

Services utilizing location information of mobile phones such as Grab and Google Maps are presumed to have secured the consent of the information subject.

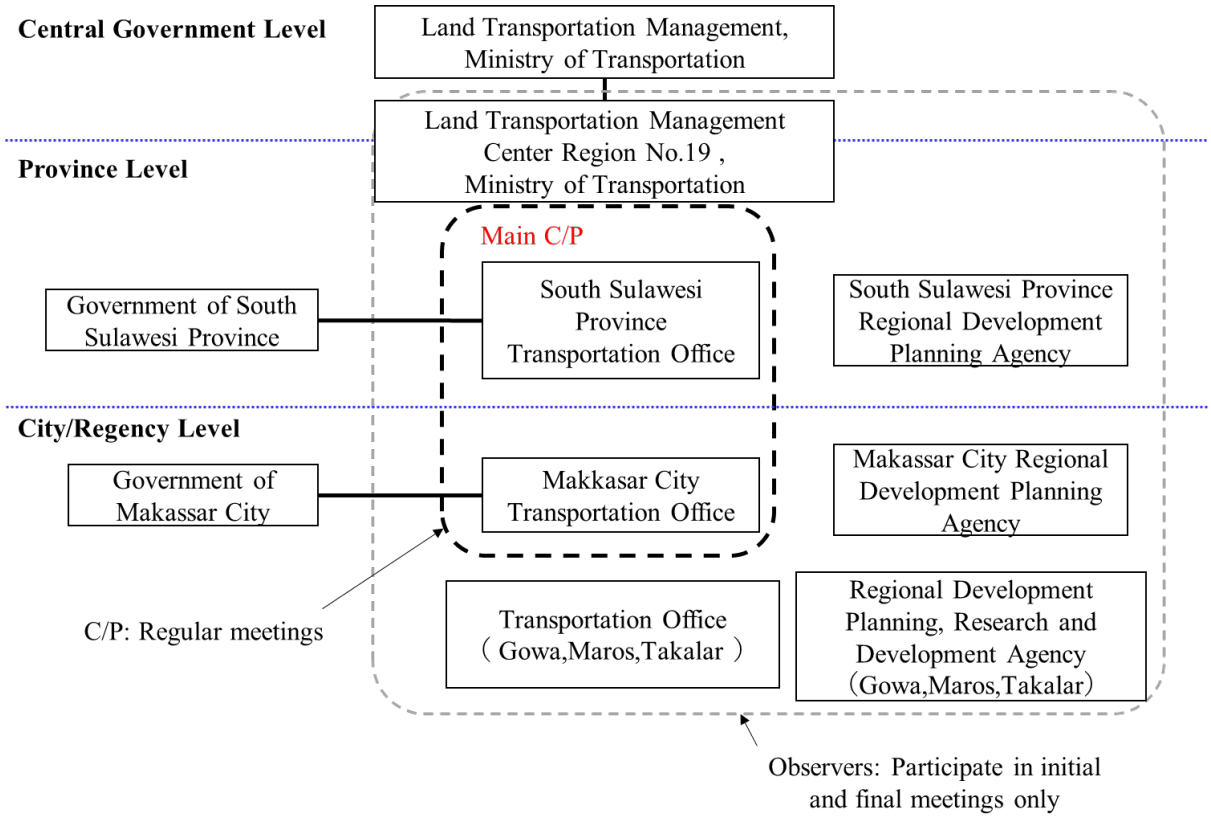
Applications like Grab/Google Maps are assumed to have acquired consent because location information can be used to identify an individual when paired with other data.

3.2 Implementation Structure for Utilization of MBD

3.2.1 Implementation Structure for Utilization of MBD

Based on the opinions of the person in charge of the South Sulawesi Province Transportation Office, an implementation structure as shown in Figure 3-1 was established for the implementation of this study, and discussions were held based on this implementation structure. Specifically, the South Sulawesi Province Transportation Office, which is in charge of public transportation in the Mamminasata Metropolitan Area, and the Makassar City Transportation Office, which is in charge of public transportation in Makassar City, were selected as the main counterparts. Study team asked the South Sulawesi Province Transportation Office to play a central role in coordinating the joint discussions. Progress meetings were held regularly with these two agencies to exchange views.

Efforts were made to avoid difficulties in coordinating the schedule of discussions and gathering opinions due to the large number of organizations involved. The Transportation Office of three municipalities surrounding Makassar City and the Regional Development Planning Agencies of the provinces and municipalities in charge of urban and regional planning in the target area were invited to participate only in the initial kick-off meeting and the final report meeting as observers. This study also collaborated with the Land Transportation Management Center Region No.19, Ministry of Transportation. This organization and the South Sulawesi Province Transportation Office manage the Teman Bus demonstration operation in the target area.



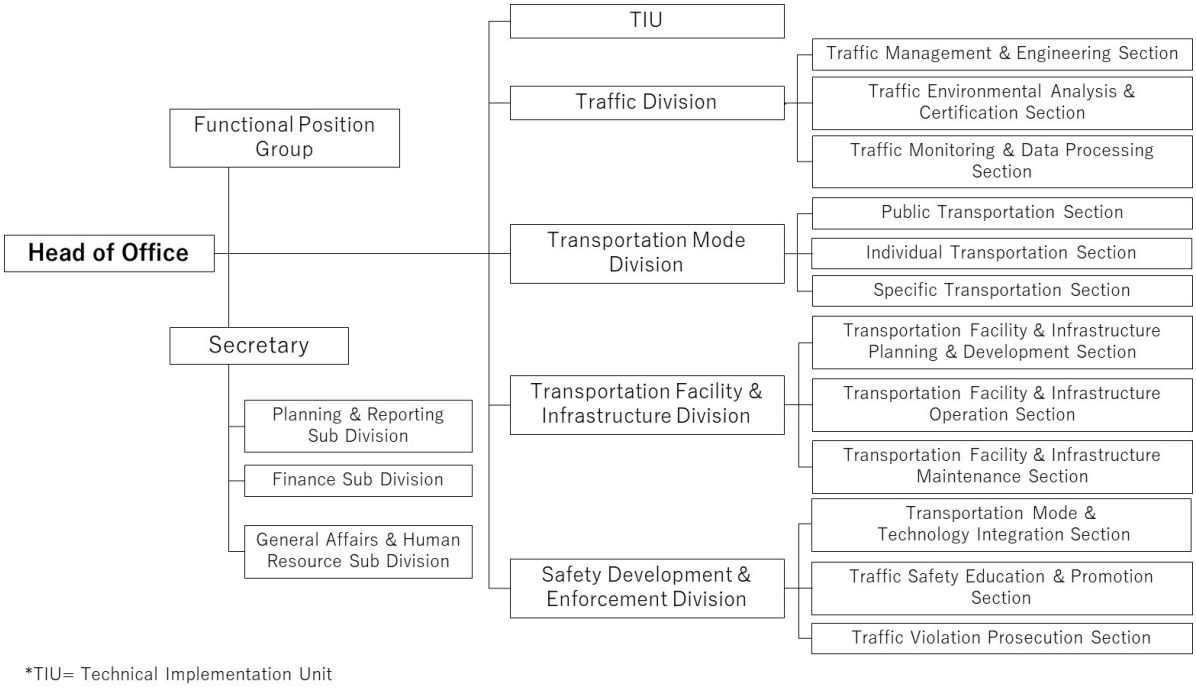
Source：Study Team

Figure 3-1 Implementation Structure for MBD Utilization

(1) Implementation Structure of Makassar City Transportation Office

The Head of Office appointed by the mayor of Makassar City leads the Makassar City Transportation Office (Figure 3-2). Their primary responsibilities include formulating technical policies concerning land/sea transportation, developing plans and programs, and issuing transportation-related permits. There are four divisions and one technical implementation unit (TIU) under the director. Traffic Monitoring & Data Processing Section is part of the Traffic Division. However, no traffic measure plan utilizing MBD has been implemented. Moreover, it has a central control room in the station that operates and monitors smart traffic lights (traffic lights with speakers and CCTV cameras) that are installed in four locations throughout the city (Figure 3-3,Figure 3-4). On the other hand, no central control is in place for other general traffic signals. Also, data interface with the aforementioned war room is yet to be established.

In addition, the Public Transportation Section under the Transportation Mode Division is in charge of public transportation. This office currently has no plan to utilize MBD in public transportation.



Source: Study Team

Figure 3-2 Organization Chart of Makassar City Transportation Office

Source: Study Team

Figure 3-3 Central Control room Monitoring Screen

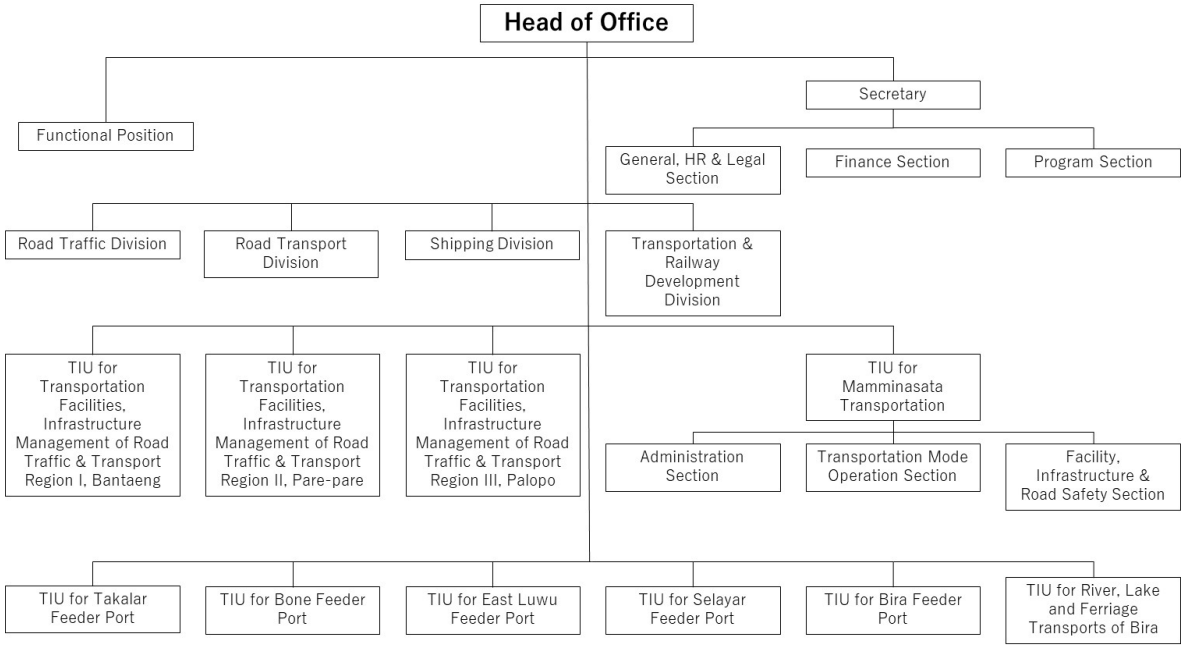
Source: Study Team

Figure 3-4 Monitoring by City Transportation Office staff

(2) Implementation Structure of South Sulawesi Province Transportation Office

The Head of Office appointed by the governor of South Sulawesi Province leads the South Sulawesi Province Transportation Office (Figure 3-5). Their primary responsibilities include formulating technical policies concerning land (including railways) and sea transportation, developing plans and programs, and issuing transportation-related permits in South Sulawesi Province. There are four divisions and 10 TIUs that have jurisdiction over each region of the state under the director. TIU for Mamminasata Transportation is the office responsible for public transportation in Mamminasata Metropolitan Area, including Makassar City. This office currently

has no plan to utilize MBD in public transportation.



Source: Study Team

Figure 3-5 Organization Chart of South Sulawesi Province Transportation Office

3.3 Issues Related to System and Implementation Structure for the MBD Utilization

3.3.1 Issues of MBD Utilization System

The location data handling was checked against Indonesia's PDPL and individual laws and regulations, and the opinion of a lawyer was obtained. As a result, there is a room for interpretation that laws and regulations on personal data protection do not apply when only location data is acquired and transferred out of the country. It should be noted that it is sometimes difficult to clearly distinguish the extent to which information is personally identifiable information. So it is unclear what interpretation the authorities will take.

In addition, the PDPL has just been enacted on October 17, 2022 and specific sub-regulations will be drafted in the future. Therefore monitoring of the progress of the Law will be necessary.

3.3.2 Issues Related to Implementation Structure for MBD Utilization

The TIU for Mamminasata Transportation is responsible for the development of the public transportation plan in the Mamminasata Metropolitan Area. However, local government staffs move between various organizations and departments in cycles of months or years (e.g., from Gowa Regency Environment Office to South Sulawesi Province Transportation Office, from South Sulawesi Province Transportation Office to South Sulawesi Province Information and Communication Office, etc.). Therefore, it is very difficult for them to pass on their know-how and

formulated plans, if they acquire and accumulate experience and knowledge about transportation planning using MBD, when they are transferred after a certain period.

The central government (Ministry of Transportation) is currently taking the lead in introducing programs such as Teman Bus, BRT, and Railway. Therefore, a permission from the central government will be required to make changes to the actual operation routes even if a new public transportation plan is developed using the MBD at provincial level.

In addition, the South Sulawesi Province Transportation Office reported that while several aid agencies, such as GIZ, have already implemented proposals for public transportation planning. The final reports containing those proposals are held only by the Ministry of Transportation and not shared with the South Sulawesi Province Transportation Office. This relationship between the central government level (Ministry of Transportation) and the province level (the South Sulawesi Province Transportation Office) can also be a barrier to supporting the development of public transportation plans using MBD.

Furthermore, in developing a public transportation plan for the Mamminasata Metropolitan Area, it is necessary to consult and reach a consensus not only with the Ministry of Transportation, but also with the various concerned agencies. Those include mainly the transportation authorities in Makassar City, Gowa Regency, Maros Regency, and Takalar Regency, as well as many stakeholders, including “ORGANDA” (an industry organization for Pete Pete drivers), bus operating companies, etc. In particular, "ORGANDA" is strongly influenced by politics, and local governments cannot ignore it. Gaining understanding and cooperation on public transportation planning using MBD will be an unavoidable issue in realizing a new public transportation plan that utilizes MBD.

4. Situation and Requirements for MBD Utilization in the Transportation Sector

Several meetings were held with the Agencies of Makassar City, Province Transportation Office, and other related agencies to understand the actual situation of utilization of MBD in the transportation sector and their utilization needs, and to obtain feedback on the results of the MBD analysis.

4.1 Summary of Meeting

The meetings with the Agencies of Makassar City, Province Transportation Office, and other related agencies are summarized below.

Table 4-1 Summary of Discussions

No.	Date and Time	Details	Participants
1	October 6,2022 11:00 to 14:00	＜The 1st meeting＞ 1.Background of the MBD study 2.Outline of the study 3.Exchange of opinions	・Land Transportation Management Center Region No.19, Ministry of Transportation ・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Transportation Office, Gowa Regency ・Transportation Office, Maros Regency ・Transportation Office, Takalar Regency ・Regional Development Planning Agency, Makassar City ・Regional Development Planning, Research and Development Agency, Gowa Regency ・Regional Development Planning, Research and Development Agency, Maros Regency ・Regional Development Planning, Research and Development Agency, Takalar Regency ・Hasanuddin University
2	November 7,2022 10:00 to 11:00	＜Courtesy call on the Governor of South Sulawesi Province＞ 1.Background of the MBD study 2.Outline of the study 3.Exchange of opinions	・Governer of South Sulawesi Province ・Hasanuddin University
3	December 6,2022 16:00 to 18:30	＜The 2nd meeting＞ 1. Confirmation of comments from 1st meeting 2. Explanation of MBD analysis results 3.Exchange of opinions	・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Cooperation Division, Makassar City
4	February 8,2023 15:20 to 18:00	＜The 3rd meeting＞ 1.Confirmation of comments from 2nd meeting	・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Cooperation Division, Makassar City

		2.Proposed Teman Bus corridor 3.Exchange of opinions	
5	March 27, 2023 11:00 to13:40	＜The 4th meeting＞ 1. Confirmation of comments from 2nd/3rd meeting 2.Teman Bus corridor, proposed Pete Pete route 3.Exchange of opinions	・Land Transportation Management Center Region No.19 , Ministry of Transportation ・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Transportation Office, Gowa Regency ・Transportation Office, Maros Regency ・Transportation Office, Takalar Regency ・Regional Development Planning Agency, Makassar City ・Regional Development Planning, Research and Development Agency, Gowa Regency

Source：Study Team

4.2 Outcome of Meetings

4.2.1 The 1st Meeting (Kick-Off Meeting)

(1) Participants

1) Indonesian side: Face-to-Face Meeting

- Land Transportation Management Center Region No.19, Ministry of Transportation
  - Husni Mubarak (Chief of Land Transport & Road Traffic Section)
  - Ruslan Dani (Staff)
  - Muhajir Syam (Staff)
- Transportation Office, South Sulawesi Province
  - Andi Nur Diyana (Chief of Mamminasata Technical Implementattion Unit)
  - Tina (Mamminasata Technical Implementattion Unit)
  - Muh. Isran (Chief of Transport and Railway Division)
  - Anmdar (Transport and Railway Division)
- Transportation Office, Makassar City
  - Tibrisi Mustari (Chief of Infrastructure Division)
  - Jasman Launtu (Chief of Transportation Mode Division)
- Transportation Office, Gowa Regency
  - Made Dianing (Chief of Traffic Division)
- Transportation Office, Maros Regency
  - Muh. Darwis (Head of Office)
  - Ahmad Sila (Policy Analysis Division)
- Transportation Office, Takalar Regency
  - Mappaturu (Secretary of Office)
  - Jamaluddin Opa (Staff)
- Regional Development Planning Agency, Makassar City

- Yamliah Akhir (Staff)
- Regional Development Planning, Research and Development Agency, Gowa Regency
  - Andi Nurhiyana (Staff)
  - Ingga Arfandi (Staff)
- Regional Development Planning, Research and Development Agency, Maros Regency
  - Najib (Head of Agency)
  - Mustika (Staff)
- Regional Development Planning, Research and Development Agency, Takalar Regency
  - Rahmansyah (Head of Agency)
  - Muhammad Waris Jaya (Staff)
  - Raliman laitu (Staff)
- Hasanuddin University
  - Ilham Bakri (Lecturer)

2) Japanese side: Hybrid Meetings (Face-to-Face & Online Meeting)

- International Policy Division, Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism
  - Nami Sato(International Transport Strategy Officer), Akitsugu Ookuma(International Cooperation Officer), Tetsuya Hatta (Chief Officer)
- Nippon Koei Co., Ltd
  - Hisanari Ushirooka, Atsushi Mochizuki, Hiroya Totani, Keita Hirayanagi, Ryoma Yae, Kenta Kikuchi, Djamaluddin Ibrahim, Miftahul Khaer, Niar Rasyid
- Agoop Corp.
  - Yusuke Kato, Miki Fujii, Kotaro Kiyoshi
- PT. SBTelecom Indonesia
  - Kim Takkun, Sugimoto Ayae, Sinatrya Rahma

(2) Summary of Discussion

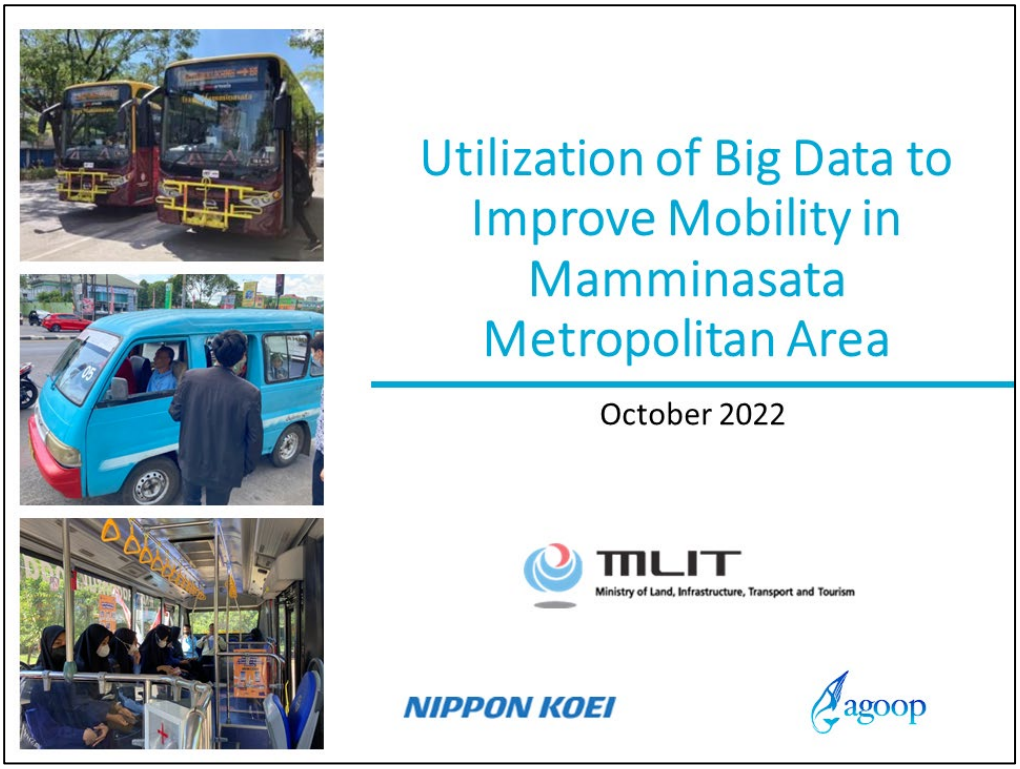
- The Japanese side explained the outline of Agoop SDK, the method of obtaining MBD, and the survey policy for this fiscal year.
- The NO.19 Regional Office commented that they hope that this study will not only evaluate Teman Bus corridors, but also recommend a route network plan for the entire Mamminasata Metropolitan Area that takes into account the overall route network plans of each city and province.
- Makassar City Regional Development Planning Agency commented that it is important to keep in mind that negotiating with app vendors that have few users in South Sulawesi will not ensure the validity of the data.
- Gowa Regency Transportation Office pointed out the need to conduct interviews to identify local needs.
- Takalar Regency Transportation Office commented that they look forward to this study because the

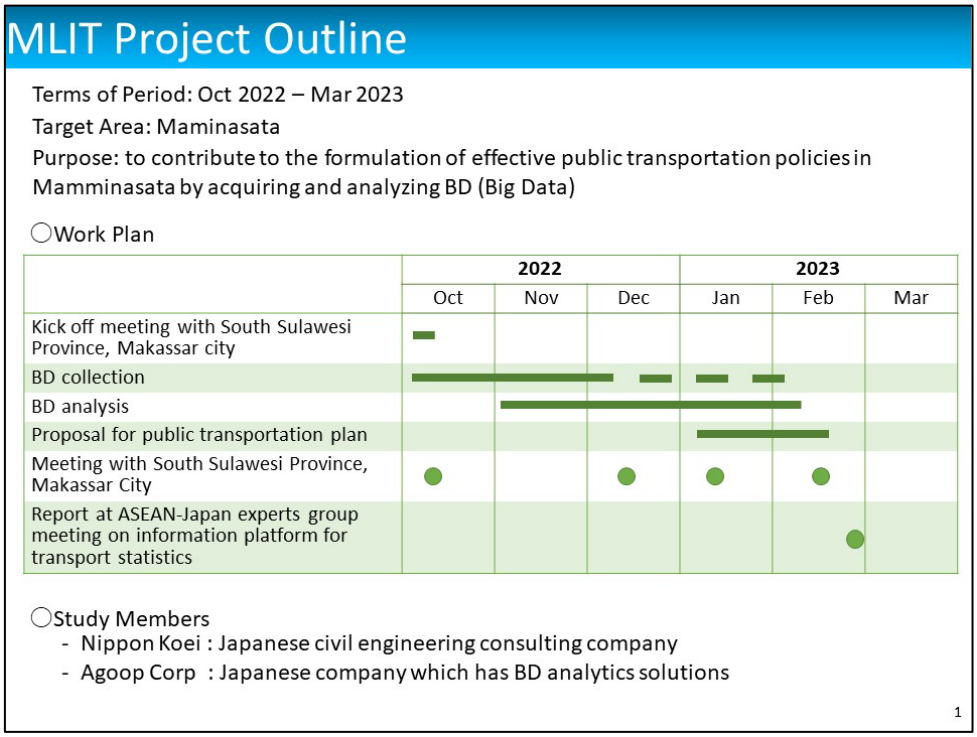
current Teman Bus corridor through Takalar Regency has limited coverage and new corridors are needed.

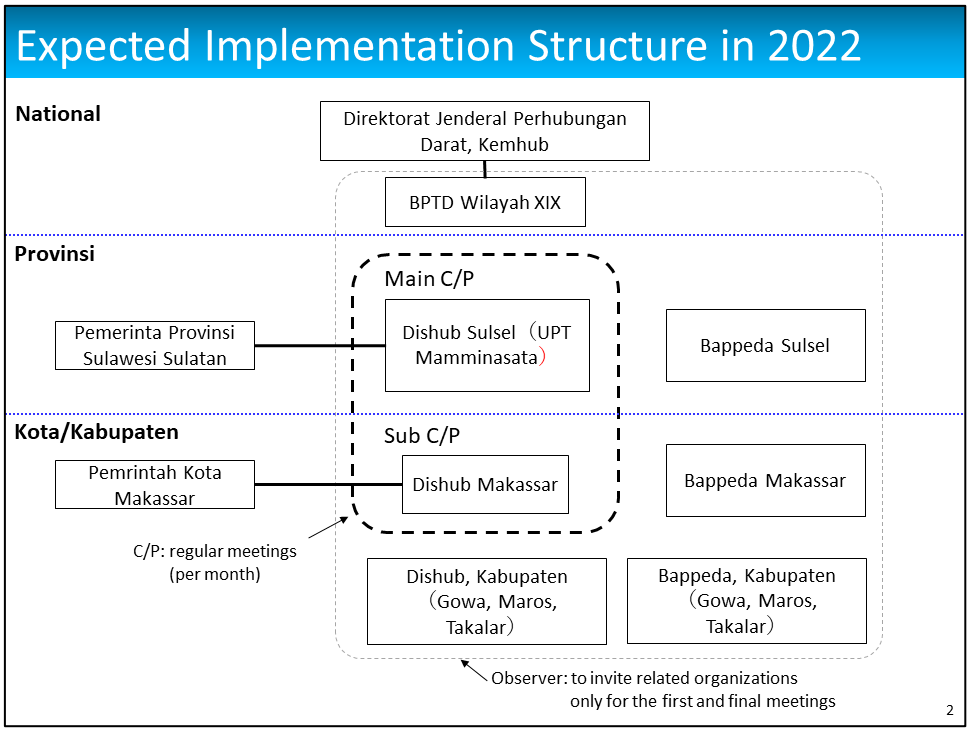
- Maros Regency Transportation Office shared information that the pilot operation of one of the Makassar-Parepare railways between Maros and Baru is scheduled to start in October 2022. They further commented that the connection between Teman Bus and the railway station and airport should be considered in the future.

(3) Meeting Materials

The meeting materials are as follows:



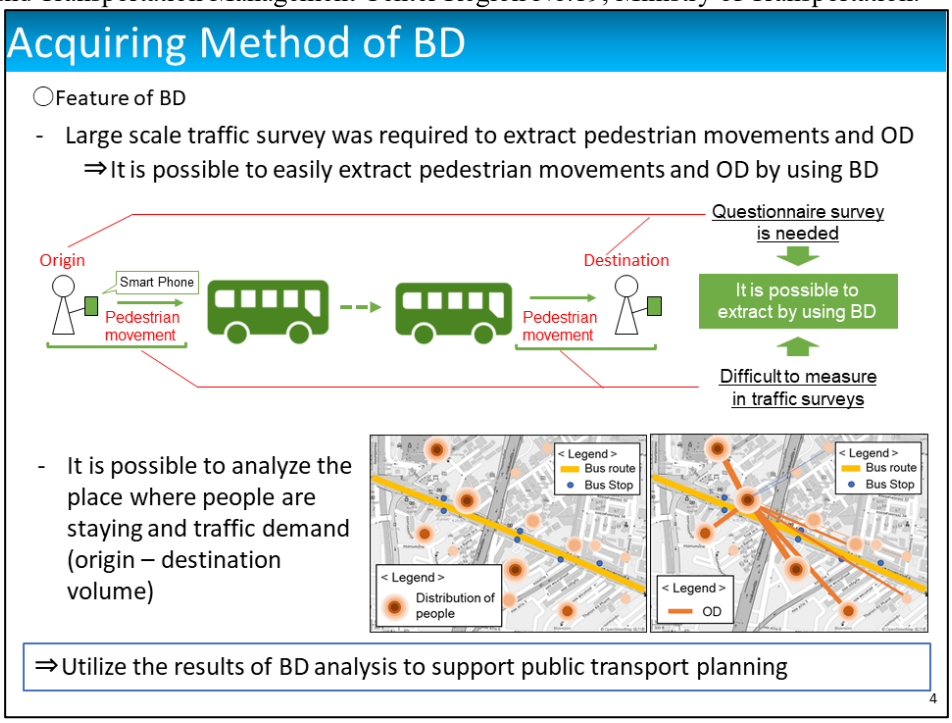


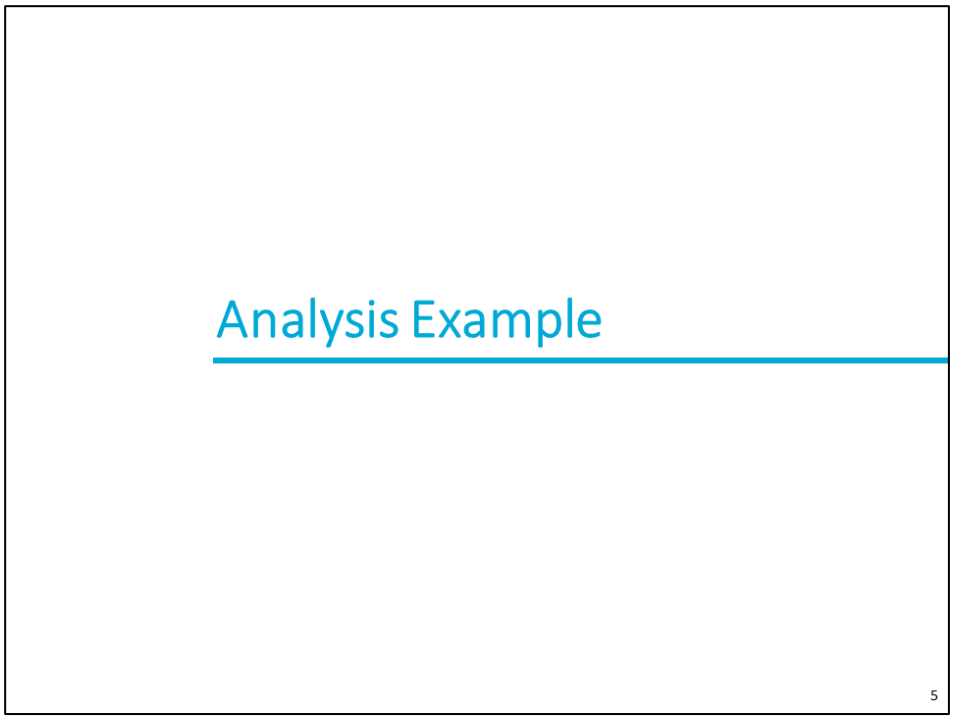


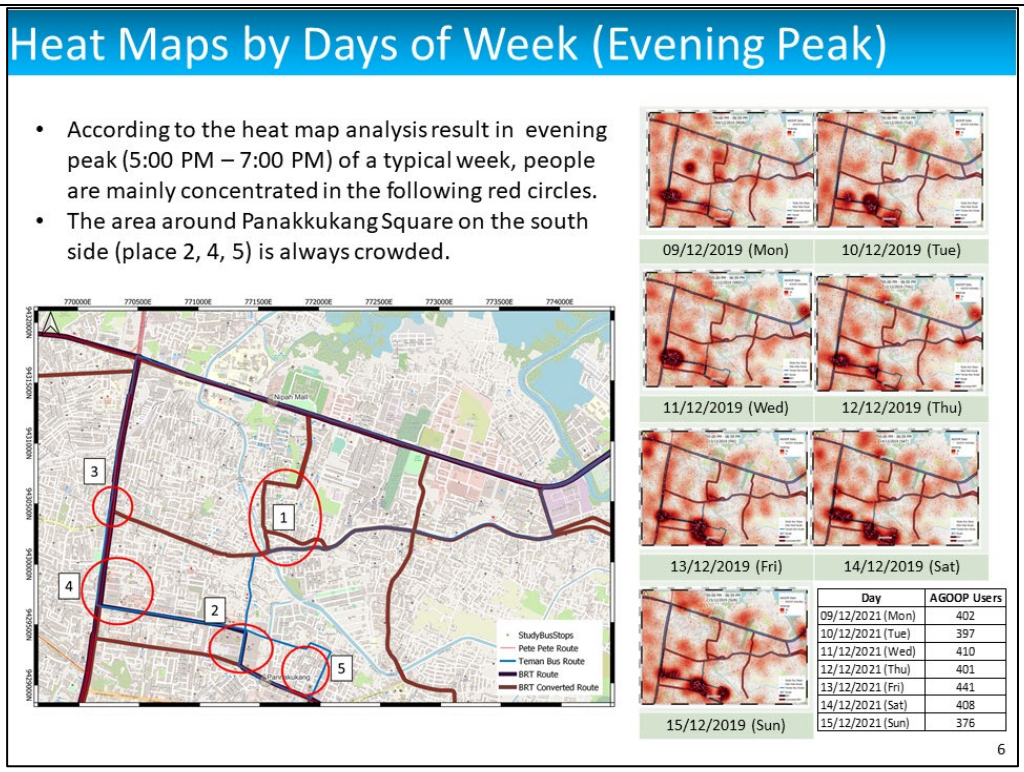
The South Sulawesi Province Transportation Office, which is in charge of public transportation in the Mamminasata Metropolitan Area, and the Makassar City Transportation Office, which is in charge of public transportation in Makassar City, were selected as the main counterparts. Progress meetings were held regularly with these two agencies to exchange views.

The Transportation Authority of the municipality surrounding Makassar City and the Regional Development Planning Agencies of the provinces and municipalities in charge of urban and

regional planning in the target area were invited to participate only in the initial kick-off meeting and the final report meeting as observers. The study work also involved collaboration with the Land Transportation Management Center Region No.19, Ministry of Transportation.

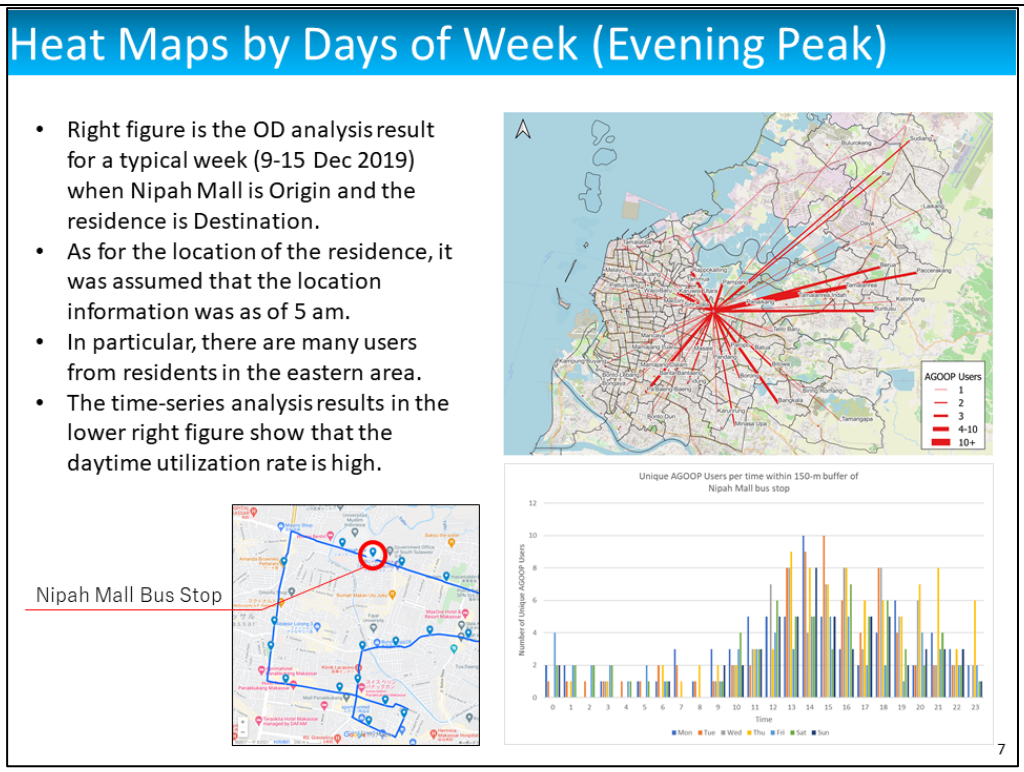






The analysis will focus on where people are concentrated at different times of the day and where people are moving from and to, and will be visualized by the heat map shown above and the OD Desired Line Diagram shown below.

From the heat map analysis, it is possible to understand when, where, and how many people are gathered by plotting the location information of application users' smartphones on a map and shading it according to its distribution density. For example, it can be seen that there are always a lot of people in the area circled in red in the above chart from 17:00 to 19:00 on 9/12/2019 to 15/12/2019 in areas No.2, No.4, and No.5.



The results of the Origin (Origin) - Destination (OD) analysis for the Makassar region are shown in the above figure. By conducting an OD analysis, it is possible to understand where and how much travel demand exists. For example, in the above figure, Nipah Mall in Makassar City is used as the starting point, and the location information at 5:00 a.m. in the early morning is assumed to be the place of residence and used as the destination. The results of the OD analysis show that there are many ODs from Nipah Mall to the eastern area of Makassar City.

Activities in 2022

8

BD Utilization Plan in 2022

BD analysis is conducted for the Mamminasata area in 2022 and conduct public transport planning proposals.

- Propose new Teman bus routes
  - Use the results of the BD analysis to confirm if there are other routes on which buses should be operated in addition to the routes currently serviced by Teman bus.
- Propose a feeder route (pete-pete)
  - Teman bus stops with particularly high demand will be identified and feeder traffic from these stops will be considered.
- Suggestions for Teman bus routes currently in operation
  - Make suggestions for the current Teman bus route based on the results of the BD analysis.

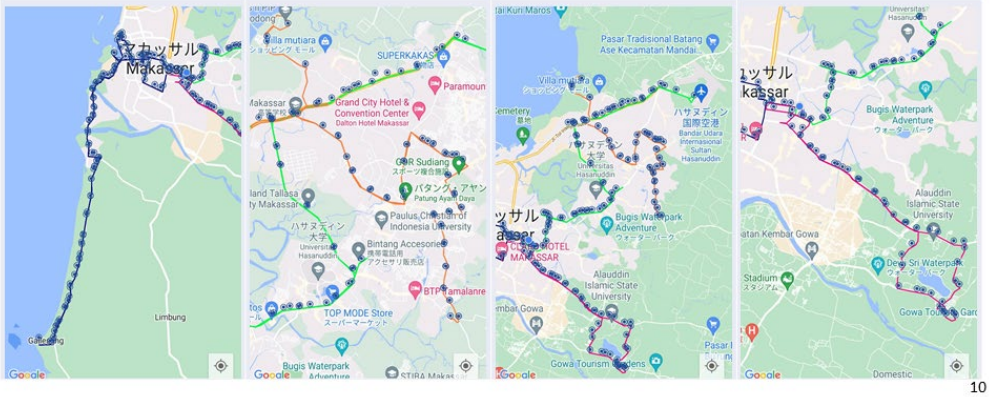
9

This study will provide support for the study of the desirable feeder transportation system linked to Teman Bus while taking into account the F/S results for the introduction of BRT, which is expected to be integrated with Teman Bus in the future.

Outline of Teman Bus

Operation time: From 5am to 9pm

Corrido 1	Corrido 2	Corrido 3	Corrido 4
21 buses	18 buses	21 buses	17 buses
Petepete: **NOT** in operation.	Petepete: in operation.	Petepete: in operation.	Petepete: **NOT** in operation.
There is a popular tourist destination at the end of the line, and more than 1,000 people use it on weekends and holidays.	No connection to the city center and few bus users, about 200 people/day.	Petepete is competing on a route connecting the airport area to the center of the city.	The line connects the center of the city with the university and is heavily used by students.



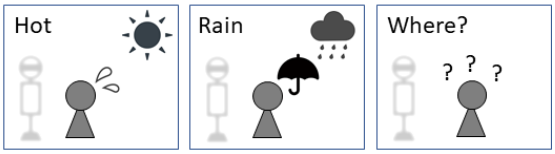
10

The above figure indicates the corridor of each Teman Bus.

Issue of Teman Bus based on Field Survey

The reason why Teman Bus is not used is not only the poor route settings

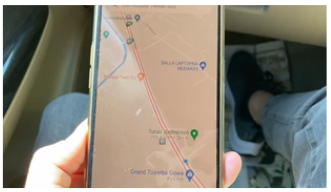
1. Bus stops are not installed



Bus Stop in Japan

2. People don't know when bus is coming

Teman bus app has already been developed. However, the location information displayed in the App is not accurate, making it difficult to use.



3. Bus user have to walk to the bus stop

Because Petepete stops anywhere, it is more convenient than buses for bus users.

It is necessary to improve and coordinate last mile transportation.

11

The above figure shows a summary of issues of Teman Bus based on the field survey. The issues such as the lack of bus stops, the accuracy of bus information provided by the app, the convenience of access to bus stops, and the location of boarding and unloading were identified.

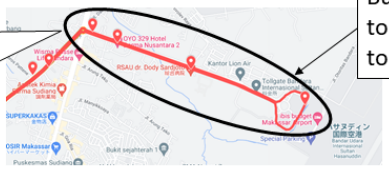
Issue of Teman Bus based on Field Survey

4. Bus user can't get on and off the bus on the service road

It is inconvenient for bus users because there are bus stops only in limited places on service roads of toll roads.

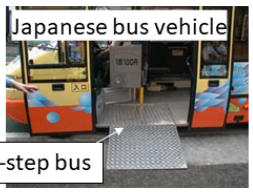
5. There is a bus stop away from the airport

Although the app shows a bus route extending to the airport, there are no actual bus stops around the airport and boarding is not possible.



Other issue: Difficult for people with disabilities to use

Seats for handicapped person is available, but they have to climb stairs to get in.



12

Request

BPTD & Dishub South Sulawesi Province

- Feasibility Study Report of INDOBUS
- Data related to Teman Bus (ex. Number of Passengers, Number of Teman Bus application user)
- Tatrawil Mamminasata 2022
- Report of KIAT Sustainable Mobility Urban Plan

Dishub Gowa, Maros, Takalar District

- Pete Pete Route in Mamminasata Metropolitan area(Gowa, Maros, Takalar)

13

4.2.2 Courtesy call on the Governor of South Sulawesi Province

(1) Participants

1) Indonesian side: Face-to-Face Meeting

- Governer of South Sulawesi Province
  - Mr. Andi Sudirman Sulaiman (Governor)
- Hasanuddin University
  - Prof. Syamsul（Professor）
  - Ilham Bakri (Faculty)

2) Japan side：Face-to-Face Meeting

- Nippon Koei Co., Ltd.
  - Hisanari Ushirooka, Keita Hirayanagi, Miftahul Khaer, Niar Rasyid

(2) Summary of Discussion

- The Japanese side explained the outline of Agoop SDK, the method of obtaining MBD, and the survey policy for this fiscal year.
- The governor commented that it would be desirable for the province to propose a new Teman Bus corridor based on the results of this study.
- The governor commented that they would like to launch a new weekend-only route to transport people from Sultan Hasanuddin International Airport to various tourist destinations in Mamminasata Metropolitan Area.
- The Governor commented that, in conducting this study, if there is any data or other information that the study team would like the South Sulawesi Province (Transportation Office) to provide, the director will decide whether or not to provide the data, but data that belongs to the provincial government can be provided.

(3) Meeting Materials

The meeting materials are the same as the meeting materials in 4.2.1.

4.2.3 The 2nd Meeting（Province Transportation Office, City Transportation Office）

(1) Participants

1) Indonesian side: Face-to-Face Meeting

- Transportation Office, South Sulawesi Province
  - Ms. Andi Nur Diyana (Chief of Mamminasata Technical Implementattion Unit)
  - Ms. Tina (Staff of Mamminasata Technical Implementattion Unit)
  - Ms. Eka (Research and Development)
- Transportation Office, Makassar City
  - Mr. Zaenal Ibrahim (Daily Executor)

- Mr.Jasman Launtu (Head of Transportation Mode Division)
- Mr.Tibrisi (Staff of Transportation Mode Division)

- Cooperation Division, Makassar City
  - Ms. Ismawaty Nur (Head)
  - Mr. Haeroel B (Staff)

2) Japanese side: Hybrid Meetings (Face-to-Face & Online Meeting)

- International Policy Division, Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism
  - Nami Sato(International Transport Strategy Officer), Akitsugu Ookuma(International Cooperation Officer), Kodai Ozawa (Officer)
- Nippon Koei Co., Ltd
  - Hisanari Ushirooka, Atsushi Mochizuki, Hiroya Totani, Keita Hirayanagi, Ryoma Yae, Kenta Kikuchi, Djamaluddin Ibrahim, Miftahul Khaer
- Agoop Corp.
  - Yusuke Kato, Miki Fujii, Kotaro Kiyoshi
- PT. SBTelecom Indonesia
  - Kim Takkun, Sugimoto Ayae, Sinatrya Rahma

(2) Summary of Discussion

- The Japanese side explained the progress of the work based on the documents and the results of the analysis using Lifesight's sample data, and explained and obtained an agreement from the counterparts to utilize data from November 2022 onward for analysis, as a survey policy.
- South Sulawesi Province Transportation Office commented that they would like study team to propose a new corridor that takes this into account because there is an overlap and competition between Teman Bus in Corridor 2 and Pete Pete routes.
- Makassar City Cooperation Division commented that they believe that linking heat maps to issues that the city and regencies are facing will contribute to meaningful public transportation formulation.
- Makassar City Transportation Office commented on the results of the analysis that expanding the scope of the analysis to include the Regency of Gowa, Maros, and Takalar has led to good results. They also commented that they would like to see new corridors considering the existing Teman Bus and Pete Pete routes based on the results of OD analysis.

(3) Meeting Materials

The meeting materials are presented as follows:

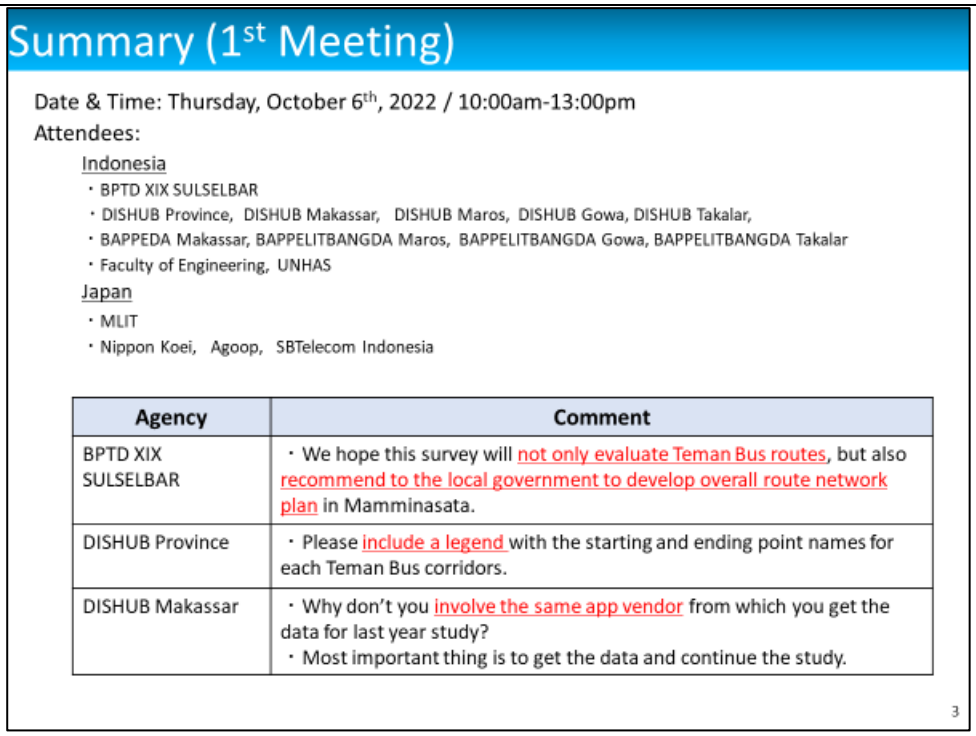
Utilization of Big Data to Improve Mobility in Mamminasata Metropolitan Area

- 2nd meeting -

1. Date: 9th December, 2022
2. Time : 15:00 – 16:00 (Makassar Time)
3. Participants
   Dishub South Sulawesi Province
   Dishub Makassar City
   Cooperation section Makassar City
   MLIT
   Agoop:
   SBTelecom Indonesia
   Nippon Koei
4. Agenda:
   I. Summary of the 1st meeting
   II. BD Utilization Plan
   III. Status of Data Collection
   IV. Analysis Results using Data from Lifesight
   V. Upcoming Schedule

1

I. Summary of the 1st Meeting



Summary (1st Meeting)

Date & Time: Thursday, October 6th, 2022 / 10:00am-13:00pm

Attendees:

Indonesia

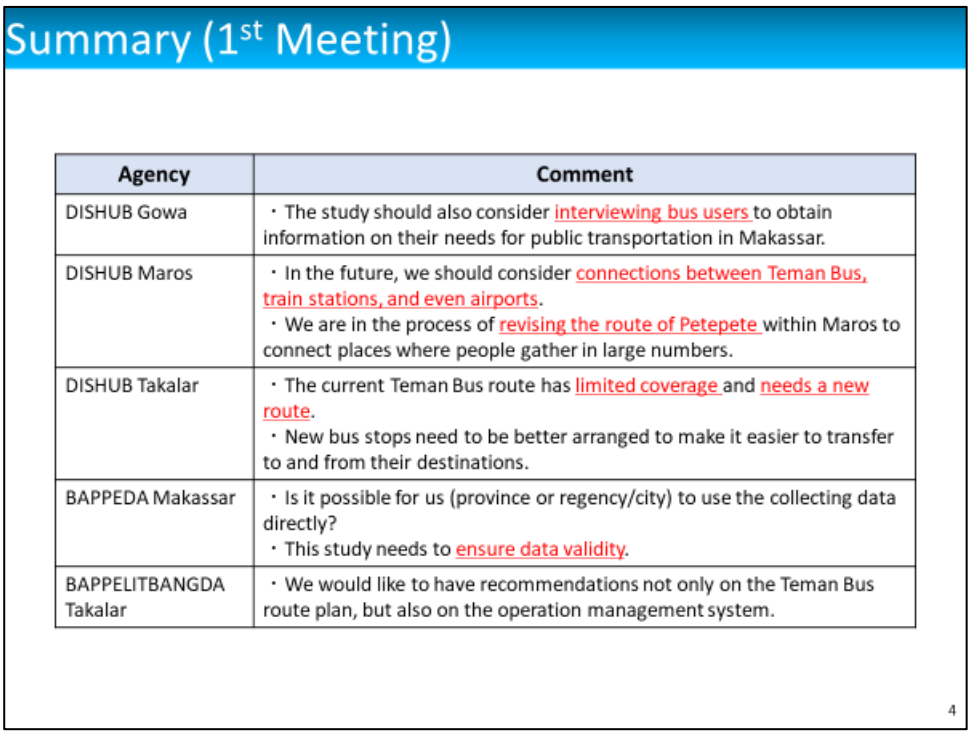
- BPTD XIX SULSELBAR
- DISHUB Province, DISHUB Makassar, DISHUB Maros, DISHUB Gowa, DISHUB Takalar,
- BAPPEDA Makassar, BAPPELITBANGDA Maros, BAPPELITBANGDA Gowa, BAPPELITBANGDA Takalar
- Faculty of Engineering, UNHAS

Japan

- MLIT
- Nippon Koei, Agoop, SBTelecom Indonesia

Agency	Comment
BPTD XIX SULSELBAR	・We hope this survey will not only evaluate Teman Bus routes, but also recommend to the local government to develop overall route network plan in Mamminasata.
DISHUB Province	・Please include a legend with the starting and ending point names for each Teman Bus corridors.
DISHUB Makassar	・Why don't you involve the same app vendor from which you get the data for last year study? ・Most important thing is to get the data and continue the study.

3



Summary (1st Meeting)

Agency	Comment
DISHUB Gowa	・The study should also consider interviewing bus users to obtain information on their needs for public transportation in Makassar.
DISHUB Maros	・In the future, we should consider connections between Teman Bus, train stations, and even airports. ・We are in the process of revising the route of Petepete within Maros to connect places where people gather in large numbers.
DISHUB Takalar	・The current Teman Bus route has limited coverage and needs a new route. ・New bus stops need to be better arranged to make it easier to transfer to and from their destinations.
BAPPEDA Makassar	・Is it possible for us (province or regency/city) to use the collecting data directly? ・This study needs to ensure data validity.
BAPPELITBANGDA Takalar	・We would like to have recommendations not only on the Teman Bus route plan, but also on the operation management system.

4

The above figure shows the comments received from the participants at the last meeting

Ⅱ. BD Utilization Plan

Study Policy for This Fiscal Year

STEP1 (2nd Meeting)

Preparation of Base Map
- Existing Teman Bus routes and bus stops
- Existing Makassar-Pare Pare Railway route and stations

Analysis using sample Big Data from "Lifesight"
- Understand congested location
- Understand trip flow inside Mamminasata Metropolitan Area

STEP2 (3rd & Final Meeting)

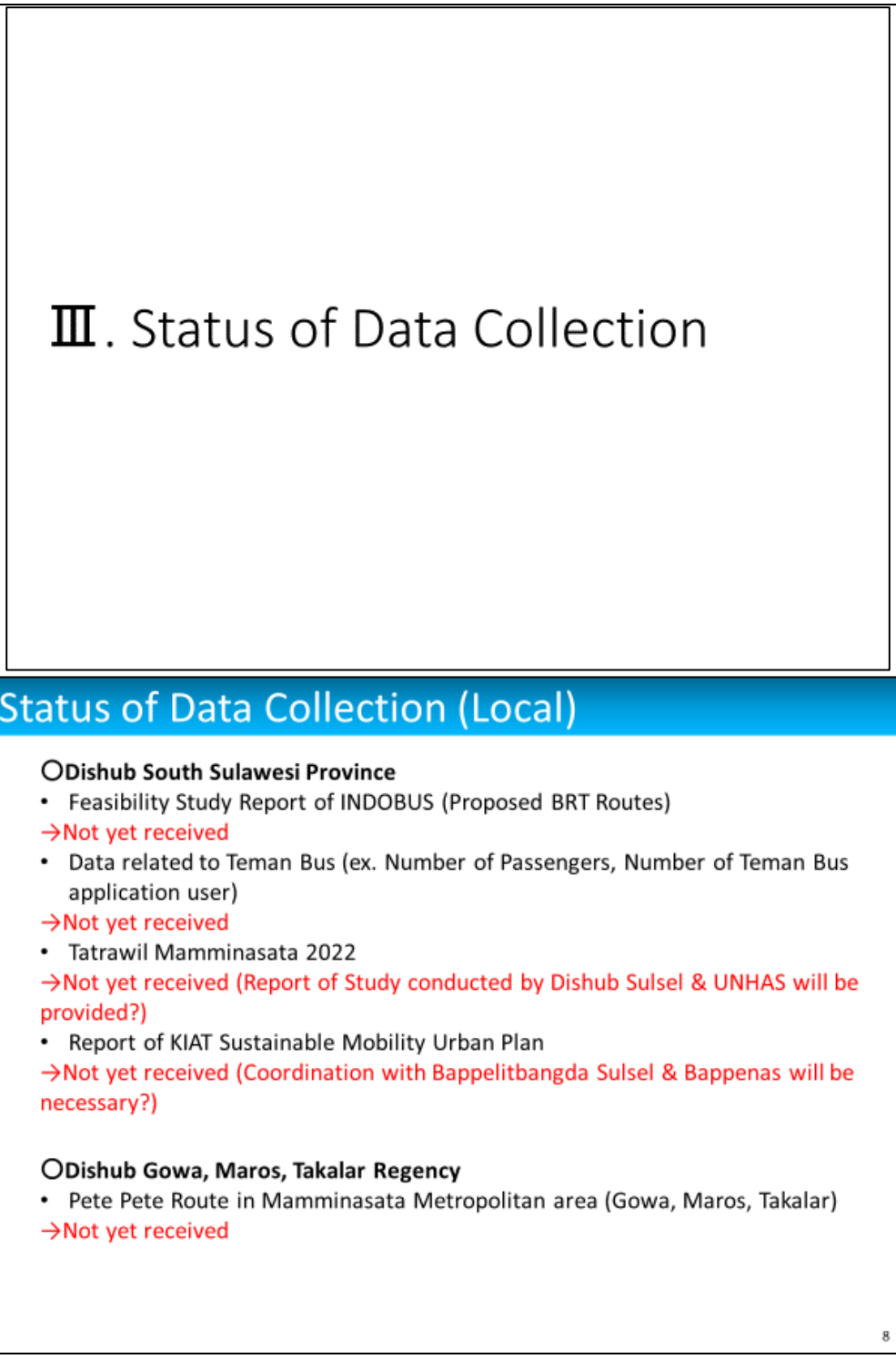
Preparation of Base Map
- Pete Pete routes
- Future BRT routes proposed in INDOBUS

Understanding passenger's perception
- Small interview to passengers of Teman Bus and Pete Pete

Analysis using latest Big Data from Agoop SDK / Other data companies
- Evaluate existing Teman Bus routes
- Propose improvement plan for existing Teman Bus routes if necessary
- Propose some Pete Pete routes in Mamminasata Metropolitan Area
- Propose new additional route for Teman Bus

6

As part of this year's study policy, study team introduced the analysis method using Lifesight's data in this meeting. In the next and final meeting, study team will analyze the Lifesight data and make proposals for the Teman Bus and Pete Pete routes.



The above figure shows the status of the acquisition of various types of data. Currently, many data have not been obtained from various organizations. So the study team will continue to collect information.

Introduction of Big Data (Lifesight)

○Outline of Lifesight

Company	Outline	Data Contents	Number of User
Lifesight	Headquartered in Singapore, the company provides offline services for digital advertising, primarily using location-based information.	・GPS data ・Obtain Ad ID	MAU※1 1.4 million (within Indonesia)

※1：MAU(Monthly Active Users):Number of active users per month

○Outline of Sample Data

	Makassar	Gowa	Maros	Takalar
Data Acquisition Period	June 28th, 2022 ～ July 11th, 2022			
Number of data (million)	16.3	3.6	2.1	0.6
Number of users (thousand)	185.1	52.6	35.0	9.0
Population(2021) (thousand)	1,427	773	396	302
Data validity (＝Users/Population)	12%＞5%	6.8%＞5%	8.8%＞5%	2.9%＜5%

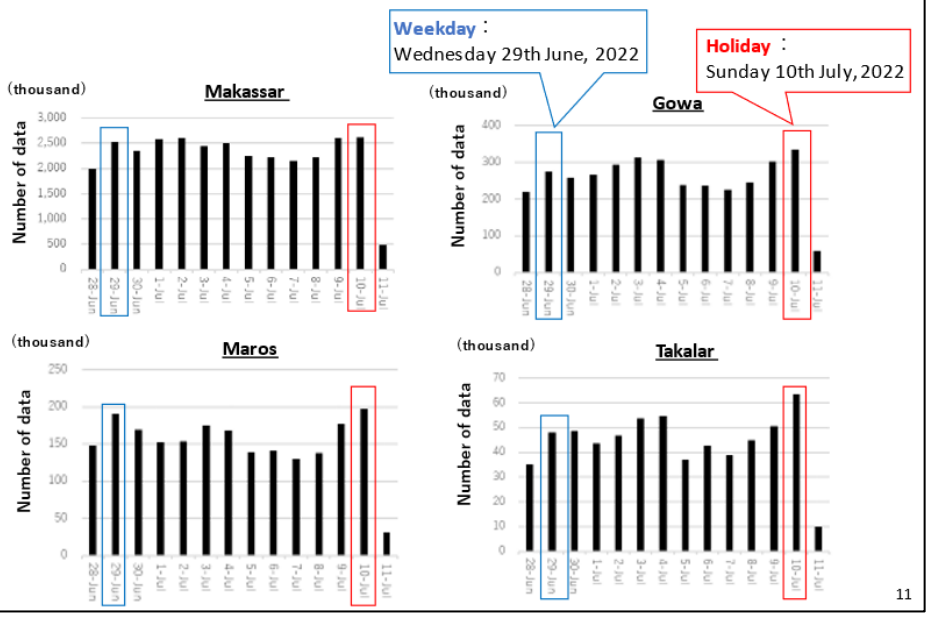
⇒MBD analysis was done using the "Lifesight"'s big data as sample analysis

10

The data used in this analysis is shown in the above figure. Lightsight is headquartered in Singapore and mainly provides offline services for location-based digital advertising. The number of users of the data in the target area (28/6/2022 - 11/7/2022) was confirmed to be more than 5% of the population, except for Takalar Regency.

Introduction of Big Data (Lifesight)

・Using data from weekdays and holidays, when the number of data is large.



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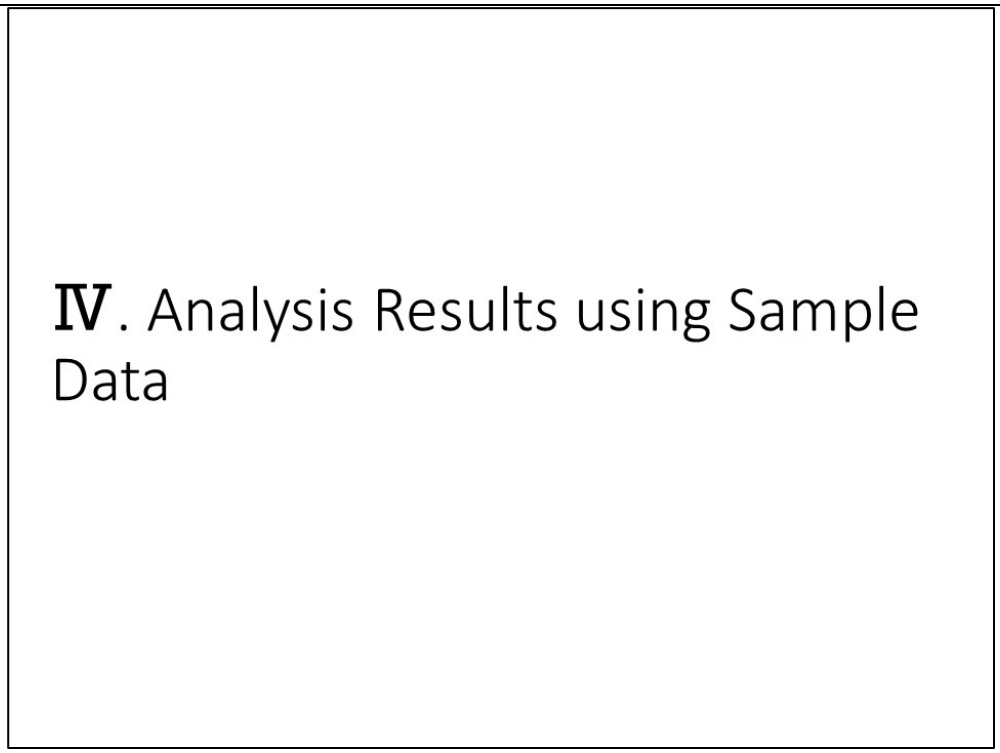
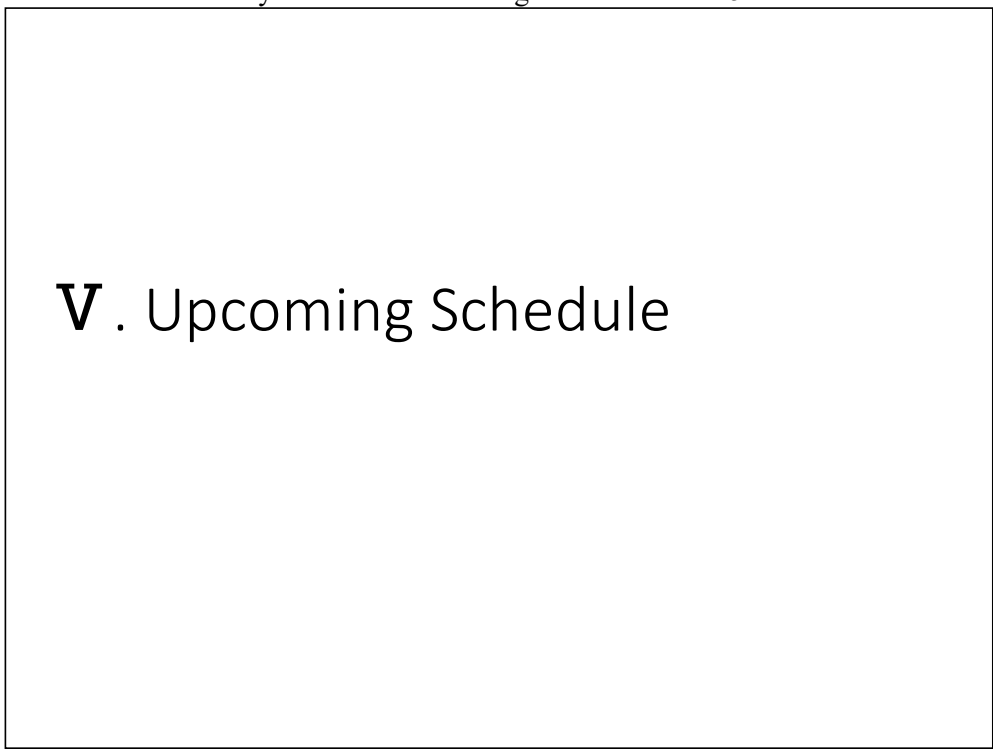
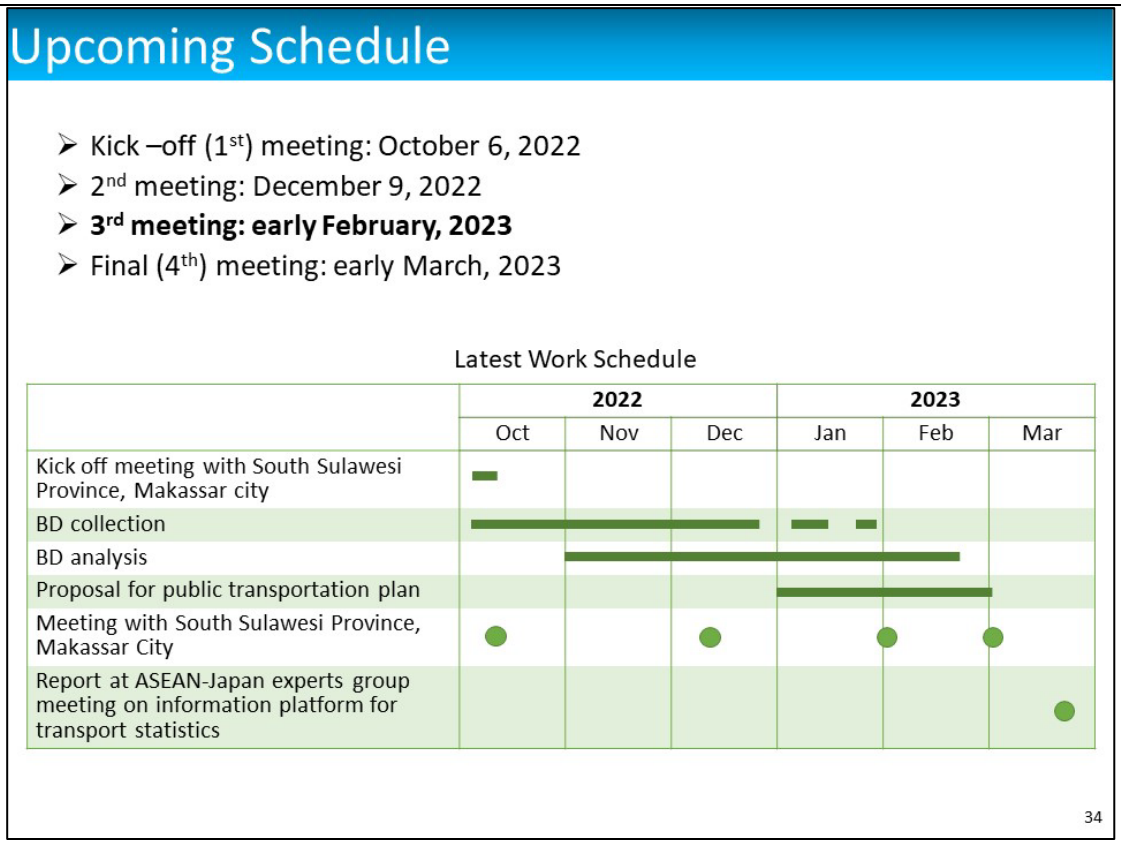
As shown in the above figure, the number of data for weekdays and holidays was checked for each regency and city. The data for weekdays (6/29/2022) and holidays (7/10/2022), which have the largest number of data, were extracted for analysis.



The results of the MBD analysis at the 2nd meeting are described in 5.2.1.





It was agreed that the study team would propose a new corridor for Teman Bus using the results of the MBD analysis at the next meeting.

4.2.4 The 3rd Meeting（Province Transportation Office, City Transportation Office）

(1) Participants

1) Indonesian side: Face-to-Face Meeting

- Transportation Office, South Sulawesi Province
  - Ms. Andi Nur Diyana (Chief of Mamminasata Technical Implementattion Unit)
  - Ms. Mansur Yahya (Chief of Road Transport Department)
- Transportation Office, Makassar City
  - Mr.Jasman Launtu (Head of Transportation Mode Division)
  - Mr.Tibrisi (Staff of Transportation Mode Division)
  - Mr.Irhandika (Staff of Transportation Mode Division)
- Cooperation Division, Makassar City
  - Mr.Haeroel B（Staff of Cooperation Section）

2) Japanese side: Hybrid Meeting (Face-to-Face & Online Meeting)

- International Policy Division, Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism
  - Nami Sato(International Transport Strategy Officer), Akitsugu Ookuma(International Cooperation Officer), Kodai Ozawa (Officer)
- Nippon Koei Co., Ltd

- Hisanari Ushirooka, Hiroya Totani, Keita Hirayanagi, Ryoma Yae, Kenta Kikuchi, Djamaluddin Ibrahim, Miftahul Khaer, Irma Anriany Rusli

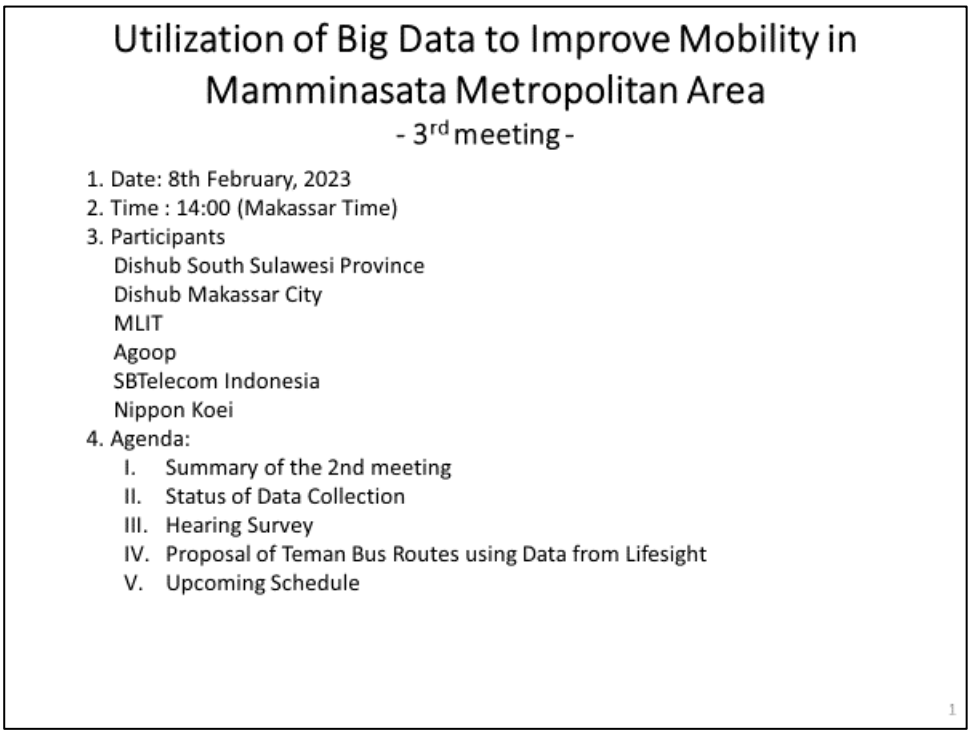
- Agoop Corp.
  - Yusuke Kato, Miki Fujii, Kotaro Kiyoshi
- PT. SBTelecom Indonesia
  - Kim Takkun, Sugimoto Ayae, Akane Yamada, Sinatrya Rahma, James, Revita, Aprillia

(2) Summary of Discussion

- The Japanese side explained the proposed Teman Bus corridor utilizing the MBD.
- The Japanese side proposed that the final report meeting in March of this fiscal year to be held in Makassar City. The South Sulawesi Province Transportation Office and the Makassar City Transportation Office agreed to hold the meeting.
- The Makassar City Transportation Office requested that the analysis be continued through December 2023, if possible. They also commented that they would like to see a more detailed study of Teman Bus and Pete Pete.
- The South Sulawesi Province Transportation Office commented that they would like the study team to conduct field surveys in Antang Perumnas and Antang Nipah Nipah areas and carry out a route analysis because many low-income residents live in those areas.
-

(3) Meeting Materials

The meeting materials are as follows:



Utilization of Big Data to Improve Mobility in Mamminasata Metropolitan Area

- 3rd meeting -

1. Date: 8th February, 2023
2. Time : 14:00 (Makassar Time)
3. Participants
   Dishub South Sulawesi Province
   Dishub Makassar City
   MLIT
   Agoop
   SBTelecom Indonesia
   Nippon Koei
4. Agenda:
   I. Summary of the 2nd meeting
   II. Status of Data Collection
   III. Hearing Survey
   IV. Proposal of Teman Bus Routes using Data from Lifesight
   V. Upcoming Schedule

1

I. Summary of the 2nd Meeting

Summary (2nd Meeting)

Date & Time:
Friday, December 9th, 2022 / 15:00am-17:30pm
Attendees:

Indonesia
- DISHUB Province, DISHUB Makassar, Cooperation Divison Makassar City

Japan
- MLIT
- Nippon Koei, Agoop, SBTelecom Indonesia

Agency	Comment
DISHUB Province	・The heat maps are an important item to reroute the Teman Bus routes and there are expected to be utilized. ・In Corridor 2, Teman Bus and Pete Pete route overlap and are in a competitive situation, so I would like you to propose a new route taking that point into consideration. ⇒We will reflect the Pete Pete routes into the GIS and analyze. ・Will you collect data again in the future and analyze it? ⇒We will use data from November 2022 onwards and analyze.

3

The above figure shows some comments received from participants at the 2nd meeting. The South Sulawesi Province Transportation Office commented on the proposed new corridors considering the competition between Teman Bus and Pete Pete route, as well as data for future use.

Summary (2nd Meeting)

Agency	Comment
DISHUB Makassar	・Expanding the scope of analysis to include Gowa, Maros, and Takalar has led to good results. ・ On the other hand, it is better to have comments on the issues of each region at the time of the meeting. ・2021 population data is used, but it would be better to use 2022, which is the same as the Lifesight's data ・I would like you to propose a new route that considers the existing Teman Bus and Pete Pete routes, referring to the results of the OD analysis.
Cooperation Divison Makassar City	・I think that MOU between the MLIT(Japan) and Ministry of Transportation (Indonesia) will facilitate the acquisition of the data currently requested. ⇒MOU is difficult. It is possible to issue the supporting letter about the requesting data provision. ・By linking the heat maps with the issues faced by the city and regency, I think that we can contribute to the formulation of efficient public transportation.

4

The Makassar City Transportation Office commented on the scope of the analysis.

The Makassar City Cooperation Division commented on the importance of linking heat map analysis to current issues that the city and regency are facing.

Ⅱ. Status of Data Collection

Status of Data Collection (Location Data)

○Status of Negotiation for SDK Introduction

Period	No. of Companies	Remarks
～March 2022	0/117	Resuming approach to app vendors from December 2022
April 2022 ～	0/39	Contacting via WA etc, and arranging the meeting with 1 company
Total	**0/156**	-

○Softbank Indonesia × Agoop Webinar

Outline of the Webinar

Date	**January 17, 2023**
Purpose	**Raise awareness of Agoop solutions**
Target	**Local Company in Indonesia**
Number of participants	**Total 36 people**
Next Action	**Coordinating individual meetings for companies participating in the webinar** **⇒Currently coordinating with 9 companies**

6

Study team summarized progress toward the introduction of Agoop SDK. A total of 156 application vendors were approached and meetings are scheduled with one company.

PT. SBTelecom Indonesia Corp. and Agoop Corp. jointly conducted a webinar to increase awareness of Agoop SDK in Indonesia. The webinar was attended by 36 people. The next action is to coordinate meetings with the nine companies that participated in the webinar.

Status of Data Collection (Local)

○Dishub South Sulawesi Province

- Feasibility Study Report of INDOBUS (Proposed BRT Routes)

→Not yet received

- Data related to Teman Bus (ex. Number of Passengers, Number of Teman Bus application user)

→Not yet received

- Tatrawil Mamminasata 2022

→Not yet received (Could Dishub South Sulawesi and UNHAS provide the Study Report of 2022 ?)

○Dishub Gowa, Maros, Takalar Regency

- Pete Pete Route in Mamminasata Metropolitan area (Gowa, Maros, Takalar)

→Information of Pete Pete routes in Gowa and Maros was provided.
But, Information of Pete Pete routes in Takalar has not been provided yet.

7

Study team obtained the information on the route of Pete Pete in Maros and Gowa regencies.

Ⅲ. Hearing Survey

Hearing with Teman Bus Users & Pete Pete Users

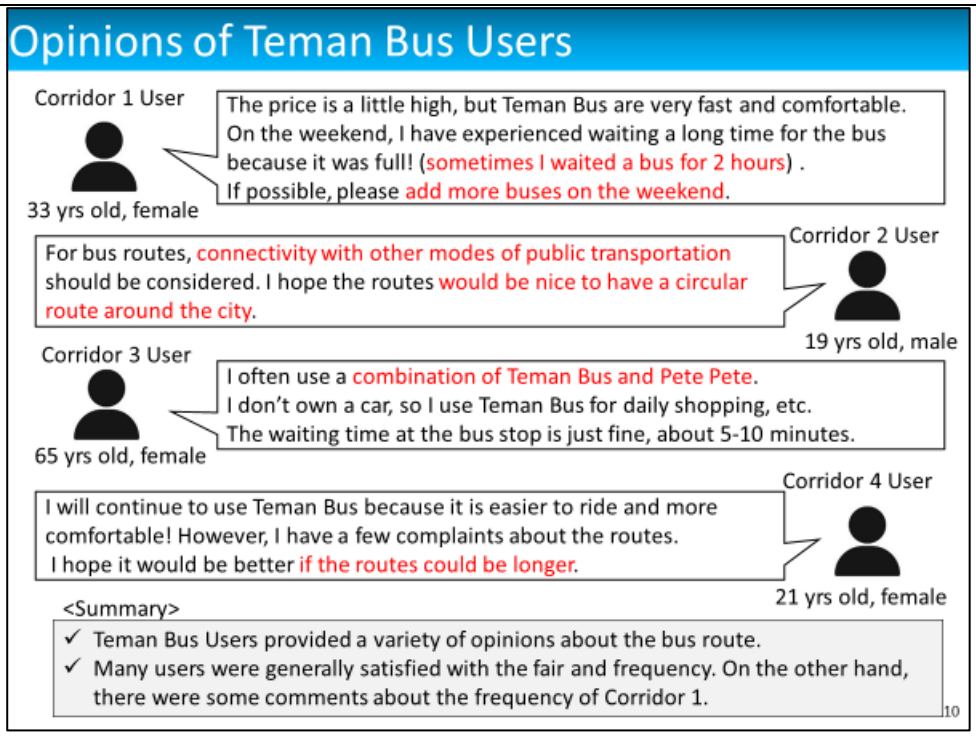
We conducted Interview to Teman Bus users and Pete Pete users for getting their opinions.

Outline of Hearing Survey

Item	Teman bus	Pete Pete
Date	5th December 2022 ～ 8th December 2022 (2.5h*4days)	
Method	Boarding each route and hearing passengers, hearing at bus stops	
Question Items	Gender, Age, Vehicle Ownership, Fare, Routes, Frequency, Waiting Time, Purpose, Boarding/Drop-off point, Bus stops, Teman Bus Applications	Gender, Age, Vehicle Ownership, Fare, Routes, Purpose, Boarding/Drop-off point
No. of interviewee	14	7

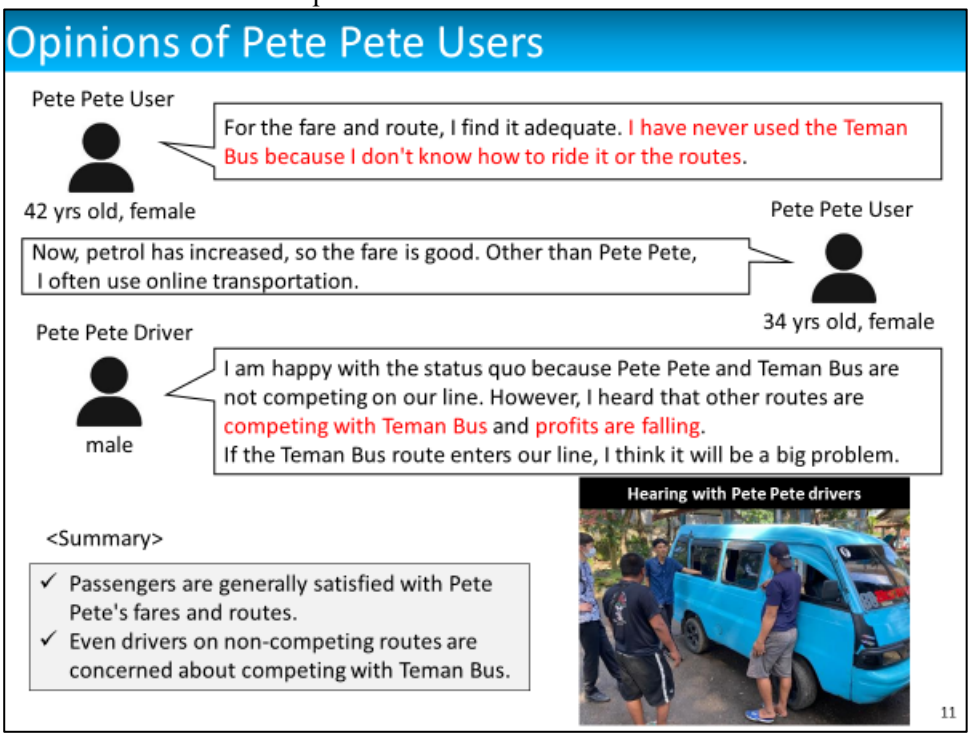
9

Study team conducted interviews with Teman Bus users and Pete Pete users. Study team asked about attributes, number of vehicles owned, satisfaction with and opinions about fares, routes, waiting time and frequency, purpose, boarding and dropping points, satisfaction with and opinions about bus stop infrastructure, and use of the Teman Bus app.



Users of each of the Teman Bus corridors expressed the following opinions

- Corridor 1: "I would like to request an increase in the number of buses on weekends."
- Corridor 2: "I would like to request the creation of a circular corridor within the city."
- Corridor 4: "I would like to request more corridors to be extended."



Pete Pete users expressed the following opinions.

- "Fares are appropriate under current conditions with rising fuel prices."

Overall, the interviewed users had no complaints about Pete Pete's fares and routes and were satisfied with the current situation. It has become an important means of transportation,

especially for women who do not own motorcycles or cars, and is used for shopping, banking, and other household errands.

On the other hand, Pete Pete drivers have voiced concerns about the decrease in profits due to overlap with Teman Bus, as has been pointed out in the past.

Ⅳ. Upcoming Schedule

Schedule of Next Meeting

- Kick –off (1st) meeting: October 6, 2022
- 2nd meeting: December 9, 2022
- 3rd meeting: early February, 2023
- **Final (4th) meeting: the end of March, 2023**

Latest Work Schedule

	2022			2023		
	Oct	Nov	Dec	Jan	Feb	Mar
Kick off meeting with South Sulawesi Province, Makassar City	▬					
BD collection	▬	▬	▬	▬ ▬		
BD analysis		▬	▬	▬	▬	
Proposal for public transportation plan				▬	▬	▬
Meeting with South Sulawesi Province, Makassar City	●		●		●	●
Report at ASEAN-Japan experts group meeting on information platform for transport statistics						●

In the 4th meeting, study team will propose a new route for Teman Bus and Pete Pete using location-based data as of December 2022.

4.2.5 The 4th Meeting（Final Report Meeting）

(1) Participants

1) Indonesian side: Face-to-Face Meeting

- Land Transportation Management Center Region No.19, Ministry of Transportation
  - Husni Mubarak (Chief of Land Transport & Road Traffic Section)
- Transportation Office, South Sulawesi Province
  - Agustina W (Head of Section in UPT Mamminasata)
  - Andi Asdiana Ekasari (Master Planner)
  - Tahir (Sub Bagian Program)
- Transportation Office, Makassar City
  - Tibrisi Mustari (Chief of Infrastructure Division)
  - Jasman Launtu (Chief of Transportation Mode Division)
- Transportation Office, Gowa Regency
  - Made Dianing (Chief of Traffic Division)
  - Diaman (Staff of Traffic Division)
- Transportation Office, Maros Regency
  - Ahmad Sila (Policy Analysis Division)
- Transportation Office, Takalar Regency
  - Jamaluddin Si (Head of DISHUB)
  - Sabri(Staff)
- Regional Development Planning Agency, South Sulawesi Province
  - Asdar (Sub Coordination)
  - Ince S Yusmi (-)
  - Aryanti Sayadi(Functional Planner)
- Regional Development Planning Agency, Makassar City
  - Yamliah Akhir (Staff)
  - Irwan(Infrastructure and Regional Development Division)
- Regional Development Planning, Research and Development Agency, Maros Regency
  - Hj. Mustika (Head of Division Planner)
  - Risma M. Udin (Functional Planner)

2) Japanese side: Hybrid Meetings (Face-to-Face & Online Meeting)

- International Policy Division, Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism
  - Nami Sato (International Transport Strategy Officer), Akitsugu Ookuma(International Cooperation Officer), Kodai Ozawa (Officer)
- Nippon Koei Co., Ltd
  - Hisanari Ushirooka, Atsushi Mochizuki, Keita Hirayanagi, Ryoma Yae, Kenta Kikuchi, Djamaluddin Ibrahim, Miftahul Khaer, Irma Anriany Rusli

- Agoop Corp.
  - Kotaro Kiyoshi
- PT. SBTelecom Indonesia
  - Kim Takkun, Sugimoto Ayae, Akane Yamada, Aprillia、James Panjaitan、Rahma、Revita

(2) Summary of discussion

- The Japanese side reported on the final results of this study.
- South Sulawesi Province Transportation Office commented that the total length of Teman Bus corridors is contractually limited to 200 km. However, they commented that the contract can be re-signed and extended beyond 200 km, if necessary.
- Makassar City Transportation Office requested that study team review once 17 Pete Pete routes in Makassar on a zero-based basis, and if necessary, propose new routes.
- Maros Regency Transportation Office asked to explain how this study is considering the need for a new route from the two railway stations (Maros and Mandai) in Maros to Sultan Hasanuddin International Airport and Mall Panakkukang. The Japanese side responded that since the railway has only been in operation for a short time and the number of users is small, it has not been considered in this work, and the study team thought it would be better to conduct an analysis using MBD and considering new routes after the number of users has increased.
- Takalar Regency Transportation Office commented that it is necessary to consider the proposal that extends Teman Bas Corridor 1 from the Galesong area to the main terminal (center) of Takalar Regency. The Japanese side responded that the OD analysis conducted this time didn't confirm much OD from the center of Takalar Regency to the Galesong area, so study team didn't propose to extend the line at this time.
- South Sulawesi Province Regional Development Planning Agency asked if the Sustainable Urban Mobility Plan was reflected in this study. The Japanese side explained that they requested that the final report of the Sustainable Urban Mobility Plan be shared, but as a result, it was not shared and thus not reflected in this study.

(3) Meeting Materials

The meeting materials are as follows:

Utilization of Big Data to Improve Mobility in Mamminasata Metropolitan Area

March 2023

MLIT
Ministry of Land, Infrastructure, Transport and Tourism

NIPPON KOEI

agoop

0

Utilization of Big Data to Improve Mobility in Mamminasata Metropolitan Area

- 4th meeting -

1. Date: 27th March, 2023
2. Time : 9:30 (Makassar Time)
3. Participants
   BPTD XIX SULSELBAR
   DISHUB Province, DISHUB Makassar, DISHUB Maros,
   DISHUB Gowa, DISHUB Takalar
   BAPPELITBANGDA Province, BAPPEDA Makassar, BAPPELITBANGDA Maros
   BAPPELITBANGDA Gowa, BAPPELITBANGDA Takalar
   MLIT
   Agoop
   SBTelecom Indonesia
   Nippon Koei
4. Agenda:
   I. Summary of the 2nd and 3rd meeting
   II. Status of Data Collection
   III. Proposal of Teman Bus Routes and PetePete Routes using Data from Lifesight
   IV. Discussion

1

I. Summary of the 2nd/3rd meeting

2

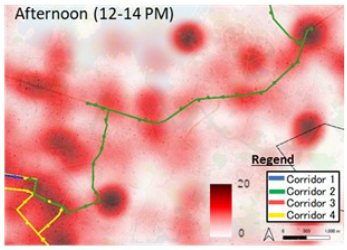
Summary (2nd Meeting)

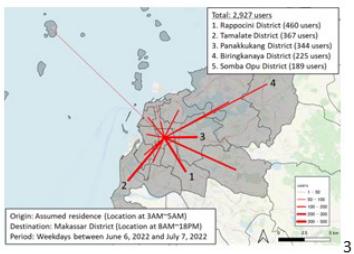
Date & Time:
Friday, December 9th, 2022 / 3:00PM-5:30PM

Attendees: Indonesia
・DISHUB Province, DISHUB Makassar, Cooperation Divison Makassar City

Japan
・MLIT
・Nippon Koei, Agoop, SBTelecom Indonesia

Agency	Comment
DISHUB Province	・In Corridor 2, Teman Bus and Pete Pete route overlap and are in a competitive situation, so I would like you to propose a new route taking that point into consideration. ⇒We will reflect the Pete Pete routes into the GIS and analyze.
DISHUB Makassar	・Expanding the scope of analysis to include Gowa, Maros, and Takalar has led to good results. ・I would like you to propose a new route that considers the existing Teman Bus and Pete Pete routes, referring to the results of the OD analysis.
Cooperation Divison Makassar City	・By linking the heat maps with the issues faced by the city and regency, I think that we can contribute to the formulation of efficient public transportation.





3

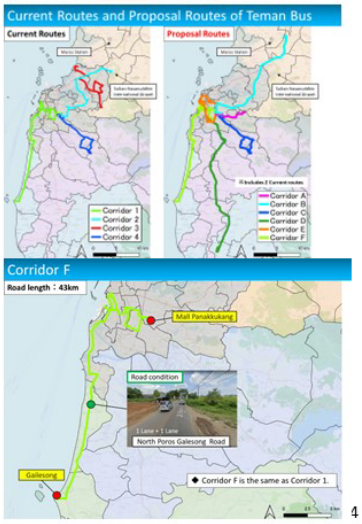
As a review of the 2nd meeting, the study team summarized the comments received from the South Sulawesi Province Transportation Office, the Makassar City Transportation Office, and the Makassar City Cooperation Division.

Summary (3rd Meeting)

Date & Time:
February 8th, 2022 / 2:00PM-5:00PM
Attendees: Indonesia
・DISHUB Province, DISHUB Makassar, Cooperation Divison Makassar City

Japan
・MLIT
・Nippon Koei, Agoop, SBTelecom Indonesia

Agency	Comment
DISHUB Province	・The total length of Teman Bus route is limited to 200km ・It is necessary to consider overlapping with the planned route connecting the airport and Maros station. ・Since there are many low-income people living in Antang Perumnas and Antang Nipah Nipah areas, it is desirable to introduce Teman Bus and Pete Pete routes to those areas.
DISHUB Makassar	・If possible, DISHUB makassar would like you to continue this survey until December 2023. ・DISHUB Makassar would like you to consider analyzing existing Teman Bus and Pete Pete routes to resolve the issue of overlapping their routes.



As a review of the 3rd meeting, study team summarized the comments received from the South Sulawesi Province Transportation Office and the Makassar City Transportation Office.

Ⅱ. Status of Data Collection

5

Status of Data Collection (Location Data)

○Status of Negotiation for SDK Introduction

Items	No. of Companies	Remarks
Total number of approaches	159	Resuming approach to app vendors from December 2022
Number of companies responded	27	Contacting via WA etc
Number of companies conducted negotiations	7	Arranging the meeting with 7 company
Number of companies introducing SDK	0	
Total	**0/159**	

○Reasons for the failure of negotiations

✓ Not suitable for their business
✓ Internal and external regulations make external collaboration difficult

6

Study team reported the progress toward the implementation of the Agoop SDK. A total of 156 application vendors were approached and 27 responded. After that, meetings were held with seven companies, but in the end, none of them were able to implement the Agoop SDK.

Status of Data Collection (Local)

○Dishub Gowa, Maros, Takalar Regency

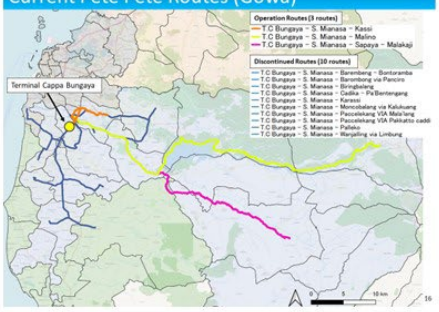
- Pete Pete Route in Mamminasata Metropolitan area (Gowa, Maros, Takalar)

→Information of Pete Pete routes in Gowa and Maros was provided.
But, Information of Pete Pete routes in Takalar was not provided.

✓ Created GIS data of Pete Pete Routes for Gowa and Maros

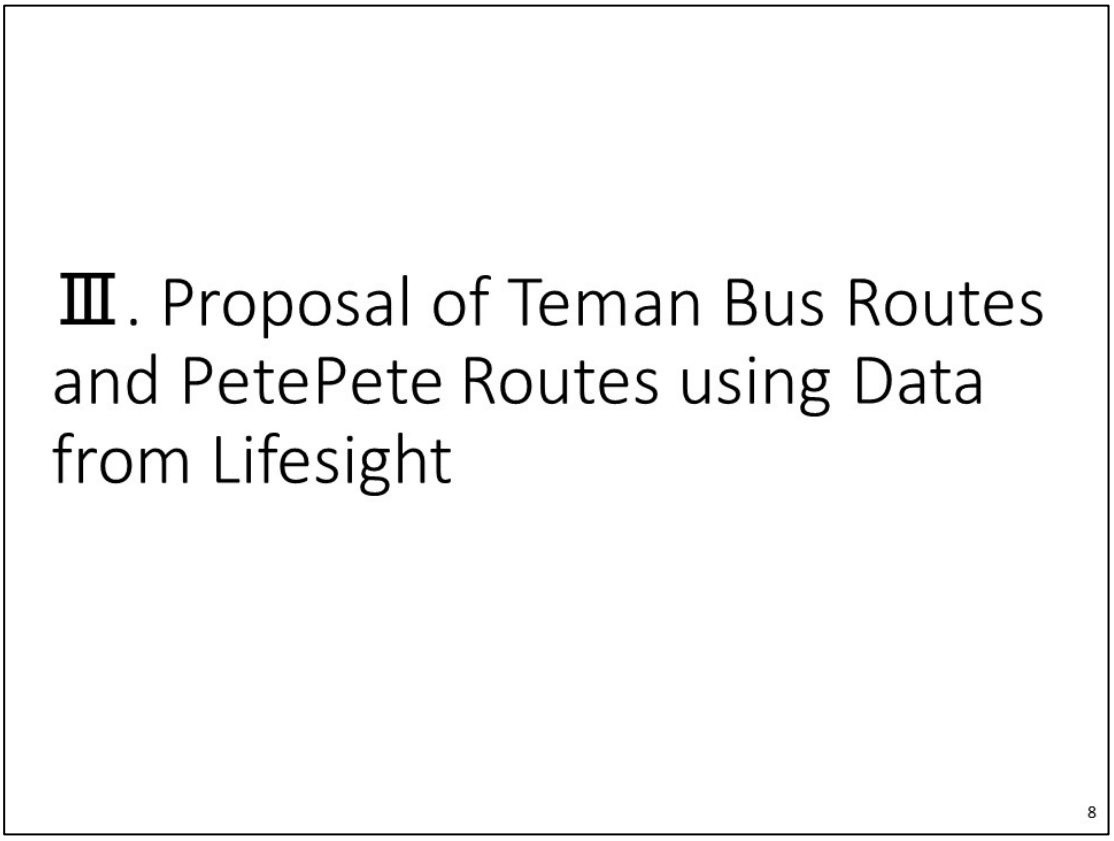
Current Pete Pete Routes (Maros)

Current Pete Pete Routes (Gowa)



8

Study team generated GIS data for the Pete Pete route in Gowa and Maros regencies.



The detail of the proposed Teman Bus and Pete Pete routes of the 4th meeting is described in 5.2.2.

4.3 Situation and Requirements for MBD Utilization in the Transportation Sector

4.3.1 Situation of MBD Utilization in the Transportation Sector

Actual uses of MBD in the transportation sector in the target area were not found according to the information given by the Province Transportation Office, the Makassar City Transportation Office, and other relevant agencies.

4.3.2 Requirements for MBD Utilization in the Transportation Sector

The table below summarizes the need of utilization of MBD confirmed by each agency. It was found that the needs include the use of MBD for statewide transportation planning, study on solutions to the problem of overlapping routes between Teman Bus and Pete Pete, the use of OD and heat map analysis for bus stop relocation planning and feeder traffic studies, etc.

Figure 4-1 Needs of Utilization of MBD Confirmed by Each Ageny

Agency	Utilization Needs
Land Transportation Management Center Region No.19, Ministry of	・Evaluation of Teman Bus corridors using MBD ・Recommendations for the development of an overall route network plan for the entire Mamminasata Metropolitan Area that takes into account the overall route network plans of the city and the various districts

Transportation	
Transportation Office, South Sulawesi Province	・ Teman Bus and Pete Pete to be analyzed simultaneously using MBD analysis to consider Pete Pete as a feeder route because of a longstanding issue of overlapping between Teman Bus and Pete Pete routes
Transportation Office, Makassar City	・ Integrated analysis of Teman Bus and Pete Pete routes using MBD
Transportation Office, Gowa City	・ Bus stops to be proposed based on MBD analysis ・ Providing and proposing feeder transport, etc.
Transportation Office, Takalar City	・ New bus stops to be better arranged to make it easier to for the users to transfer to their destinations

Source:Study Team

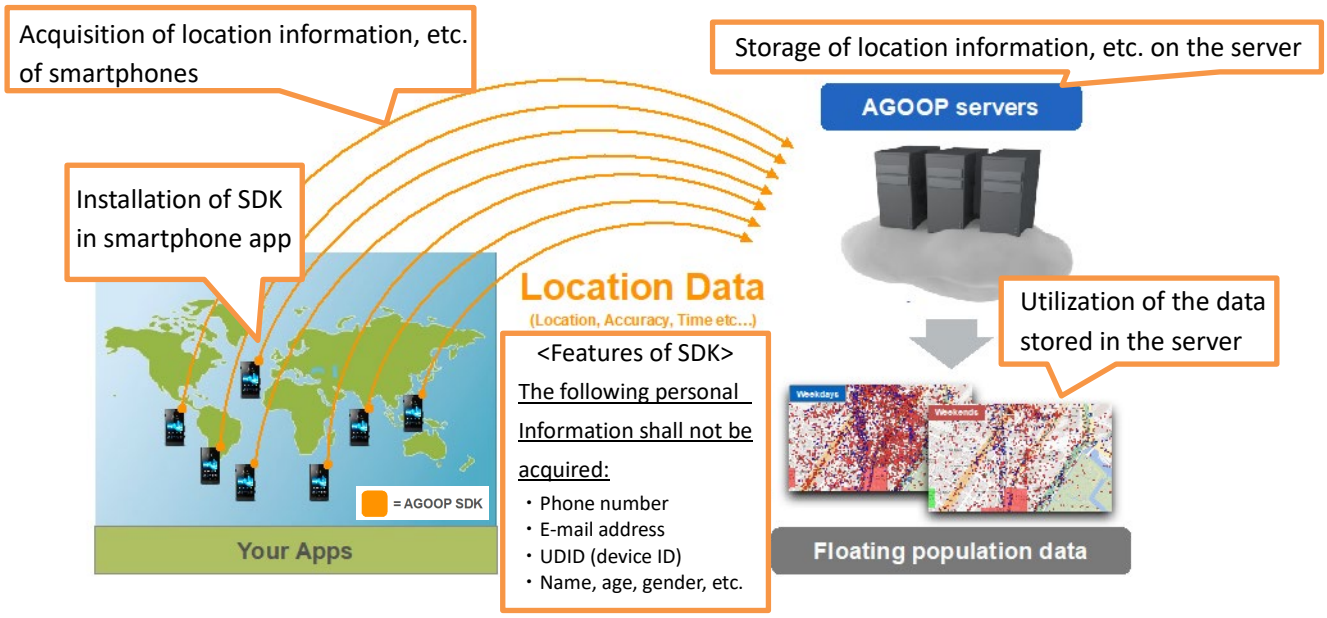
5. MBD Acquisition and Population Flow Analysis

5.1 MBD Acquisition Method

5.1.1 MBD acquisition using Agoop SDK

"Agoop SDK", a technology developed independently by Agoop, was suggested to acquire MBD. SDK is a kit installed in the smartphone application to collect MBD. The information on latitude and longitude, and time can be obtained from the application with Agoop SDK and used as continuous data as shown in Figure 5-1.

It is necessary to negotiate with the application vendors to install SDK in the smartphone application.



Source: Study Team

Figure 5-1 Overview of Agoop SDK

5.1.2 Negotiation with the Application Vendors

Study team negotiated with the application vendors for the installation of SDK in the smartphone applications. The results of the negotiations is outlined in Table 5-1. The list of the outcome of negotiations with the application vendors is shown in Table 5-2, Table 5-3, and Table 5-4.

At first, study team made a list of application vendors and tried to approach them using e-mail or customer service contact listed on their website. Study team also held a webinar on the SDK and attempted to reach its participants.

Study team approached a total of 159 companies and received the responses only from 27 companies (17.0%). Then, the negotiations were made with 7 companies. But it did not result in the introduction of SDK. The major reasons for not resulting in agreement of introduction of SDK are:

- Not suitable for their own business,
- Difficulties for them to collaborate with outside parties due to internal and/or external regulations

Table 5-1 Overview of Results of Negotiations with the Application Vendors

Item	Number of companies	Percentage	Remarks
Total number of companies approached	159	-	
Number of companies that responded	27	17.0%	Face-to-face meetings and individual feedback
Number of companies that conducted business negotiations	7	4.4%	
Number of companies that adopted SDK	0	0%	

Source：Study Team

Table 5-2 List of Outcome of Negotiations with the Application Vendors (1)

No	Customer Name	Category	Apps Name	MAU	Status	Updated	Feasibility
1	ACT Foundation https://act.id/home/i	9. ETC	Indonesia Dermawan	100K	9. Lost	2022/3/11	9. Lost
2	LinkAja https://www.linkaja.id/	7. FinTech	LinkAja	-	9. Lost	2022/3/11	9. Lost
3	Traveloka https://www.traveloka.com/en-id/	1. SuperApps	Traveloka	-	9. Lost	2022/3/11	9. Lost
4	Peduli Lindungi https://www.pedulilindungi.id/	1. SuperApps	Peduli Lindungi	143M	9. Lost	2022/3/11	9. Lost
5	Skill Academy by Ruang Guru https://skillacademy.com/	6. Education	Skill Academy	-	9. Lost	2022/3/11	9. Lost
6	BlueBird Group https://www.bluebirdgroup.com/	2. Transportation	My BlueBird	-	9. Lost	2022/3/11	9. Lost
7	Amartha https://amartha.com/id_ID/	7. FinTech	Amartha	-	9. Lost	2022/3/11	9. Lost
8	Dana https://www.dana.id/	7. FinTech	Dana	-	9. Lost	2022/3/11	9. Lost
9	Jenius	7. FinTech	Jenius		9. Lost	2022/3/11	9. Lost
10	Asia Trans	2. Transportation			1. First Contact	2022/3/11	9. Lost
11	Oke Jek	2. Transportation			1. First Contact	2022/3/11	9. Lost
12	Nujek-Nusantara Ojek	2. Transportation			1. First Contact	2022/3/11	9. Lost
13	Kita bisa	7. FinTech			1. First Contact	2022/3/11	9. Lost
14	Doku	7. FinTech			1. First Contact	2022/3/11	9. Lost
15	Bareksa	7. FinTech			1. First Contact	2022/3/11	9. Lost
16	Go-Pay	7. FinTech			2. Responding	2022/3/11	9. Lost
17	Ovo	7. FinTech			2. Responding	2022/3/11	9. Lost
18	Maxim	2. Transportation			1. First Contact	2022/3/11	9. Lost
19	byU	8. Social			1. First Contact	2022/3/11	9. Lost
20	Tiket.com	1. SuperApps			1. First Contact	2022/3/11	9. Lost
21	Detik	3. Media			1. First Contact	2022/3/11	9. Lost
22	Caping	3. Media			1. First Contact	2022/3/11	9. Lost
23	Kompas.com	3. Media			1. First Contact	2022/3/11	9. Lost
24	Babe	3. Media			1. First Contact	2022/3/11	9. Lost
25	Kumparan	3. Media			1. First Contact	2022/3/11	9. Lost
26	IDN Times	3. Media			1. First Contact	2022/3/11	9. Lost
27	CNBC Indonesia	3. Media			1. First Contact	2022/3/11	9. Lost
28	Halodoc	9. ETC			1. First Contact	2022/3/11	9. Lost
29	Zomato	5. F&B			1. First Contact	2022/3/11	9. Lost
30	Ralali	9. ETC			1. First Contact	2022/3/11	9. Lost
31	Warna Warni Media Group	3. Media			9. Lost	2023/1/29	Open/Next Phase
32	Carirekan	9. ETC	Carirekan		9. Lost	2023/1/29	Open/Next Phase
33	Udemy	6. Education	Udemy		3. First Proposal	2022/3/11	9. Lost
34	Paxel Teknologi Unggul	9. ETC	Paxel		1. First Contact	2022/3/11	9. Lost
35	Zilingo	9. ETC	Zilingo		2. Responding	2023/2/22	7. Lost (Company regulation/ OJK/etc)
36	Javamifi	9. ETC	Javamifi		1. First Contact	2022/3/11	9. Lost
37	Zalora	9. ETC	Zalora		1. First Contact	2022/3/11	9. Lost
38	Mokkaya	9. ETC	Mokkaya		9. Lost	2022/3/11	9. Lost
39	Evermos	9. ETC	Evermos		9. Lost	2022/3/11	9. Lost
40	Tix id	4. Entertainment	Tix id		9. Lost	2022/3/11	9. Lost

Source：Study Team

Table 5-3 List of Outcome of Negotiations with the Application Vendors (2)

No	Customer Name	Category	Apps Name	MAU	Status	Updated	Feasibility
41	Trip.com	9. ETC	Trip.com		9. Lost	2022/3/11	9. Lost
42	Brainly	6. Education	Brainly		9. Lost	2022/3/11	9. Lost
43	BukuKas	9. ETC	BukuKas		9. Lost	2022/3/11	9. Lost
44	Podcast Radio Musik	4. Entertainment	Podcast Radio Musik		9. Lost	2022/3/11	9. Lost
45	Spotify	4. Entertainment	Spotify		9. Lost	2022/3/11	9. Lost
46	Joox music	4. Entertainment	Joox music		9. Lost	2022/3/11	9. Lost
47	Akulaku	9. ETC	Akulaku		9. Lost	2022/3/11	9. Lost
48	BukuWarung	9. ETC	BukuWarung		9. Lost	2022/3/11	9. Lost
49	WeTV	4. Entertainment	WeTV		9. Lost	2022/3/11	9. Lost
50	Vidio	4. Entertainment	Vidio		9. Lost	2022/3/11	9. Lost
51	Bibit	9. ETC	Bibit		1. First Contact	2022/3/11	9. Lost
52	Kredivo	9. ETC	Kredivo		9. Lost	2022/3/11	9. Lost
53	Alfagif	9. ETC	Alfagif		9. Lost	2022/3/11	9. Lost
54	PLN Mobile	9. ETC	PLN Mobile		9. Lost	2022/3/11	9. Lost
55	SHAREit	9. ETC	SHAREit		9. Lost	2022/3/11	9. Lost
56	E-SAMSAT	0. Governement	E-SAMSAT		9. Lost	2022/3/11	9. Lost
57	Webtoon	9. ETC	Webtoon		9. Lost	2022/3/11	9. Lost
58	MangaToon	9. ETC	MangaToon		9. Lost	2022/3/11	9. Lost
59	Getcontact	9. ETC	Getcontact		9. Lost	2022/3/11	9. Lost
60	Truecaller	9. ETC	Truecaller		9. Lost	2022/3/11	9. Lost
61	Discord	9. ETC	Discord		9. Lost	2022/3/11	9. Lost
62	Tantan	9. ETC	Tantan		9. Lost	2022/3/11	9. Lost
63	beetalk	9. ETC	beetalk		9. Lost	2022/3/11	9. Lost
64	Viu	4. Entertainment	Viu		9. Lost	2022/3/11	9. Lost
65	Disney+ Hotstar	4. Entertainment	Disney+ Hotstar		9. Lost	2022/3/11	9. Lost
66	Cookpad	9. ETC	Cookpad		9. Lost	2022/3/11	9. Lost
67	Mamikos	9. ETC	Mamikos		9. Lost	2022/3/11	9. Lost
68	Tinder	9. ETC	Tinder		9. Lost	2022/3/11	9. Lost
69	Waze	9. ETC	Waze		9. Lost	2022/3/11	9. Lost
70	Mobile JKN	0. Governement	Mobile JKN		9. Lost	2022/3/11	9. Lost
71	Alodokter	9. ETC	Alodokter		9. Lost	2022/3/11	9. Lost
72	JMO	0. Governement	JMO		9. Lost	2022/3/11	9. Lost
73	KlikDokter	9. ETC	KlikDokter		9. Lost	2022/3/11	9. Lost
74	Primaku	9. ETC	Primaku		9. Lost	2022/3/11	9. Lost
75	Smule	9. ETC	Smule		9. Lost	2022/3/11	9. Lost
76	Shazam	9. ETC	Shazam		9. Lost	2022/3/11	9. Lost
77	Theasianparent	9. ETC	Theasianparent		9. Lost	2022/3/11	9. Lost
78	Bigo live	8. Social	Bigo live		9. Lost	2022/3/11	9. Lost
79	OmeTV	8. Social	OmeTV		9. Lost	2022/3/11	9. Lost
80	Segari	5. F&B	Segari		9. Lost	2023/1/29	Open/Next Phase
81	Duitin	7. FinTech	Duitin		1. First Contact	2022/3/11	9. Lost
82	Hago	8. Social	Hago		9. Lost	2022/3/11	9. Lost
83	OYO	9. ETC	OYO		1. First Contact	2022/3/11	9. Lost
84	KAIAccess	0. Governement	KAIAccess		9. Lost	2022/3/11	9. Lost
85	Agoda	9. ETC	Agoda		9. Lost	2022/3/11	9. Lost
86	RedDoorz	9. ETC	RedDoorz		9. Lost	2022/3/11	9. Lost
87	Pegipegi	9. ETC	Pegipegi		1. First Contact	2022/3/11	9. Lost
88	Snack Video	9. ETC	Snack Video		9. Lost	2022/3/11	9. Lost
89	KineMaster	9. ETC	KineMaster		9. Lost	2022/3/11	9. Lost
90	Antrean Pajak	0. Governement	Antrean Pajak		9. Lost	2022/3/11	9. Lost
91	PhotoRoom	9. ETC	PhotoRoom		9. Lost	2022/3/11	9. Lost
92	booking.com	9. ETC	booking.com		9. Lost	2022/3/11	9. Lost
93	Duo	9. ETC	Duo		9. Lost	2022/3/11	9. Lost
94	McDonalds	5. F&B	McDonalds		9. Lost	2022/3/11	9. Lost
95	ForeCoffee	5. F&B	ForeCoffee		1. First Contact	2022/3/11	9. Lost
96	KopiKenangan	5. F&B	KopiKenangan		1. First Contact	2022/3/11	9. Lost
97	UberEats	5. F&B	UberEats		1. First Contact	2022/3/11	9. Lost
98	SeaBank	7. FinTech	SeaBank		3. Responding	2023/2/22	7. Lost (Company regulation/ OJK/etc)
99	BabyCenter	9. ETC	BabyCenter		9. Lost	2022/3/11	9. Lost
100	PregnancyTracker	9. ETC	PregnancyTracker		9. Lost	2022/3/11	9. Lost
101	FitnessFirst	9. ETC	FitnessFirst		9. Lost	2022/3/11	9. Lost
102	Celebrity Fitness	9. ETC	Celebrity Fitness		9. Lost	2022/3/11	9. Lost
103	Indosat	9. ETC	MyIM3		1. First Contact	2022/3/11	9. Lost
104	Jobstreet	9. ETC	Jobstreet		1. First Contact	2022/3/11	9. Lost
105	Linkedin	9. ETC	Linkedin		1. First Contact	2022/3/11	9. Lost
106	JobsDB	9. ETC	JobsDB		1. First Contact	2022/3/11	9. Lost
107	Prodia	9. ETC	Prodia		9. Lost	2022/3/11	9. Lost
108	Kimia Farma	9. ETC	Kimia Farma		9. Lost	2022/3/11	9. Lost
109	Prambors	3. Media	Prambors		7. Meeting in Bahasa	2023/2/10	9. Lost (No feedback)
110	HardrockFM	3. Media	HardrockFM		1. First Contact	2023/1/29	Open/Next Phase
111	GenFM	3. Media	GenFM		1. First Contact	2023/1/29	Open/Next Phase
112	MustangFM	3. Media	MustangFM		9. Lost	2022/3/11	9. Lost
113	Kulina	5. F&B	Kulina		9. Lost	2022/3/11	9. Lost
114	Garena	9. ETC	Garena		4. 2nd Proposal	2022/3/11	Open/Next Phase
115	Chatime	5. F&B	Chatime		4. 2nd Proposal	2022/3/11	Open/Next Phase
116	Lazada Indonesia	9. ETC	Lazada		7. Meeting in Bahasa	2023/2/23	7. Lost (Company regulation/ OJK/etc)
117	Bank Syariah BSI	7. FinTech	BSI		9. Lost	2023/1/4	9. Lost (No feedback)
118	Starbucks	5. F&B	Starbucks Indonesia		9. Lost	2023/1/4	9. Lost (No feedback)
119	Ajaib	7. FinTech	Ajaib		2. Responding	2023/2/21	9. Lost (No feedback)
120	Blibli	7. FinTech	blibli		9. Lost	2023/1/4	9. Lost (No feedback)

Source: Study Team

Table 5-4 List of Outcome of Negotiations with the Application Vendors (3)

No	Customer Name	Category	Apps Name	MAU	Status	Updated	Feasibility
121	ADAKami	7. FinTech	AdaKami		1. First Contact	2023/1/4	9. Lost (No feedback)
122	Bilibili	7. FinTech	bilibili		9. Lost	2023/1/4	9. Lost (No feedback)
123	Atome Kredit Pintar	7. FinTech	Atome ID		1. First Contact	2023/1/4	9. Lost (No feedback)
124	PT Anteraja	9. ETC	Anteraja		1. First Contact	2023/1/4	9. Lost (No feedback)
125	Akseleran	7. FinTech	Akseleran		9. Lost	2023/1/4	9. Lost (No feedback)
126	Sayurbox	5. F&B	Sayurbox		7. Meeting in Bahasa	2023/2/22	8. Lost (Business situation not good)
127	Bank Mandiri	7. FinTech	Livin by Mandiri		7. Meeting in Bahasa	2023/2/22	7. Lost (Company regulation/ OJK/etc)
128	Pegadaian	7. FinTech	Pegadaian Digital		9. Lost	2023/1/26	9. Lost (No feedback)
129	Kredito	7. FinTech	Kredito		9. Lost	2023/1/26	9. Lost (No feedback)
130	Jago	7. FinTech	Jago		1. First Contact	2023/1/26	9. Lost (No feedback)
131	Paxel	9. ETC	Paxel		1. First Contact	2023/1/26	9. Lost (No feedback)
132	Watsons	9. ETC	WatsonsID		9. Lost	2023/1/26	9. Lost (No feedback)
133	Sociolla	9. ETC	SOCO by Sociolla		9. Lost	2023/1/26	9. Lost (No feedback)
134	Mitra Adi Perkasa	9. ETC	MAPCLUB		9. Lost	2023/1/26	9. Lost (No feedback)
135	Lalamove	9. ETC	Lalamove		9. Lost	2023/1/26	9. Lost (No feedback)
136	OY!	7. FinTech	OY! Indonesia		9. Lost	2023/1/26	9. Lost (No feedback)
137	Pahamify https://pahamify.com/	6. Education	Pahamify		7. Meeting in Bahasa	2023/2/10	8. Lost (Business situation not good)
138	siCepat	9. ETC	siCepat		1. First Contact	2023/1/26	9. Lost (No feedback)
139	Aruna	9. ETC	Aruna		2. Responding	2023/2/22	5. Continue next meeting
140	JD ID	9. ETC	JD ID		9. Lost	2023/1/26	9. Lost (No feedback)
141	DUIT (UKB Global Group)	7. FinTech	DUIT		1. First Contact	2023/2/9	9. Lost (They have another priority system)
142	Bstation (bilibili) https://www.bilibili.tv/id	8. Social	Bstation		10. Join Webinar	2023/2/20	7. Lost (Company regulation/ OJK/etc)
143	Komunal Indonesia https://komunal.co.id/beranda	7. FinTech	Komunal		7. Meeting in Bahasa	2023/2/22	5. Continue next meeting
144	Amerta Indah Otsuka	5. F&B	Born to Sweat		9. Lost	2023/1/4	9. Lost (No feedback)
145	RCTI (MNC Group)	3. Media	RCTI+		10. Join Webinar	2023/2/7	7. Lost (Company regulation/ OJK/etc)
146	Dentsu	3. Media			9. Lost	2023/2/9	6. Lost (No need to know detail)
147	United tractors	9. ETC			9. Lost	2023/1/10	9. Lost (No feedback)
148	PT. Sharp Electronics Indonesia	9. ETC			10. Join Webinar	2023/3/9	9. Lost (They have another priority system)
149	NET Mediatama Televisi	3. Media	Netverse		10. Join Webinar	2023/2/9	9. Lost (The SDK solution not fit with their company needs)
150	PT PGAS Solution (Pertamina Group)	9. ETC			10. Join Webinar	2023/2/9	7. Lost (Company regulation/ OJK/etc)
151	PT Jakarta Propertindo	0. Governement			10. Join Webinar	2023/2/9	6. Lost (No need to know detail)
152	Tektonindo anugerah mandiri	9. ETC			10. Join Webinar	2023/2/22	6. Lost (No need to know detail)
153	TRISTEL	9. ETC			10. Join Webinar	2023/2/22	6. Lost (No need to know detail)
154	PT. Shopee Internasional Indonesia	1. SuperApps			10. Join Webinar	2023/2/8	6. Lost (No need to know detail)
155	Kompas TV	3. Media			10. Join Webinar	2023/2/9	7. Lost (Company regulation/ OJK/etc)
156	PT Sabre Travel Network Indonesia	9. ETC			10. Join Webinar	2023/2/22	7. Lost (Company regulation/ OJK/etc)
157	PT Mandala Finance	7. FinTech	Mantis	150K	1. First Contact	2023/2/22	0. TBC
158	PT Indomobil Finance Indonesia	7. FinTech	IMFI EZ	10k	7. Meeting in Bahasa	2023/2/22	7. Lost (Company regulation/ OJK/etc)
159	Mitra Indoteknologi	9. ETC	Draiv	100K	1. First Contact	2023/2/22	0. TBC

Source：Study Team

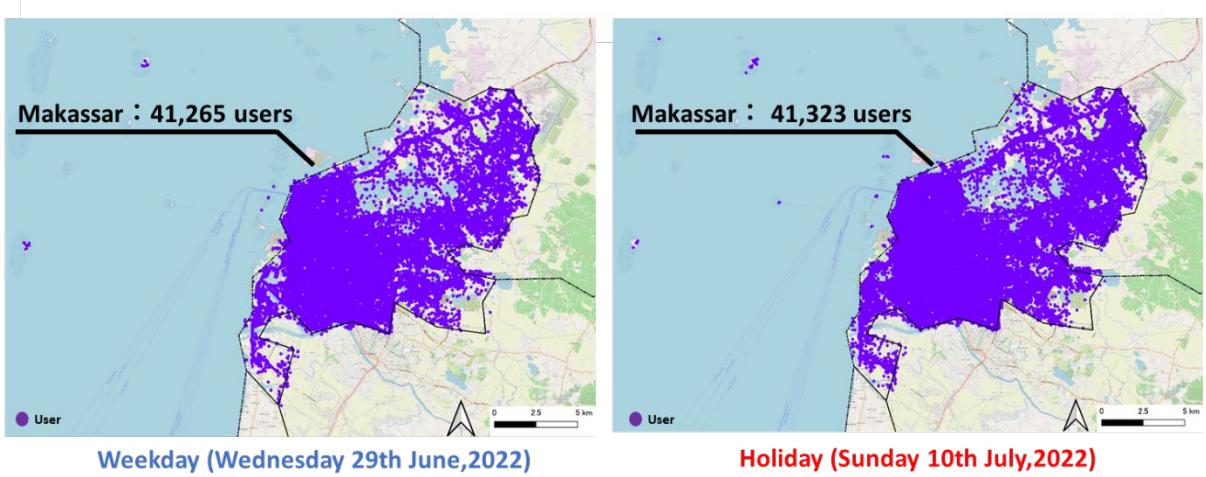
5.1.3 Utilization of Past Data

The study team conducted a human flow analysis of target area by utilizing the smartphone location data in Indonesia that Lifesight had obtained for the period of June 28, 2022 to July 11, 2022 due to the long time required to negotiate with the vendors. The results of the analysis were used for the 2nd and 3rd discussions.

Lifesight, headquartered in Singapore, provides offline services for digital advertising, primarily using location-based information. Lifesight has 14 million data users (MAUs[22]) in Indonesia. The latitude, longitude, and time can be obtained from Lifesight's location data.

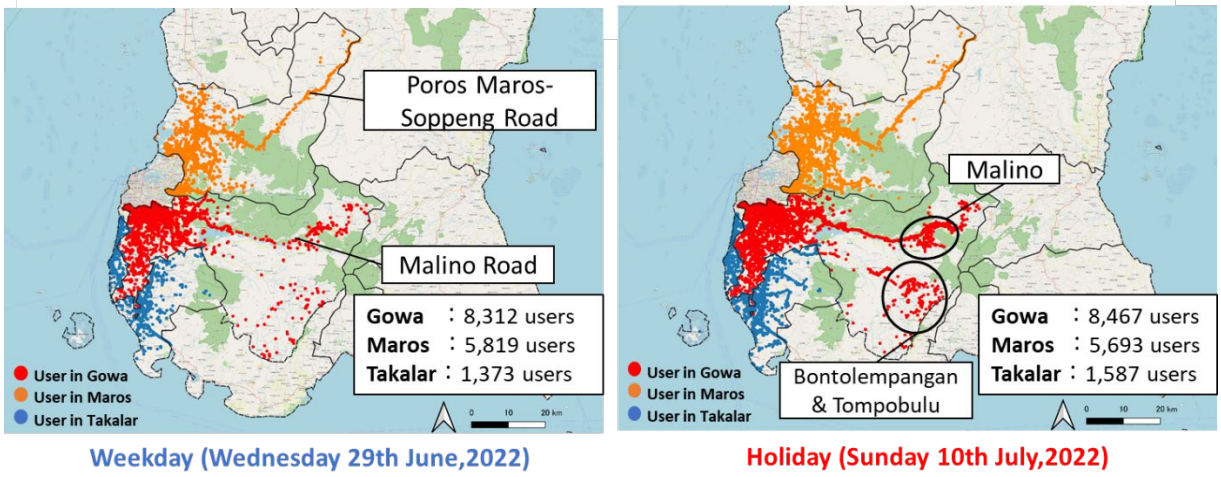
Approximately 1.4 million individual IDs were acquired per month in the entire Indonesia according to the data from June 28, 2022 to July 11, 2022. Of this total, Makassar City had 185,000 people, which is about 13.0% of the total population of Makassar City (= 185,000/1,427,000). It was about 6.8% of the total population in Gowa Regency (= 52,000/773,000), about 8.8% in Maros Regency (= 35,000/142,700), about 2.9% in Takalar Regency(=90,000/302,000) respectively. Figure 5-2 and Figure 5-3 show the distribution of the acquired data in the target area on June 29, 2022 (weekday) and July 10, 2022 (holiday).

[22] Abbreviation for Monthly Active Users. Refers to the number of users who have used or had activity at least once in a particular month.



Source: Study Team

Figure 5-2 Distribution of Data Acquired during Weekdays and Holidays in Makassar City



Source: Study Team

Figure 5-3 Distribution of Data Acquired during Weekdays and Holidays in Gowa Regency, Maros Regency, and Takalar Regency

5.2 Results of MBD Analysis

Several meetings were held to report the results of MBD analysis to the related agencies. The summary and results are shown below.

5.2.1 Summary of Meeting

Table 5-5 Summary of Meeting

No.	Date and Time	Details	Participants
1	December 6,2022 16:00 to 18:30	＜The 2nd meeting＞ 1. Confirmation of comments from 1st meeting 2. Explanation of MBD analysis results	・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Cooperation Division, Makassar City

		3.Exchange of opinions	
2	February 8,2023 15:20 to 18:00	＜The 3rd meeting＞ 1.Confirmation of comments from 2nd meeting 2.Proposed Teman Bus corridor 3.Exchange of opinions	・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Cooperation Division, Makassar City
3	March 27, 2023 11:00 to13:40	＜The 4th meeting＞ 1. Confirmation of comments from 2nd/3rd meeting 2.Teman Bus corridor proposed Pete Pete route 3.Exchange of opinions	・Land Transportation Management Center Region No.19, Ministry of Transportation ・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Transportation Office, Gowa Regency ・Transportation Office, Maros Regency ・Transportation Office, Takalar City ・Regional Development Planning Agency, Makassar City ・Regional Development Planning, Research and Development Agency, Gowa Regency

Source: Study Team

5.2.2 Outcome of Meeting

(1) The 2nd Meeting（Province Transportation Office, City Transportation Office）

1) Participants

（i）Indonesian side: Face-to-Face Meeting

- Transportation Office, South Sulawesi Province
  - Ms. Andi Nur Diyana (Chief of Mamminasata Technical Implementattion Unit)
  - Ms. Tina (Staff of Mamminasata Technical Implementattion Unit)
  - Ms. Eka (Research and Development)
- Transportation Office, Makassar City
  - Mr. Zaenal Ibrahim (Daily Executor)
  - Mr.Jasman Launtu (Head of Transportation Mode Division)
  - Mr.Tibrisi (Staff of Transportation Mode Division)
- Cooperation Division, Makassar City
  - Ms. Ismawaty Nur (Head)
  - Mr. Haeroel B (Staff)

（ii）Japanese side: Hybrid Meetings(Face-to-Face & Online Meeting)

- International Policy Division, Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism
  - Nami Sato(International Transport Strategy Officer), Akitsugu Ookuma(International Cooperation Officer), Kodai Ozawa (Officer)
- Nippon Koei Co., Ltd

- Hisanari Ushirooka, Atsushi Mochizuki, Hiroya Totani, Keita Hirayanagi, Ryoma Yae, Kenta Kikuchi, Djamaluddin Ibrahim, Miftahul Khaer

- Agoop Corp.
  - Yusuke Kato, Miki Fujii, Kotaro Kiyoshi
- PT. SBTelecom Indonesia
  - Kim Takkun, Sugimoto Ayae, Sinatrya Rahma

2) Findings and Comments on MBD Analysis Results

- The South Sulawesi Province Transportation Office commented that they would like the new corridor to take this into account since there is an overlap and competition between Teman Bus in Corridor 2 and Pete Pete routes. They also asked about the reason for the different number of users in the morning, daytime, and evening. The study team responded that the data used in this study was acquired through several different applications and that the acquisition method differs depending on whether the data is acquired in the foreground, background, or powered on/off, resulting in differences in the number of users at different times of the day.
- The Makassar City Transportation Office commented that expanding the scope of the analysis to include the Gowa, Maros, and Takalar Regencies in addition to Makassar City has led to good results.
- The Makassar City Cooperation Division commented that they believe that linking heat maps to issues that the city and county are facing will contribute to meaningful public transportation formulation.

3) Meeting Materials

The meeting materials are as follows:

Utilization of Big Data to Improve Mobility in Mamminasata Metropolitan Area

- 2nd meeting -

1. Date: 9th December, 2022
2. Time : 15:00 – 16:00 (Makassar Time)
3. Participants
   Dishub South Sulawesi Province
   Dishub Makassar City
   Cooperation section Makassar City
   MLIT
   Agoop:
   SBTelecom Indonesia
   Nippon Koei
4. Agenda:
   I. Summary of the 1st meeting
   II. BD Utilization Plan
   III. Status of Data Collection
   IV. Analysis Results using Data from Lifesight
   V. Upcoming Schedule

1

Ⅳ. Analysis Results using Sample Data

Introduction of Big Data (Lifesight)

○Outline of Lifesight

Company	Outline	Data Contents	Number of User
Lifesight	Headquartered in Singapore, the company provides offline services for digital advertising, primarily using location-based information.	・GPS data ・Obtain Ad ID	MAU※1 1.4 million (within Indonesia)

※1：MAU(Monthly Active Users):Number of active users per month

○Outline of Sample Data

	Makassar	Gowa	Maros	Takalar
Data Acquisition Period	June 28th, 2022 ～ July 11th, 2022			
Number of data (million)	16.3	3.6	2.1	0.6
Number of users (thousand)	185.1	52.6	35.0	9.0
Population(2021) (thousand)	1,427	773	396	302
Data validity (＝Users/Population)	12%＞5%	6.8%＞5%	8.8%＞5%	2.9%＜5%

⇒MBD analysis was done using the "Lifesight"'s big data as sample analysis

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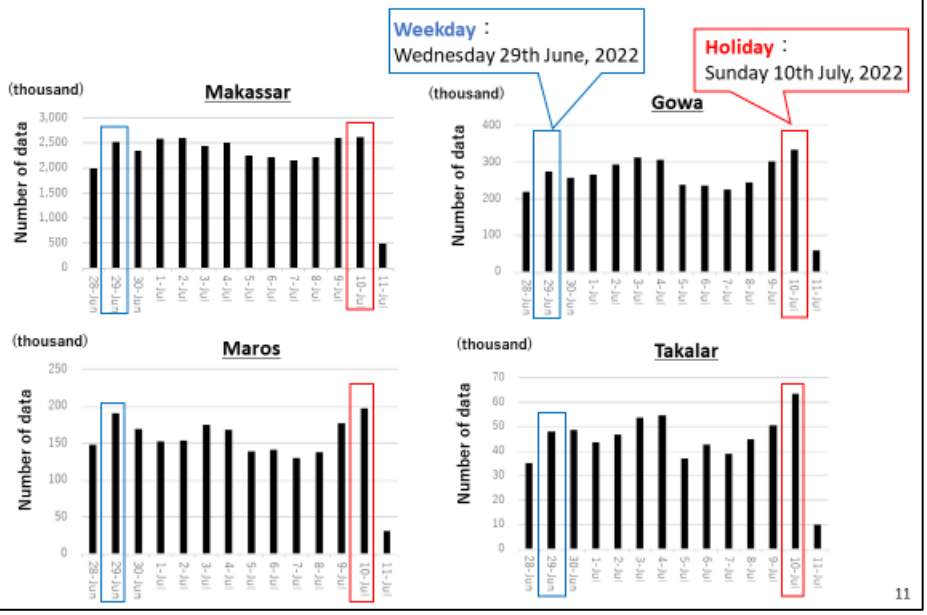
The study team used the external data, Lifesight's big data (for the period June 28, 2022 to July 11, 2022) for the analysis because any installations of Agoop SDK to the location application were not achieved. The details of Lifesight's data are shown in 5.1.3.

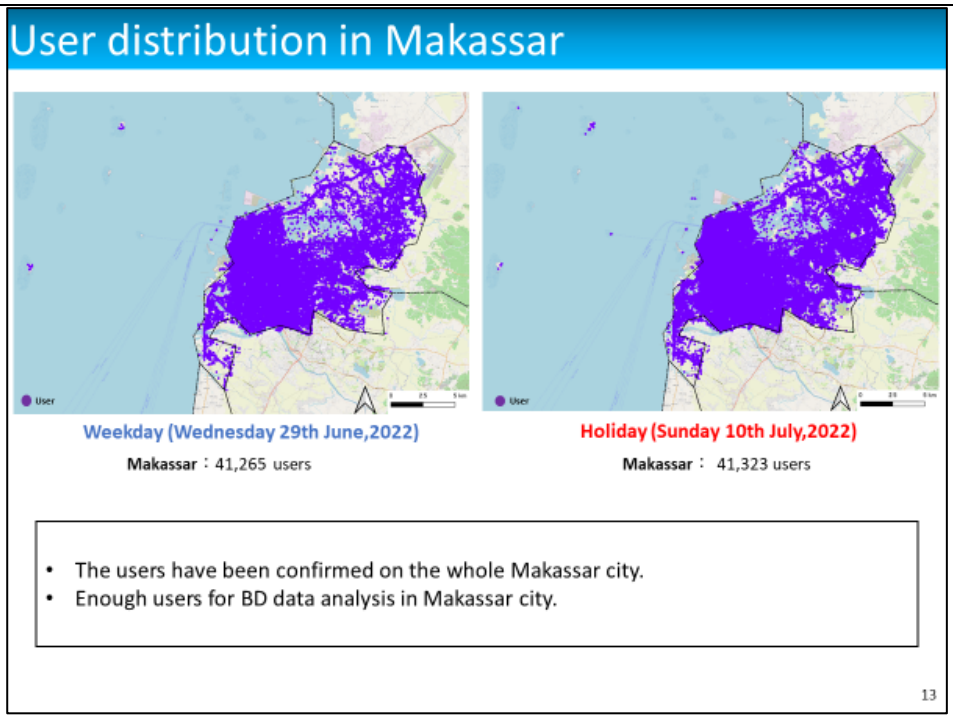
Introduction of Big Data (Lifesight)

・Using data from weekdays and holidays, when the number of data is large.

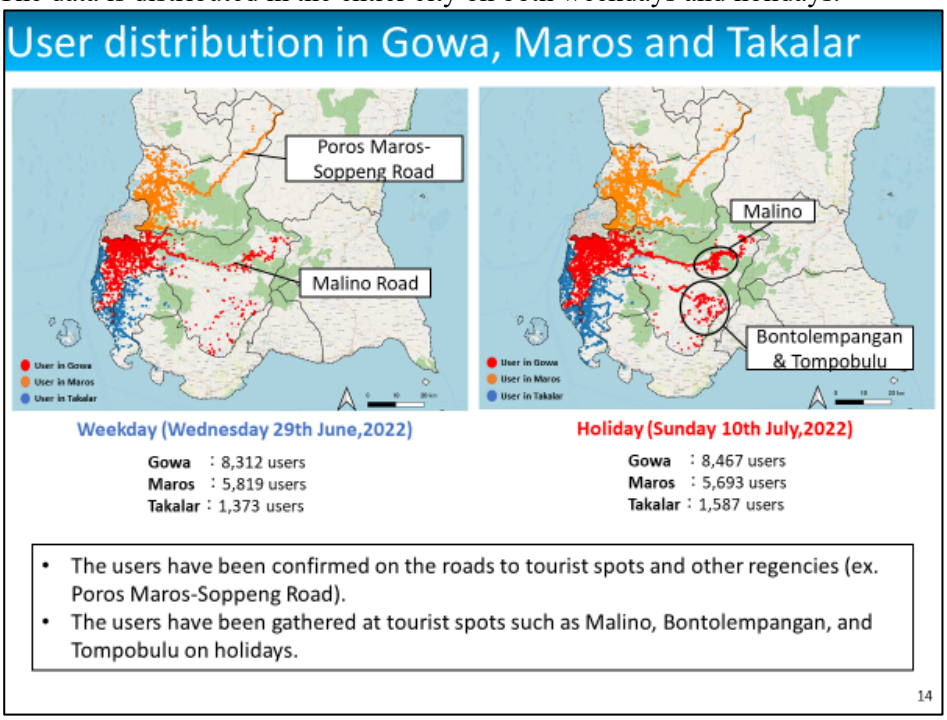


11

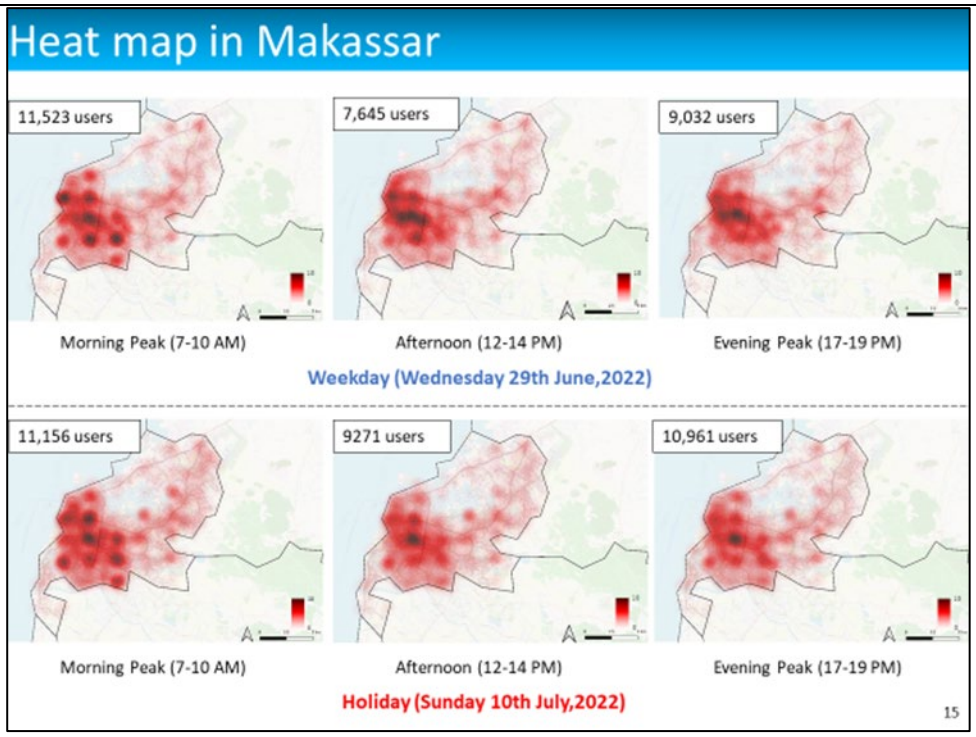
The number of data per day during the acquisition period was checked for each regency/city. The study team used the data from weekdays (Wednesday, 29/6/2022) and holidays (Sunday, 10/7/2022), when the number of data acquisitions was high, for this analysis.



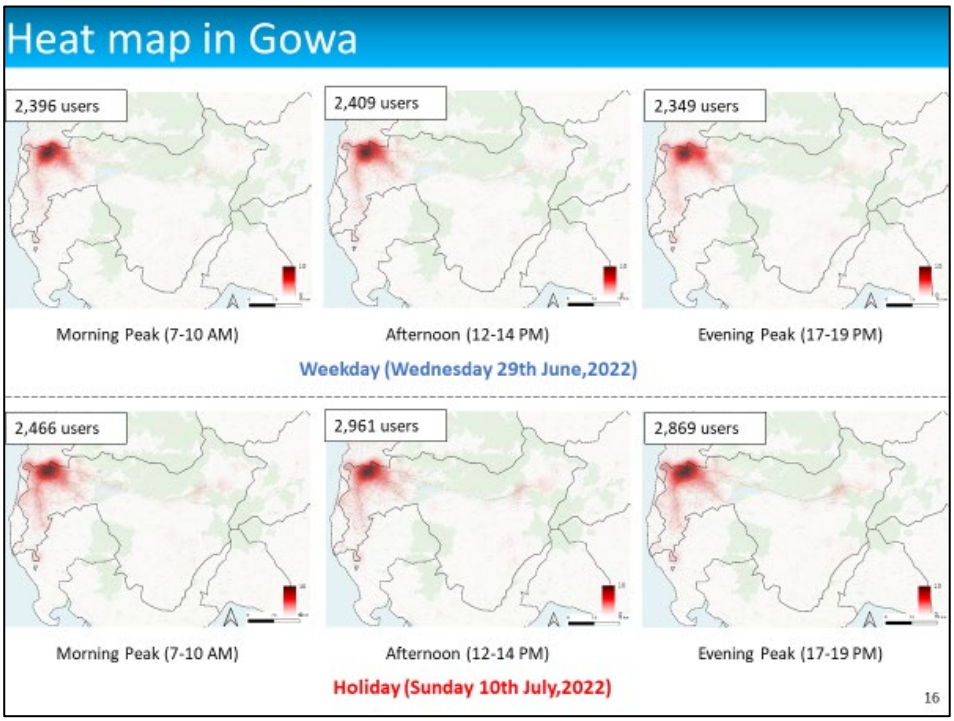
The above table shows the distribution of data in Makassar City on the targeted weekdays and holidays. The data is distributed in the entier city on both weekdays and holidays.



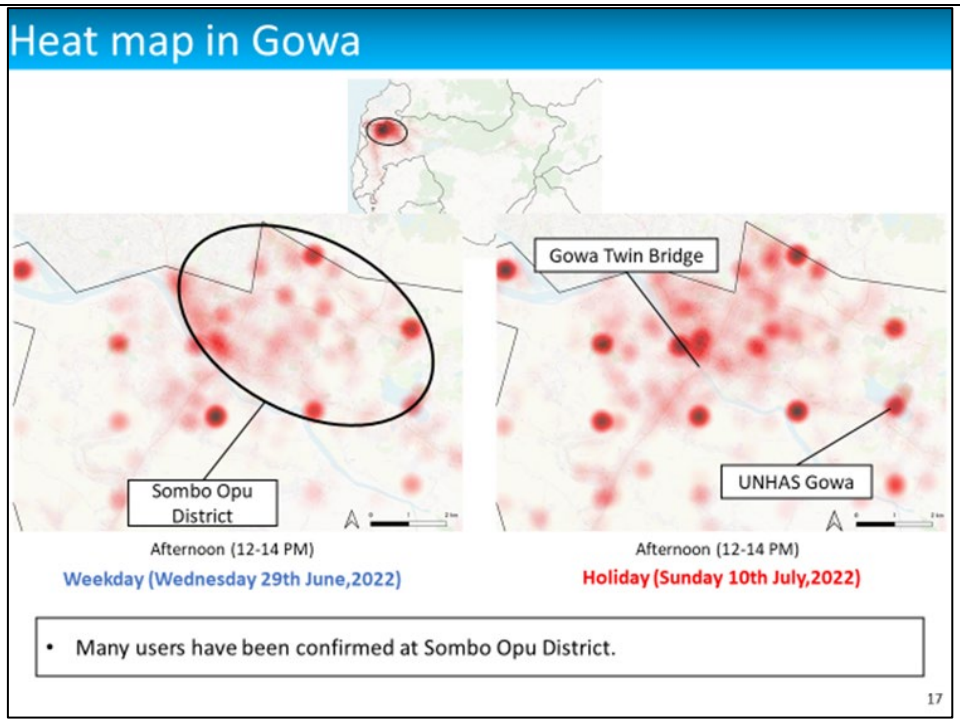
The above figure shows the distribution of data in Gowa, Maros, and Takalar Regencies on the targeted weekdays and holidays. In Gowa Regency, data are distributed in the Malino and Bontolempanga&Tompobulu areas, which are tourist areas, on holidays compared to weekdays. In Maros Regency, the data are distributed in the center and along the main road, Poros Maros-Soppeng road. In Takalar Regency, the data are distributed on the west side, which is along the coast. On the other hand, it is less distributed on the east side.



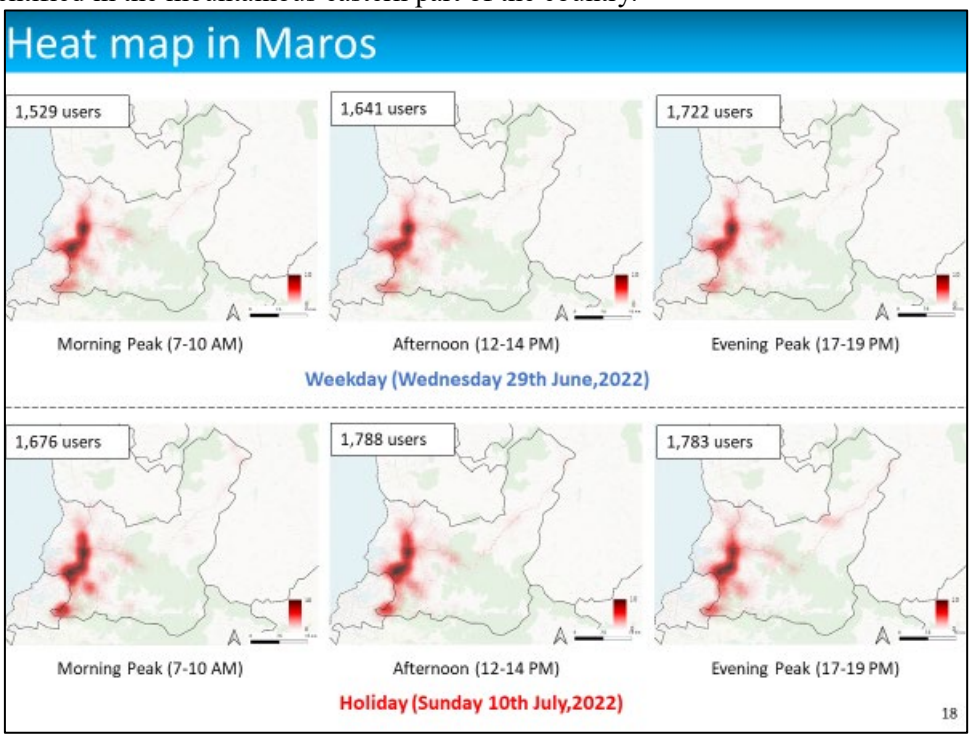
The results of the heatmap analysis by time zone (7am-10am, 12pm-14pm, 5pm-7pm) for weekdays (June 29, 2022) and by time zone (7am-10am, 12pm-14pm, 5pm-7pm) for holidays (July 10, 2022) in Makassar City are shown in the figure above. Regardless of the weekday or holiday and regardless of the time of day, it can be seen that users are concentrated especially in the central area of Makassar City.



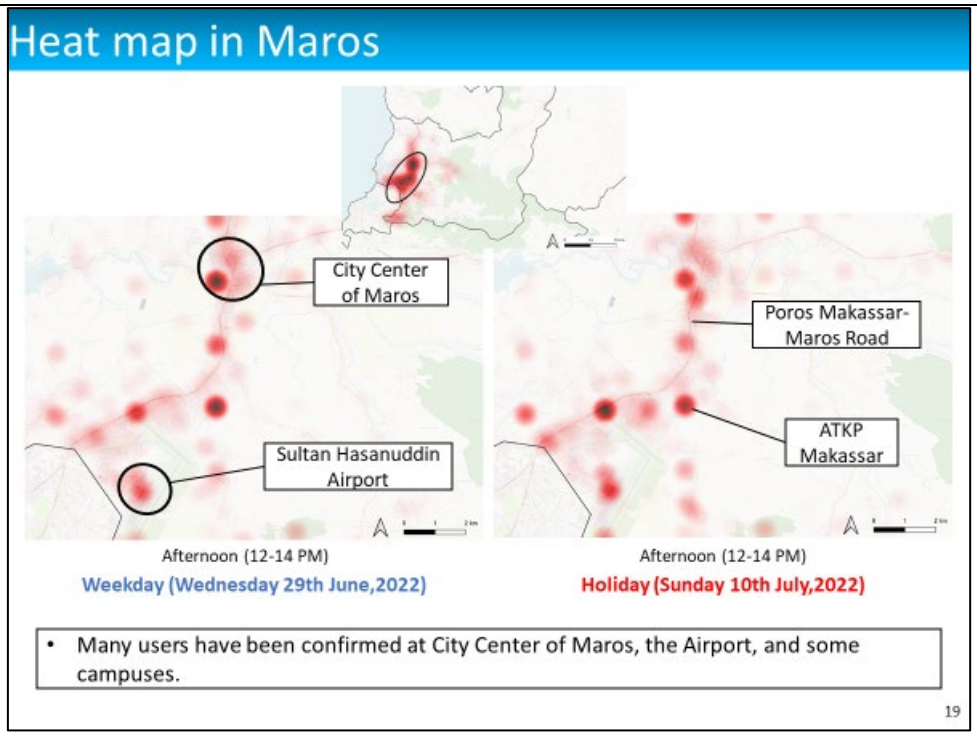
The above figure shows the results of the heatmap analysis by time of day (7:00-10:00, 12:00-14:00, 17:00-19:00) for weekday (June 29, 2022) and holiday (July 10, 2022) in Gowa Regency



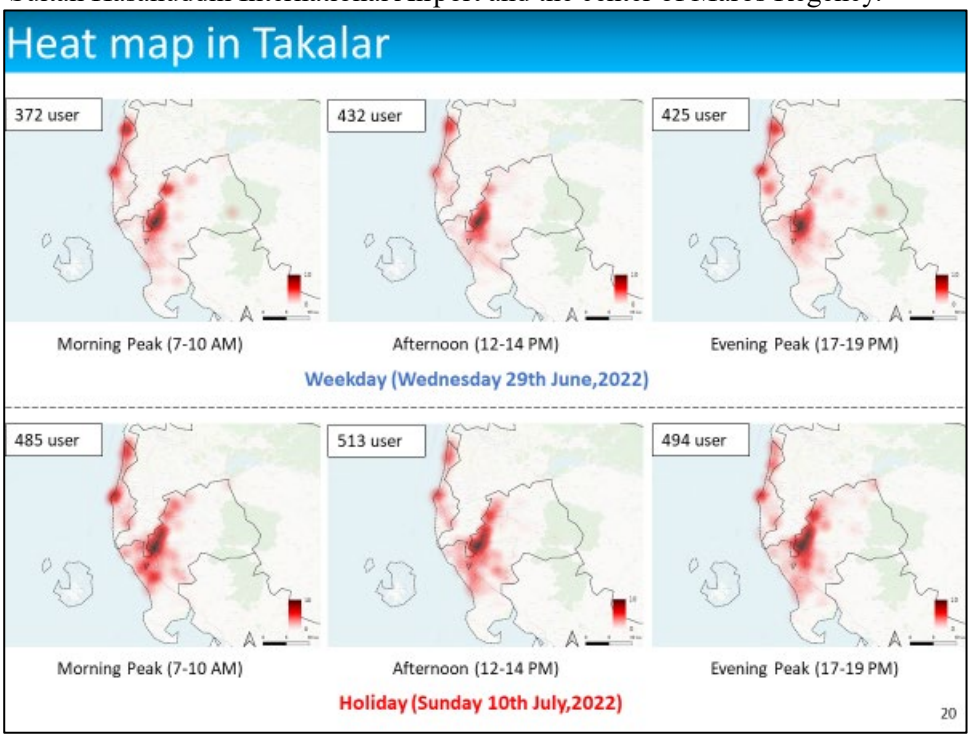
Regardless of the weekday or holiday and time of day, most users were found in the Sombo Opu area in the northwest near Makassar City. On the other hand, users were not so well identified in the mountainous eastern part of the country.



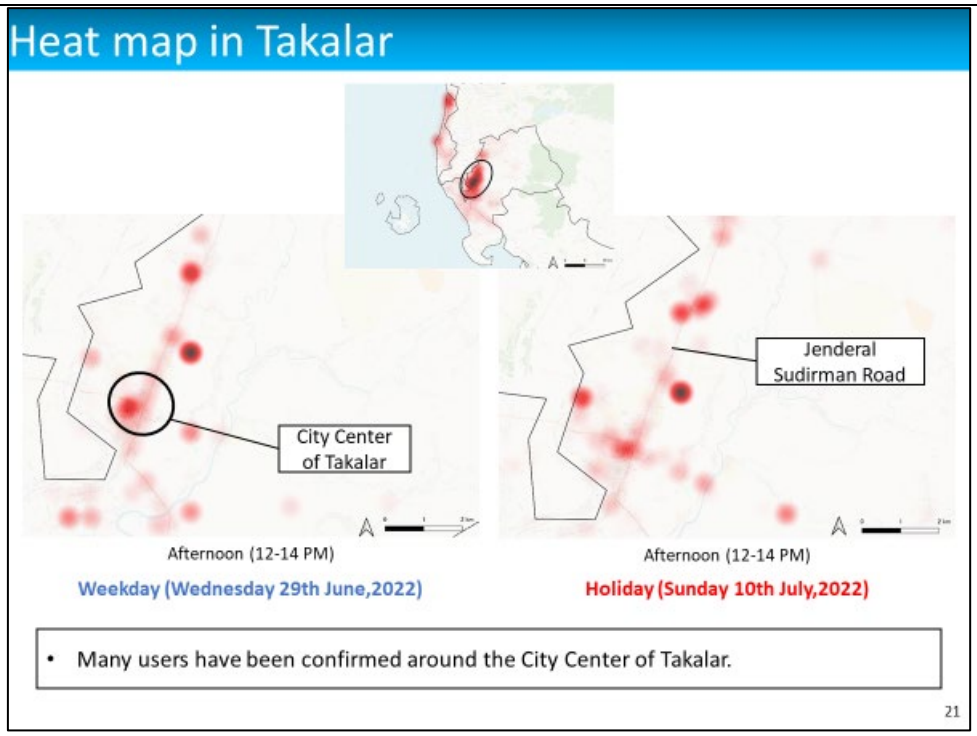
The above figure shows the results of the heatmap analysis by time of day (7:00-10:00, 12:00-14:00, 17:00-19:00) for weekday (June 29, 2022) and holiday (July 10, 2022) in Maros Regency.



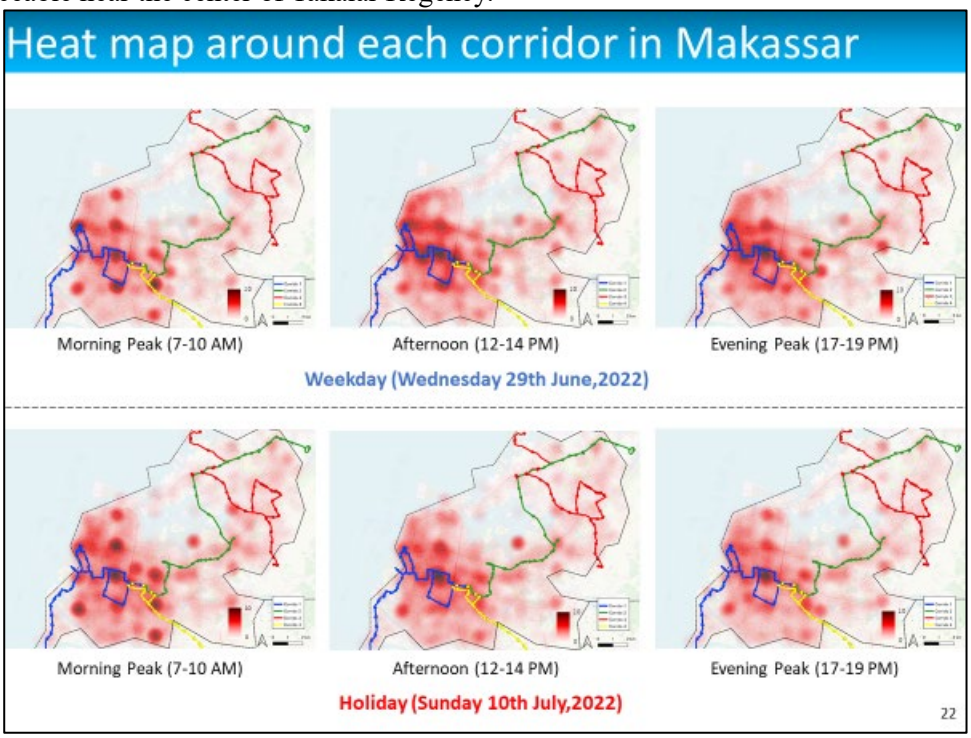
The users were mostly found in the southwestern area near Makassar City, especially near the Sultan Hasanuddin International Airport and the center of Maros Regency.



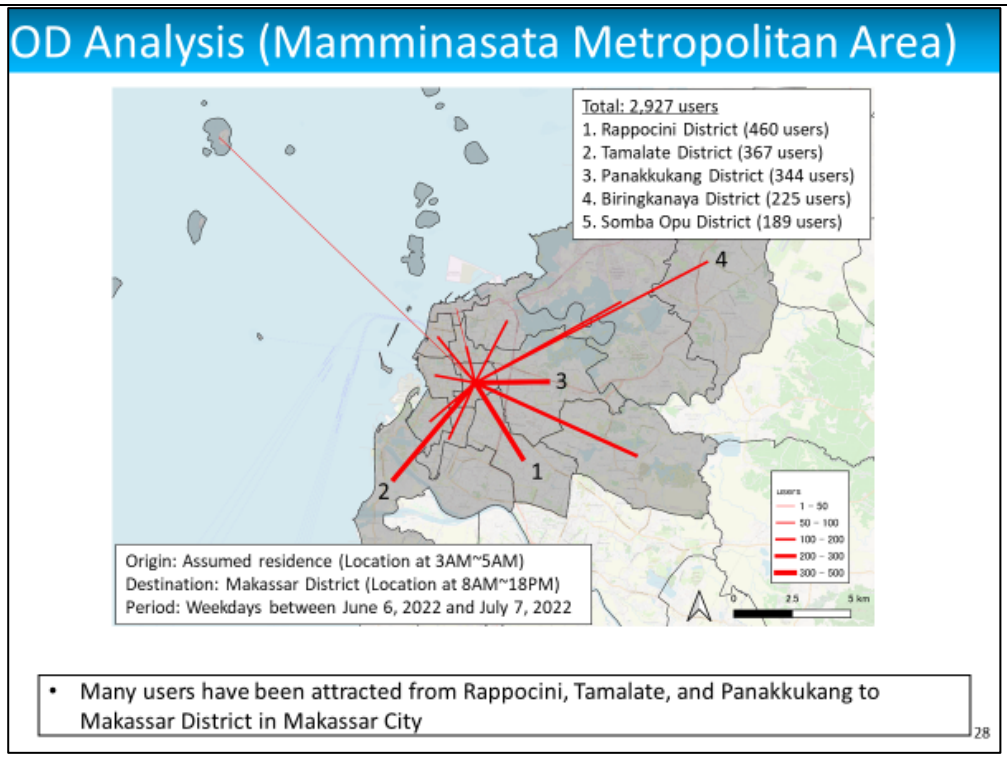
The above figure shows the results of the heatmap analysis by time of day (7:00-10:00, 12:00-14:00, 17:00-19:00) for weekday (June 29, 2022) and holiday (July 10, 2022) in Takalar Regency.



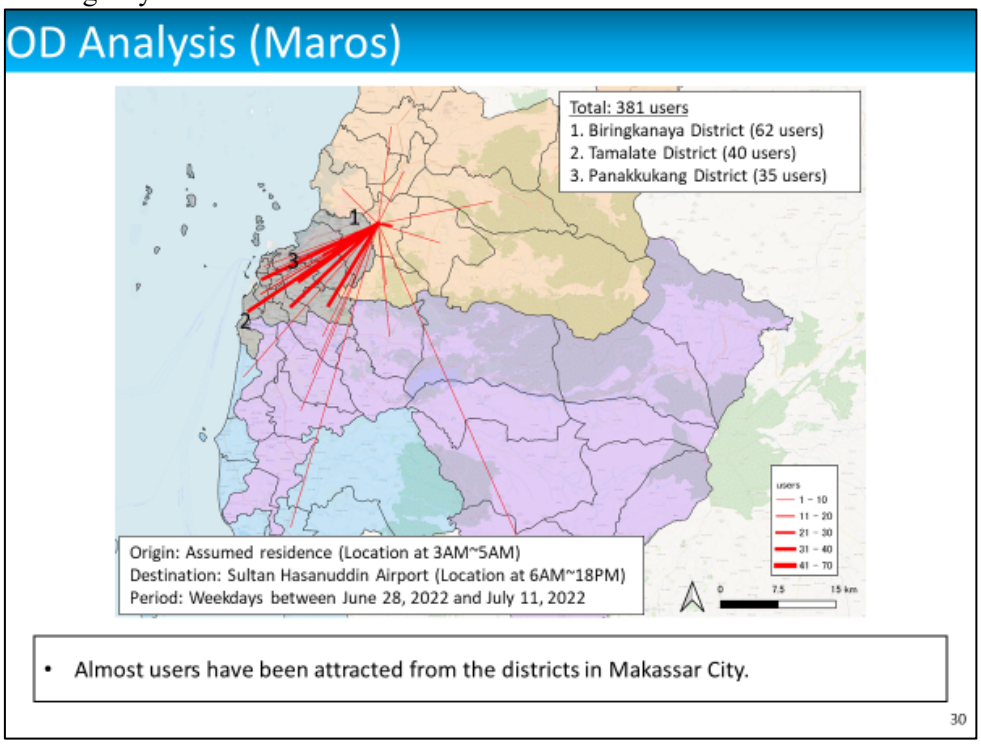
The users were found in large numbers in the west near Makassar City and were especially noticeable near the center of Takalar Regency.



The above figure shows the maps overlaying the previously mentioned heat map and Teman bus corridors in Makassar City. The current Teman Bus corridor does not cover the entire Makassar city center, where demand is high. It can also be seen that Corridor 3 runs through an area that does not have many users.

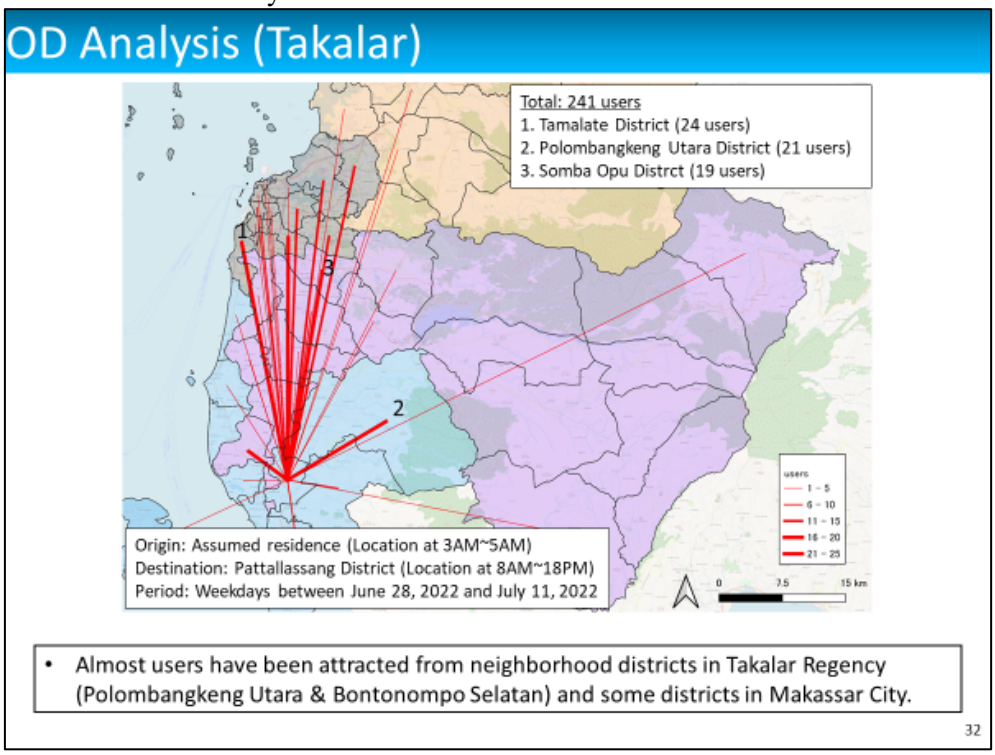


The results of the OD analysis are based on two weeks of data from June 28, 2022 to July 11, 2022, with the Makassar district as the end point and the residence as the starting point. In particular, it can be observed that people are flowing from the southeastern area adjacent to Gowa Regency to Makassar District.



The results of the OD analysis are based on two weeks of data from June 28, 2022 to July 11, 2022, using Sultan Hasanuddin International Airport in Maros Regency as the end point and the residence as the starting point. It can be seen that many users heading to the international airport

travel from Makassar City.



The results of the OD analysis are based on two weeks of data from June 28, 2022 to July 11, 2022, using the Takalar center as the end point and the residence as the starting point. The largest number of movements are from the eastern part of Takalar Regency. Many movements can also be observed from Makassar City.

(2) The 3rd Meeting（Province Transportation Office, City Transportation Office)

1) Participants

（i）Indonesian side: Face-to-Face Meeting

- Transportation Office, South Sulawesi Province
  - Ms. Andi Nur Diyana (Chief of Mamminasata Technical Implementattion Unit)
  - Ms. Mansur Yahya (Chief of Road Transport Department)
- Transportation Office, Makassar City
  - Mr.Jasman Launtu (Head of Transportation Mode Division)
  - Mr.Tibrisi (Staff of Transportation Mode Division)
  - Mr.Irhandika (Staff of Transportation Mode Division)
- Cooperation Division, Makassar City
  - Mr.Haeroel B（Staff of Cooperation Section）

（ii）Japanese side: Hybrid Meeting (Face-to-Face & Online Meeting)

- International Policy Division, Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism
  - Nami Sato(International Transport Strategy Officer), Akitsugu Ookuma(International Cooperation Officer), Kodai Ozawa (Officer)
- Nippon Koei Co., Ltd

- Hisanari Ushirooka, Hiroya Totani, Keita Hirayanagi, Ryoma Yae, Kenta Kikuchi, Djamaluddin Ibrahim, Miftahul Khaer, Irma Anriany Rusli

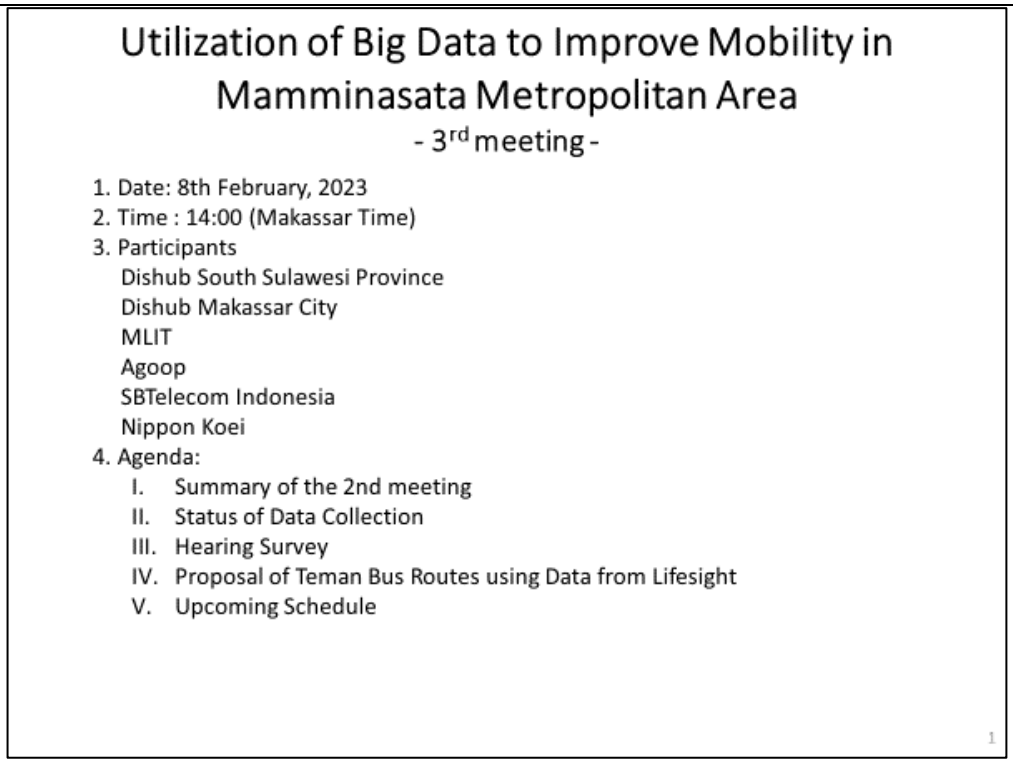
- Agoop Corp.
  - Yusuke Kato, Miki Fujii, Kotaro Kiyoshi
- PT. SBTelecom Indonesia
  - Kim Takkun, Sugimoto Ayae, Akane Yamada, Sinatrya Rahma, James, Revita, Aprillia

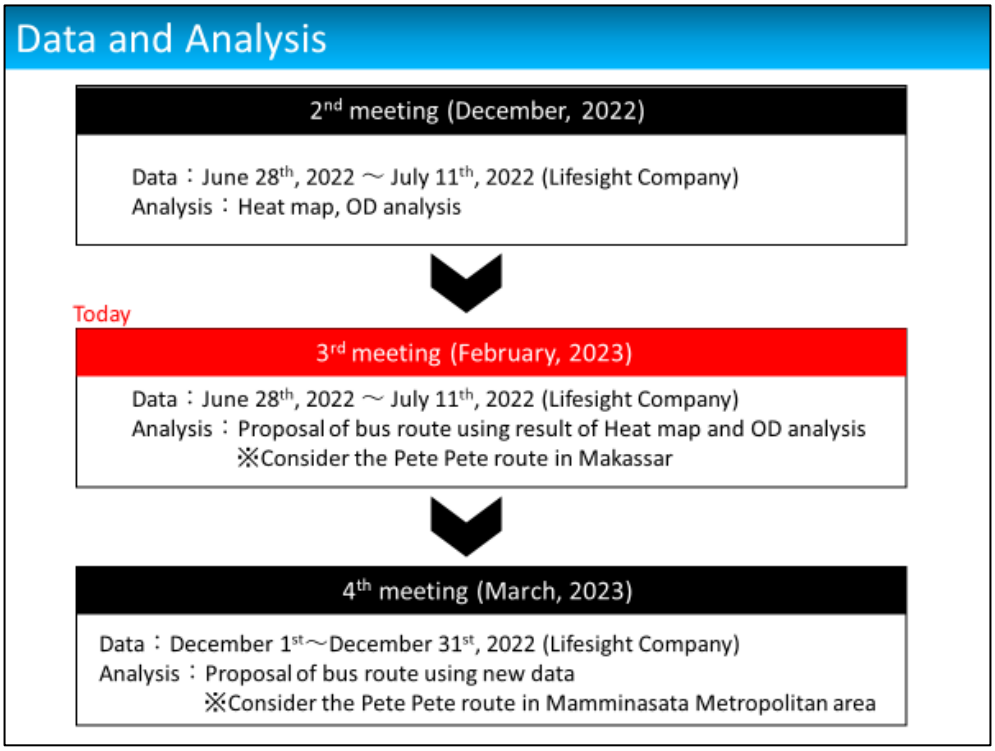
2) Findings and Comments on MBD Analysis Results

- The Makassar City Transportation Office pointed out that Corridor A needs to be reconsidered because the road is not wide enough and is not a critical road.
- The Makassar City Transportation Office commented that it would be desirable to analyze the 16 routes of Pete Pete in Makassar and propose a change route at the final meeting in order to realize an integrated public transport network.
- The Makassar City Transportation Office commented that new Teman Bus corridors are being planned by the Ministry of Transportation from Sultan Hasanuddin International Airport to Maros Station on the Makassar-Parepare railroad, and asked if the proposed Corridor B and the aforementioned corridor would not overlap.
- The South Sulawesi Province Transportation Office commented that the total length of Teman Bus corridors is stipulated to be up to 200 km, so this should be taken into account.
- The South Sulawesi Province Transportation Office has informed study team that the existing Teman Bus Corridor 3 is under review by them and is likely to change. They also commented that the proposed Corridor B should also be considered for overlap with the planned corridor connecting the mentioned airport to the Maros station.
- The South Sulawesi Province Transportation Office has informed study team that the proposed Corridor A would not be effective because the area on the proposed Corridor A is dominated by middle-income residents who are not expected to transfer from private cars and private motorcycles even if Teman Bus were to operate in the area. On the other hand, they commented that the Antang Perumnas area south of Water Park has a large low-income population, and they think it would be better to consider operating in that area.

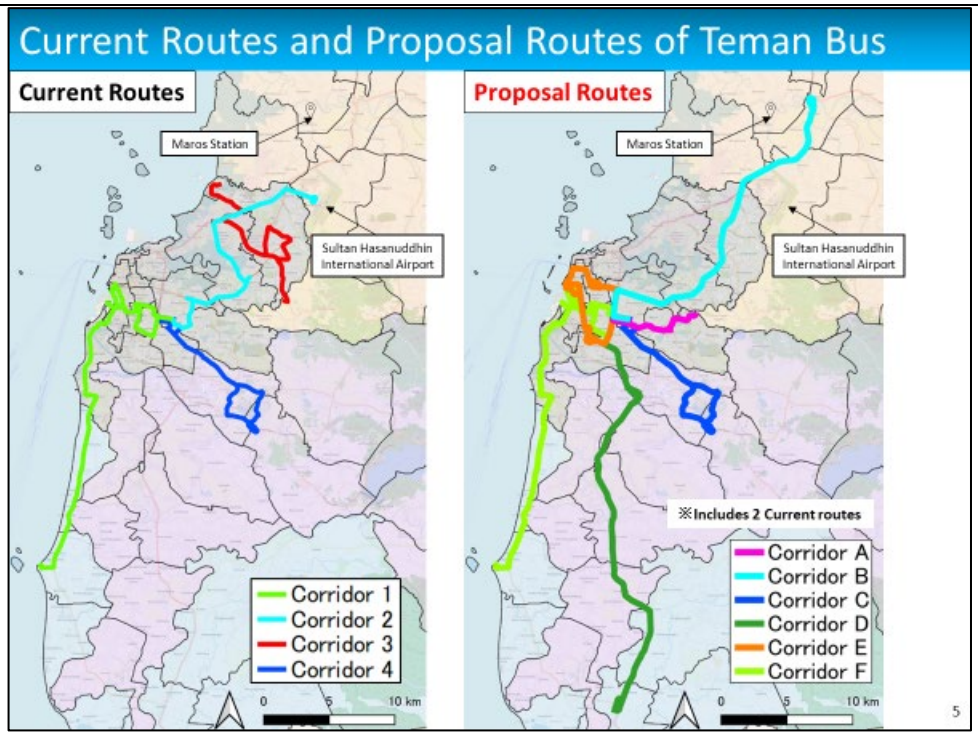
3) Meeting Materials

The meeting materials are as follows:

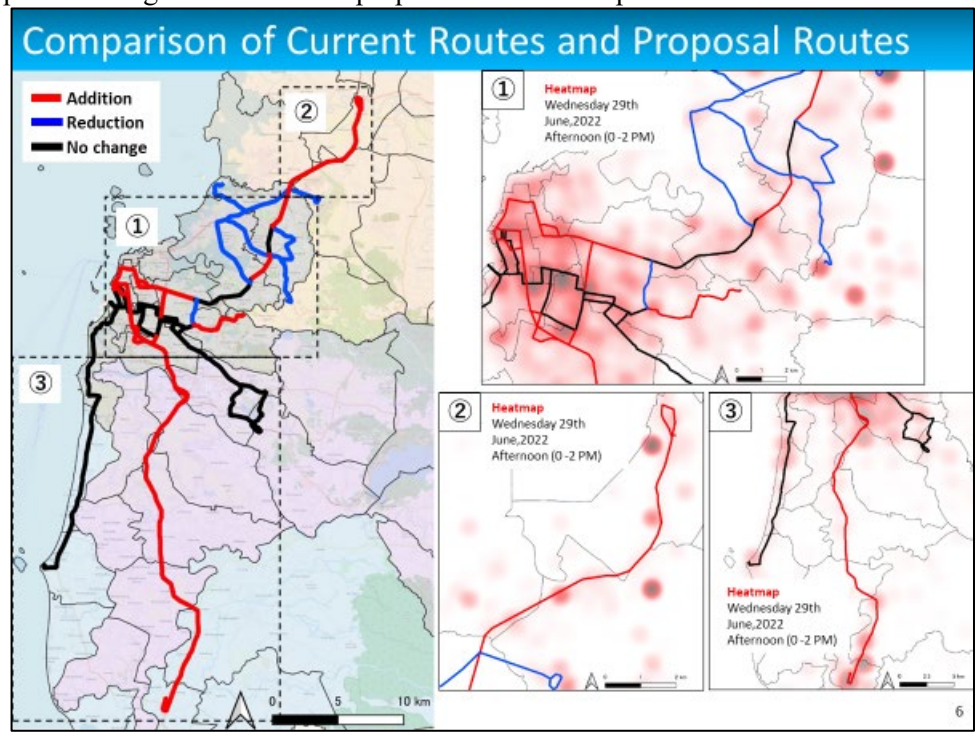




In the 3rd meeting, the study team proposed new corridors for Teman Bus by MBD analysis, using the same data, Lifesight, as in the 2nd meeting, and obtained feedback from the participants.

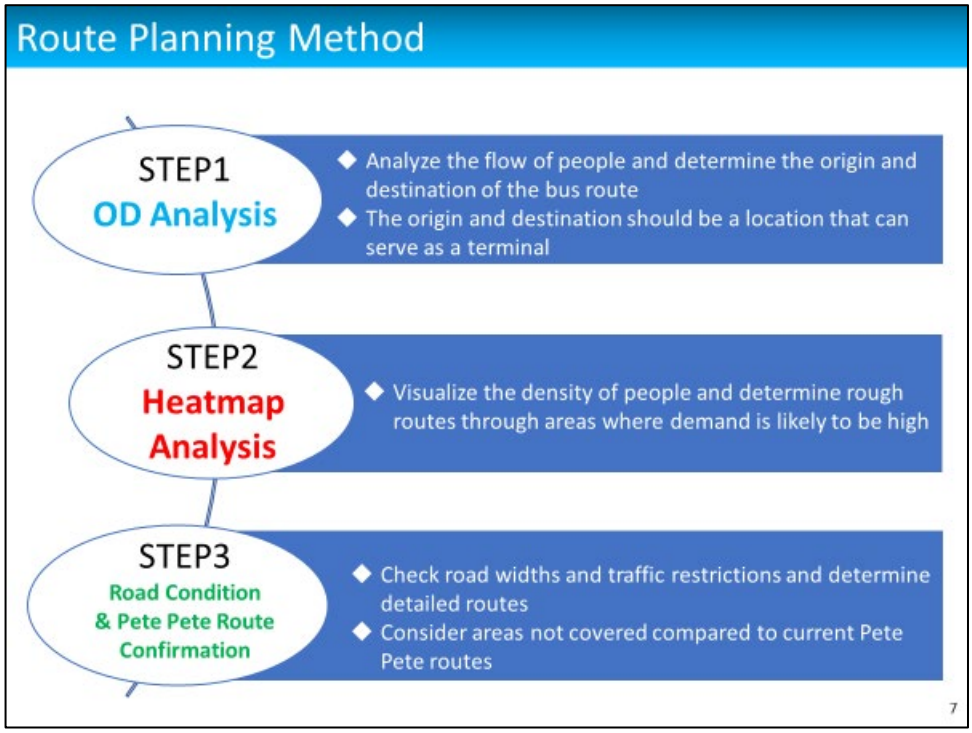


The existing Teman Bus corridors (4 routes) are shown in the above figure to the left. Study team proposed Corridor A-F as shown in the above figure to the right. Corridor 1 and Corridor 4 are being kept as existing. Details of each proposed corridor are provided below.



The above figure shows a comparison of existing Teman Bus corridors and proposed corridors. The red lines in the figure indicate new corridors proposed from existing corridors, the blue lines indicate corridors deleted, and the black lines indicate corridors unchanged from existing ones. In the area of ①, a new line was proposed in the western center of Makassar City. On the other hand, Corridor 3 in the eastern part of the city, where many users could not be identified on the heat map,

was proposed to eliminate the corridor. In area ②, Corridor 2, originally terminating at Hasanuddin International Airport, was proposed to be extended to the center of Maros Regency. In area ③, study team proposed a corridor between the center of Makassar City and the center of Takalar Regency.



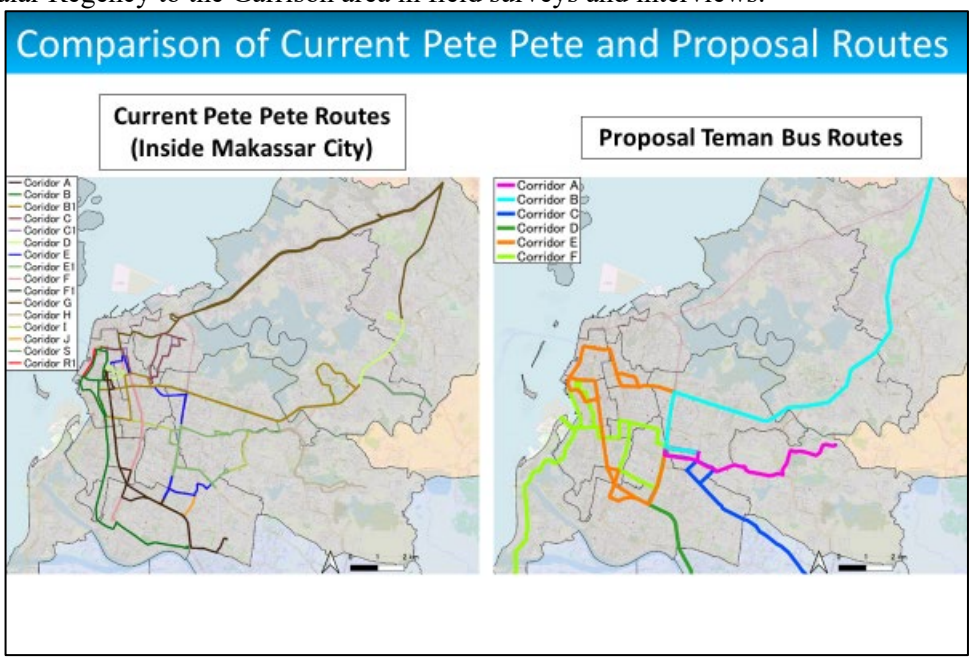
In considering new corridors, the above steps 1 through 3 were followed. In Step 1, OD analysis was used to determine flow of people and the starting/ending points of bus routes. In Step 2, a heat map analysis was conducted based on MBD, and areas/points where a large amount of location information was recorded were confirmed, and bus routes and starting/ending points were analyzed. In Step 3, study team checked the road conditions of the route examined in Step 2, and also confirmed overlap with the existing Pete Pete route.

Route Planning Method

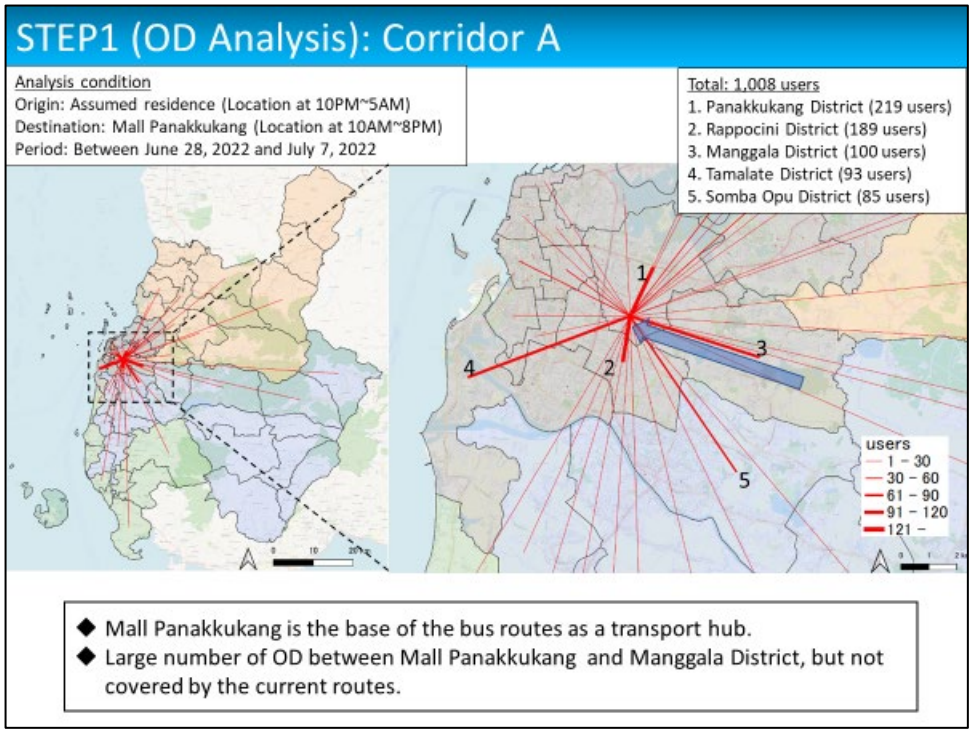
Consideration Method of each Proposal Corridor

Corridor	STEP1 ➡	STEP2 ➡	STEP3	Notes
Corridor A	✓	✓	✓	-
Corridor B	✓	✓	✓	-
Corridor C	✓	✓	✓	-
Corridor D	✓	✓	✓	-
Corridor E	-	✓	✓	Considered a potential route based on Heatmap analysis inside City Center of Makassar
Corridor F	-	-	-	Not changed without any evaluation due to high demand of passengers for tourism (especially weekend)

Corridors A-D were analyzed according to the three STEPs described above. Corridor E proposed a circulation corridor in the city center based on a heat map, without conducting an OD analysis, because of feedback from users in the interview survey and examples of circulating community buses in urban areas in Japan. Corridor F was decided not to change since study team confirmed the demand for weekday commuter and school use and for weekend visitors from Takalar Regency to the Garrison area in field surveys and interviews.



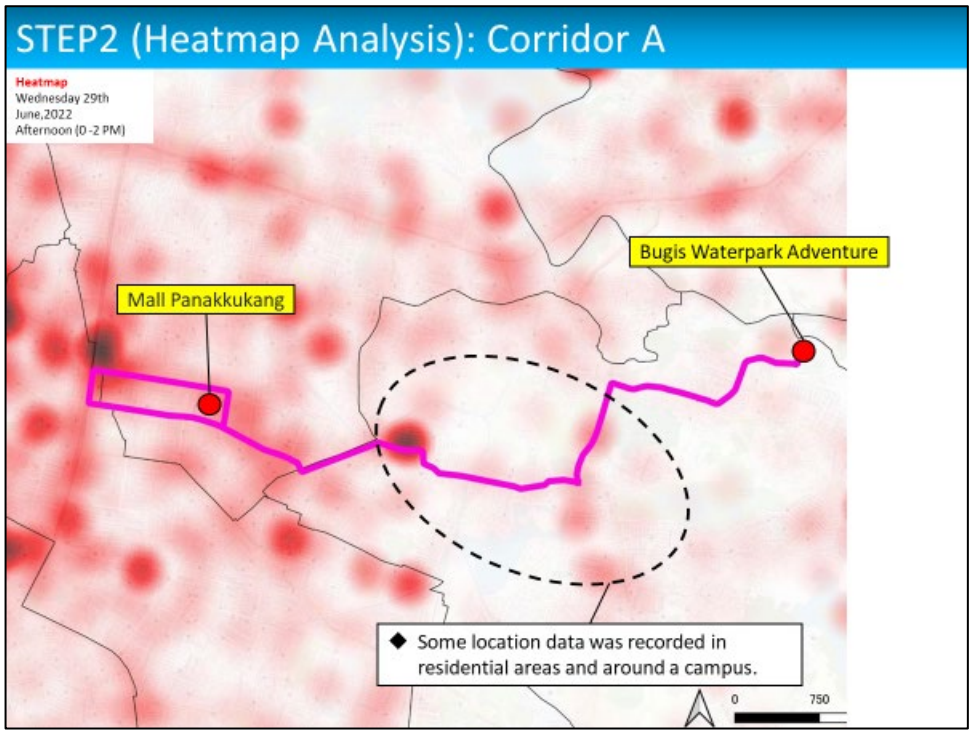
The 16 Pete Pete routes in Makassar City were organized in GIS, and above Pete Pete route map was referred to in STEP3.



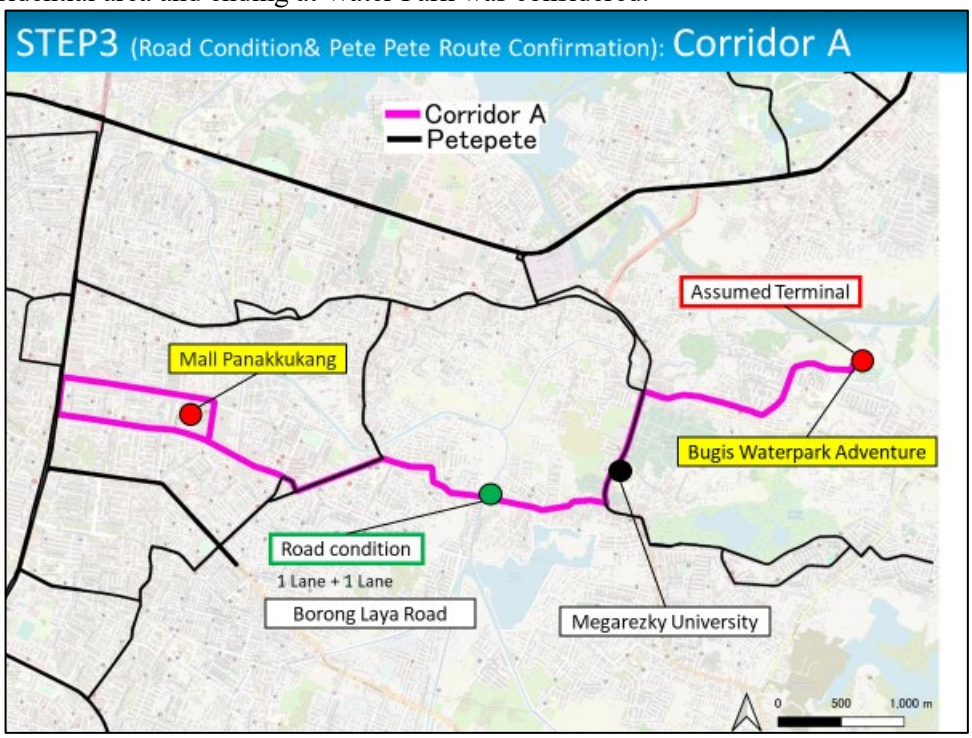
Using MBD from 28/6/2022 to 11/7/2022, OD analysis was conducted starting from the estimated residential area and ending at Mall Panakkukang..

The origin (Origin) was estimated to be the location (home) where the location information of the user was recorded from 22:00 to 5:00.

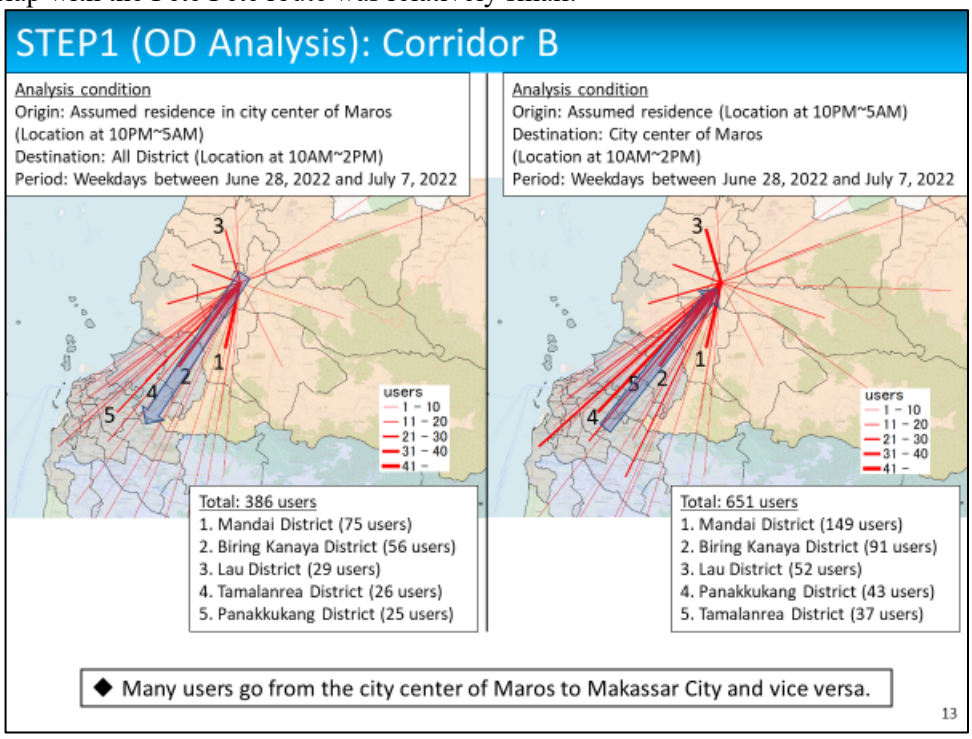
The purpose of this analysis was to examine corridors not covered by the existing four corridors. As a result, travel demand from the Manggala district east of Makassar City to Mall Panakkukang was identified.



Based on the OD analysis, a heat map analysis was conducted to confirm the amount of location information along the corridor. As a result, a corridor from Mall Panakkukang through a residential area and ending at Water Park was considered.



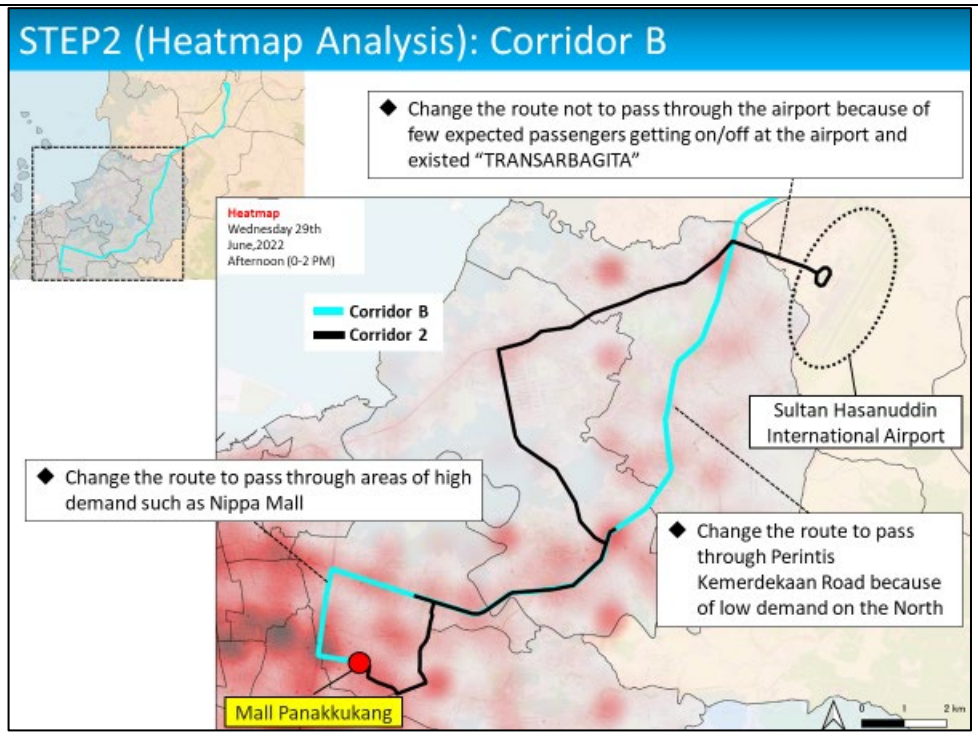
Road conditions were checked based on the considered corridor. It was confirmed that it is two-lane and that there is no problem for bus operation. In addition, it was confirmed that the overlap with the Pete Pete route was relatively small.



The above figure shows the results of the consideration of Corridor B. The left figure shows where users whose location was recorded in the center of Maros between 22:00 and 5:00 moved to between 10:00 and 14:00 in order to analyze the demand for commuting to and from the center of Maros.

The right figure shows where users whose location was recorded in the center of Maros between 22:00 and 5:00 moved to between 10:00 and 14:00 in order to analyze the travel demand travel from each district to the center of Maros.

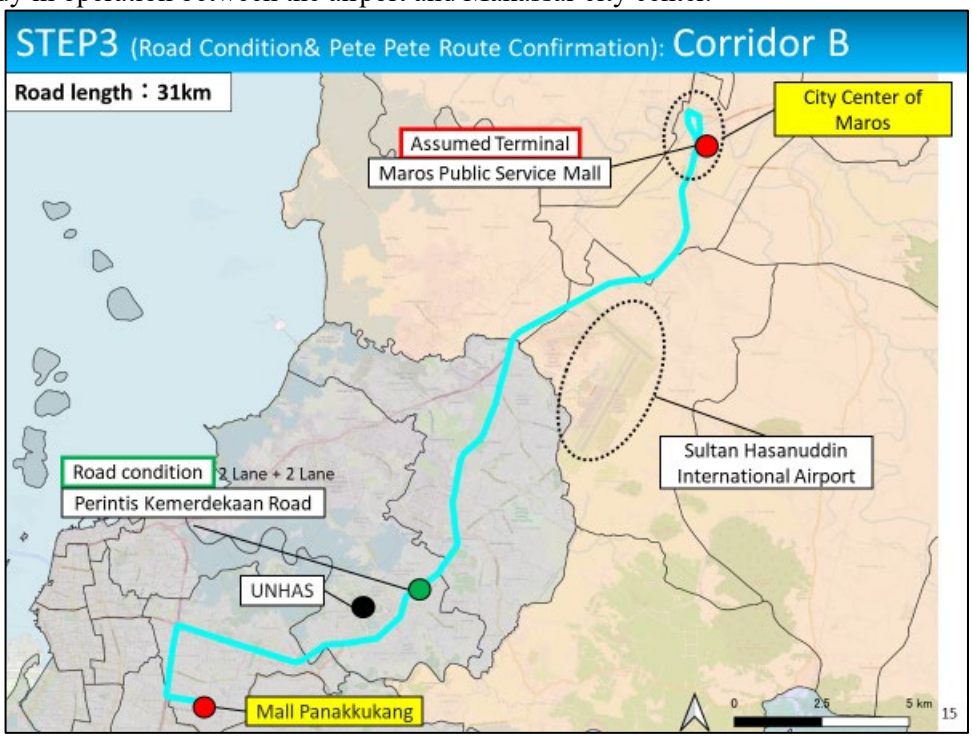
From the arrows, it can be seen that there is a high travel demand between Maros - Makassar in both directions and the JL Poros Makassar - Maros (JL Perintis Kemerdekaan).



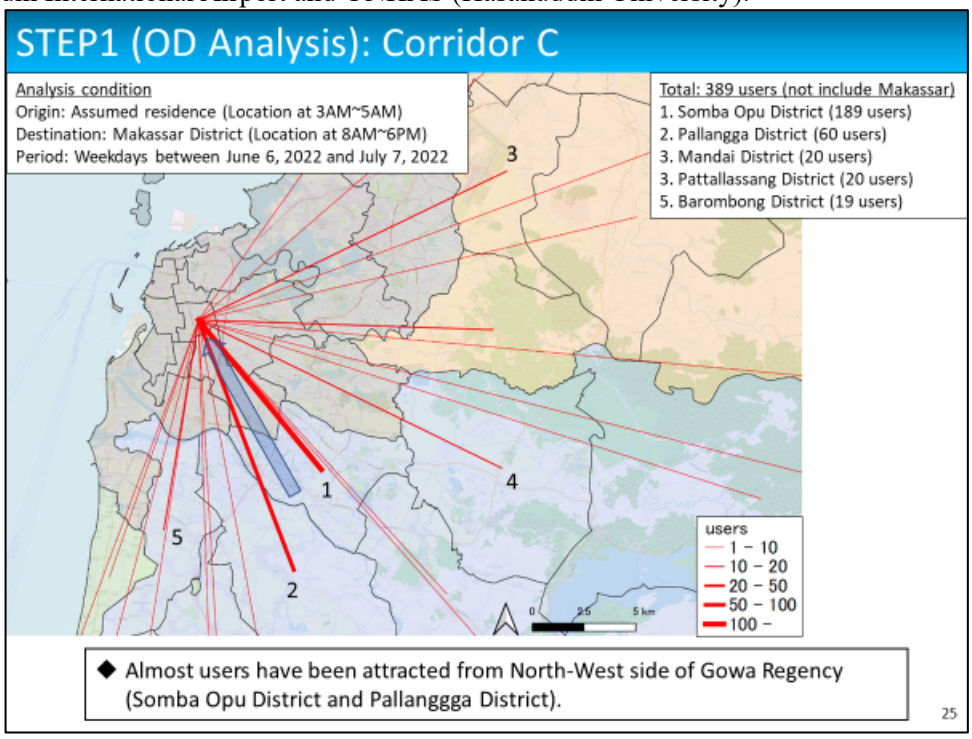
Next, based on the heat map analysis, the proposed corridor in light blue was considered.

Existing Corridor 2 runs along the expressway, but study team proposed to change the route to run along JL Perintis Kemerdekaan Street. In addition, existing Corridor 2 terminates at Sultan Hasanuddin International Airport, but study team proposed changing the route to not enter the airport for the following two reasons.

The first reason is that Teman Bus vehicles, which are two-step buses, are difficult to use for travelers with large luggage. The second reason is that an airport bus (refer to 2.2.1(5) for details) is already in operation between the airport and Makassar city center.

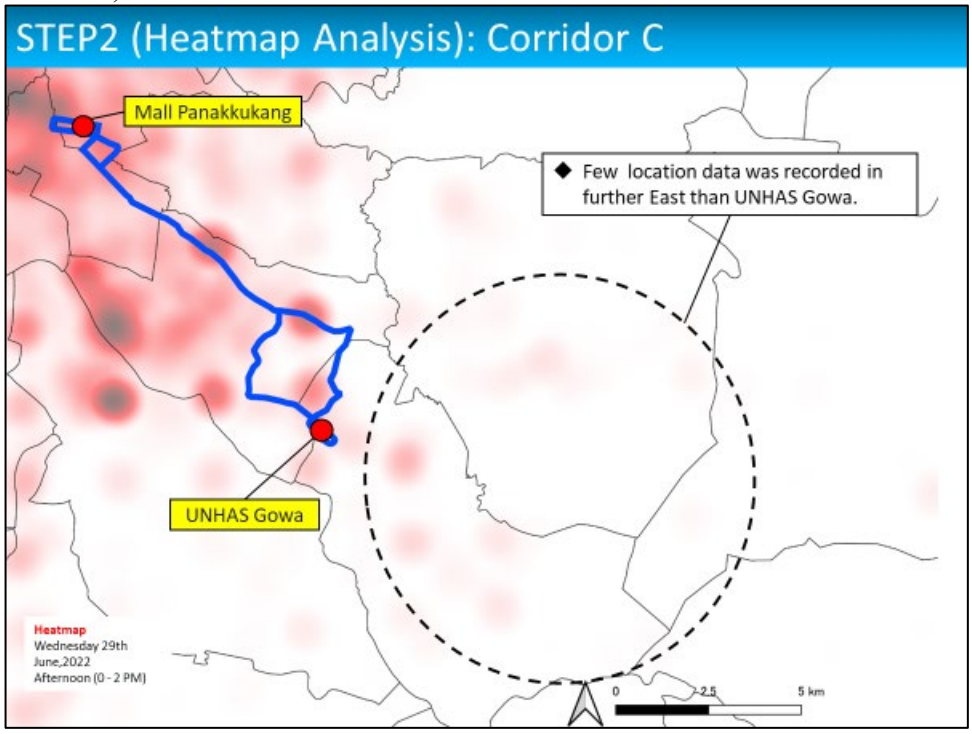


Road conditions and the overlap of the Pete Pete route were checked. For Corridor B, there is concern about overlap with Pete Pete route on JL Perintis Kemerdekaan Road between Sultan Hasanuddin International Airport and UNHAS (Hasanuddin University).



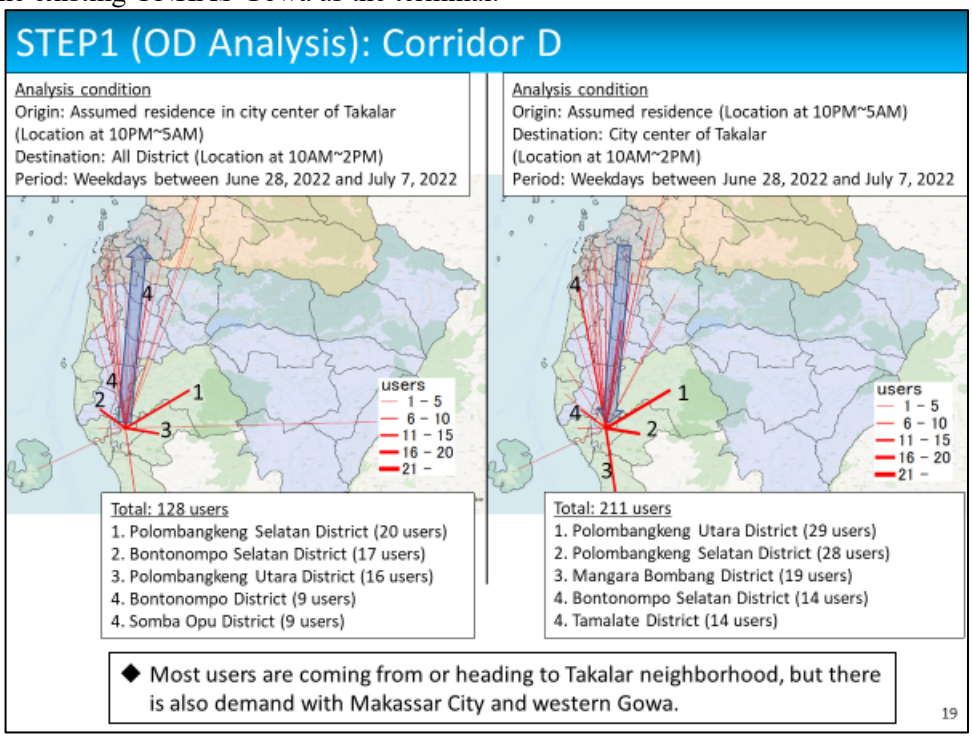
The above figure shows which district a user whose location information was recorded in the Makassar district from 8:00 to 18:00 on weekdays was in from 3:00 to 5:00.

As indicated by the arrows, the travel demand from the northwest side of Gowa (Somba Opu and Pallangga districts) can be seen.



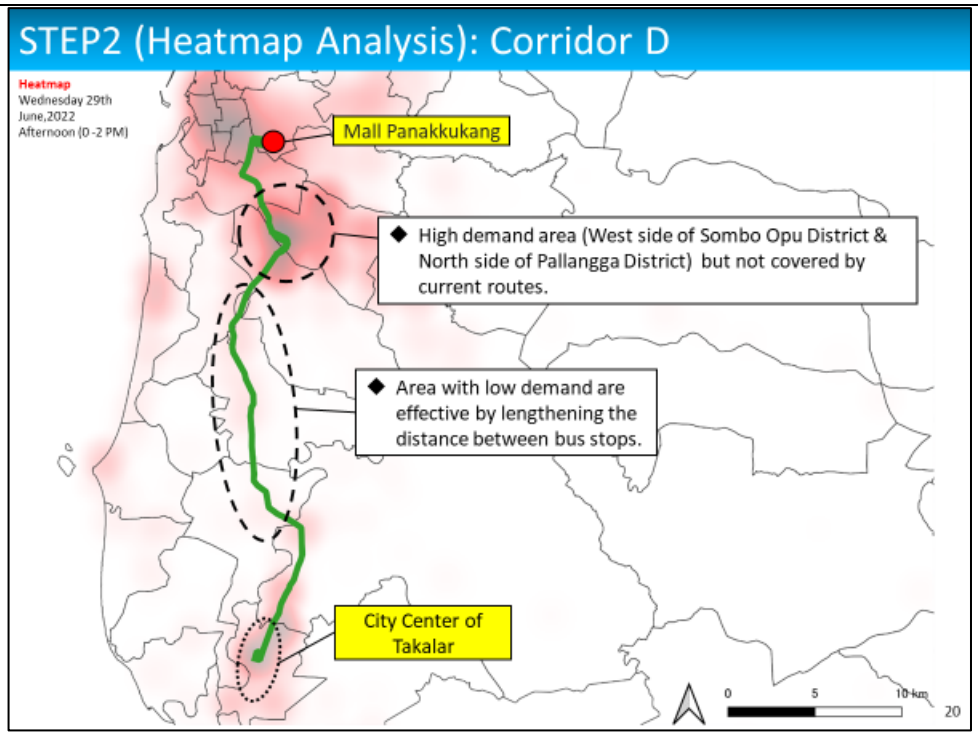
A heatmap analysis was conducted to confirm the location information in the area east of

UNHAS Gowa, but little was confirmed. Therefore, study team decided not to extend the line, but to keep the existing UNHAS Gowa as the terminal.

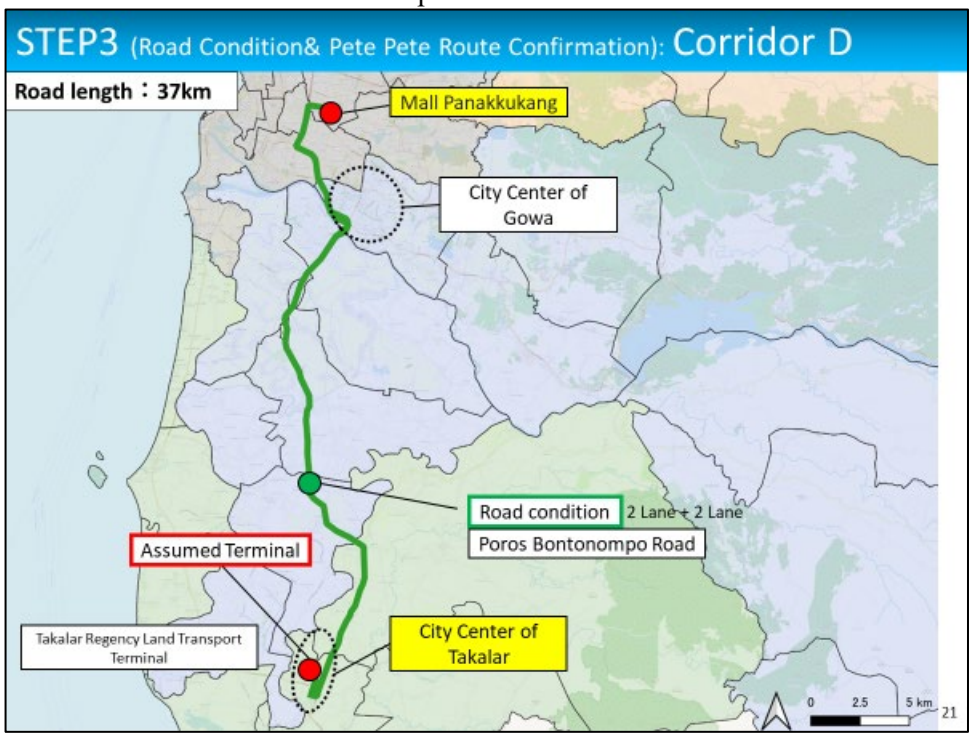


The left figure shows which district a user whose location information was recorded in the Takalar center district from 22:00 to 5:00 on weekdays was in from 10:00 to 14:00. This analyzes the commuting demand from the center of Takalar.

The right figure shows which district a user whose location information was recorded in the Takalar center district from 10:00 to 14:00 on weekdays was in from 22:00 to 5:00. This analyzes the commuting demand from each district to the center of Takalar. As can be seen from the arrows, the travel demand between Takalar and Makassar and northwest Gowa was identified. It is also assumed that many of these moves were made via JL Poros Bontonompo.

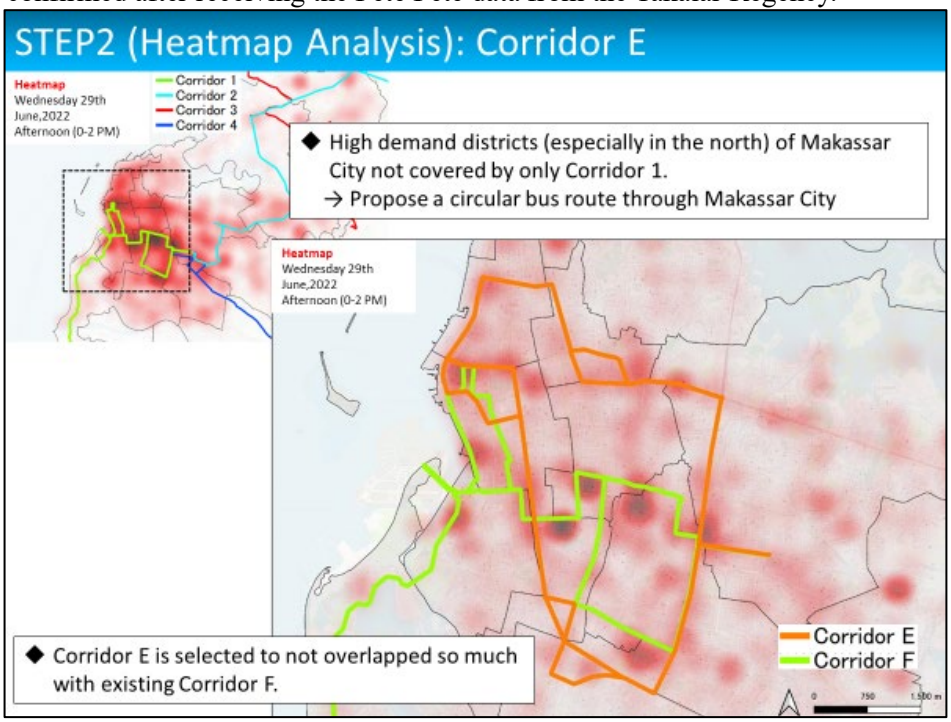


Based on the heat map analysis, the proposed green corridor was considered. From the OD analysis, study team considered route that could be covered for travel demand in the Makassar city center - northwest Gowa area. In addition, the extension of the route from northwest Gowa to Takalar center was considered to cover the travel demand between Makassar and Takalar. Looking at the amount of location information, there is little location information in the western area of Gowa Regency. So it is assumed that the distance between bus stops can be increased in this section.

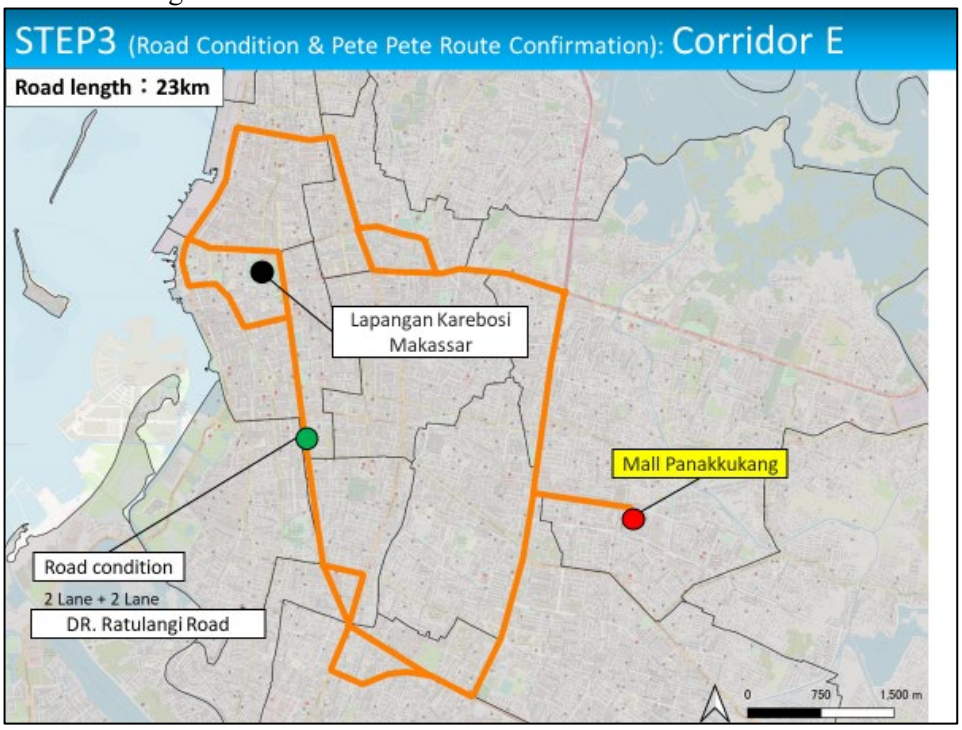


Regarding the road conditions, study team confirmed that there were no problems with the bus service. As a terminal in the center of Takalar Regency, study team proposed the Takalar Regency

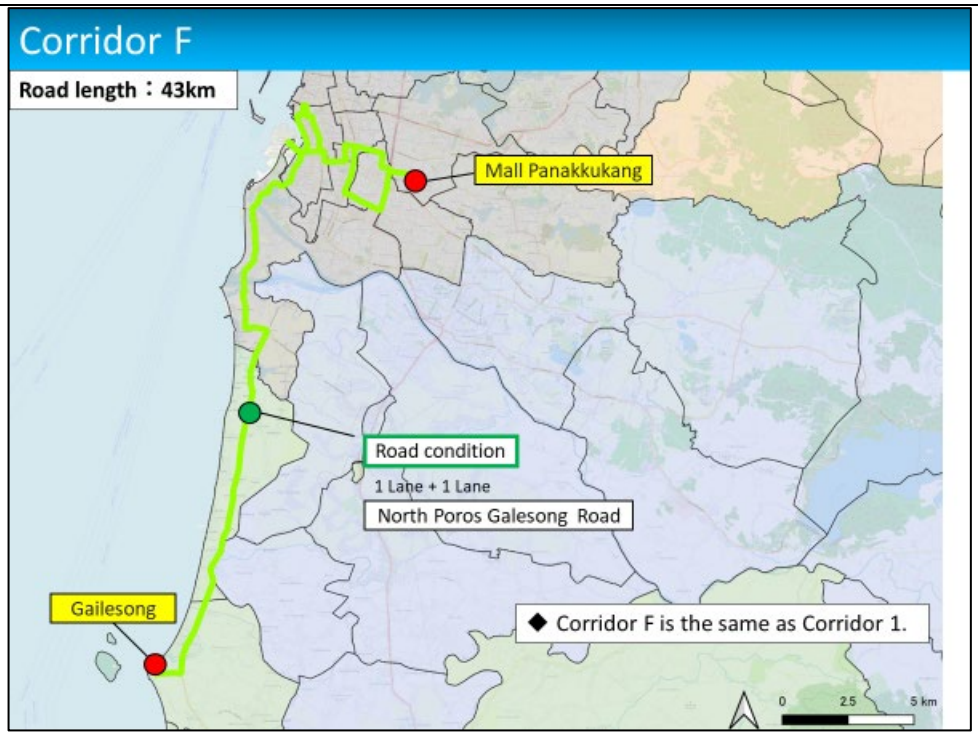
Land Transport Terminal to secure the depot (terminal). However, for this corridor, the overlap should be confirmed after receiving the Pete Pete data from the Takalar Regency.



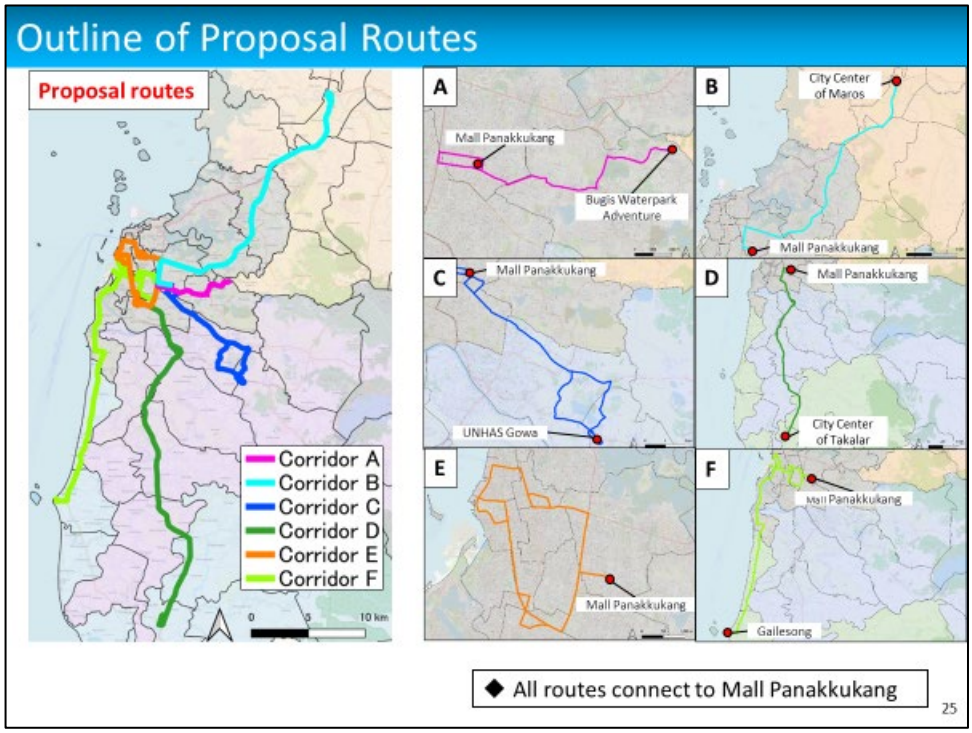
Corridor E was proposed as a circulation route in the city center based on a heat map, without conducting an OD analysis. This is because that there are feedback from users in the interview survey and examples of circulating community buses in urban areas in Japan. The corridor that doesn't overlap with the existing Corridor 1 was considered.

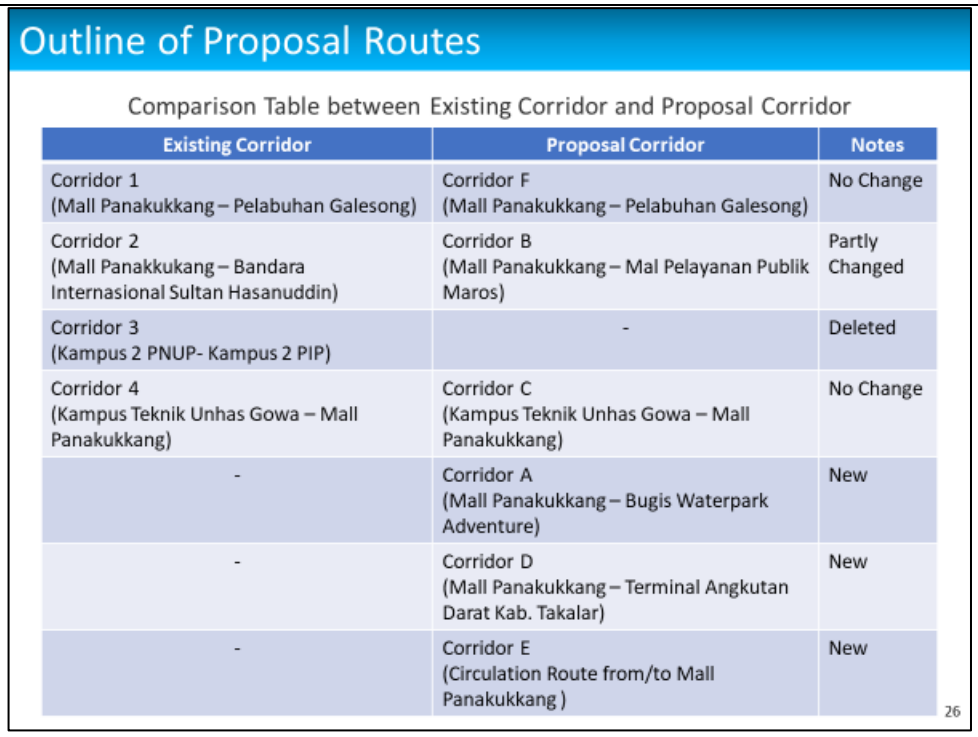


Regarding the road conditions, study team confirmed that there are no problems with the bus service. On the other hand, there is some overlap with the Pete Pete routes.



Corridor F was decided not to change since study team confirmed the demand for weekday commuter and school use and for weekend visitors from Takalar Regency to the Garrison area in field surveys and interviews.





(3) The 4th Meeting（Final Report Meetong)

1) Participants

（i） Indonesian side: Face-to-Face Meeting

- Land Transportation Management Center Region No.19 , Ministry of Transportation
  - Husni Mubarak (Chief of Land Transport & Road Traffic Section)
- Transportation Office, South Sulawesi Province
  - Agustina W (Head of Section in UPT Mamminasata)
  - Andi Asdiana Ekasari (Master Planner)
  - Tahir (Sub Bagian Program)
- Transportation Office, Makassar City
  - Tibrisi Mustari (Chief of Infrastructure Division)
  - Jasman Launtu (Chief of Transportation Mode Division)
- Transportation Office, Gowa Regency
  - Made Dianing (Chief of Traffic Division)
  - Diaman (Staff of Traffic Division)
- Transportation Office, Maros Regency
  - Ahmad Sila (Policy Analysis Division)
- Transportation Office, Takalar Regency
  - Jamaluddin Si (Head of DISHUB)
  - Sabri(Staff)
- Regional Development Planning Agency, South Sulawesi Province
  - Asdar (Sub Coordination)
  - Ince S Yusmi (-)

- Aryanti Sayadi(Functional Planner)

- Regional Development Planning Agency, Makassar City
  - Yamliah Akhir (Staff)
  - Irwan(Infrastructure and Regional Development Division)
- Regional Development Planning, Research and Development Agency, Maros Regency
  - Hj. Mustika (Head of Division Planner)
  - Risma M. Udin (Functional Planner)

（ii）Japanese side: Hybrid Meeting (Face-to-Face & Online Meeting)

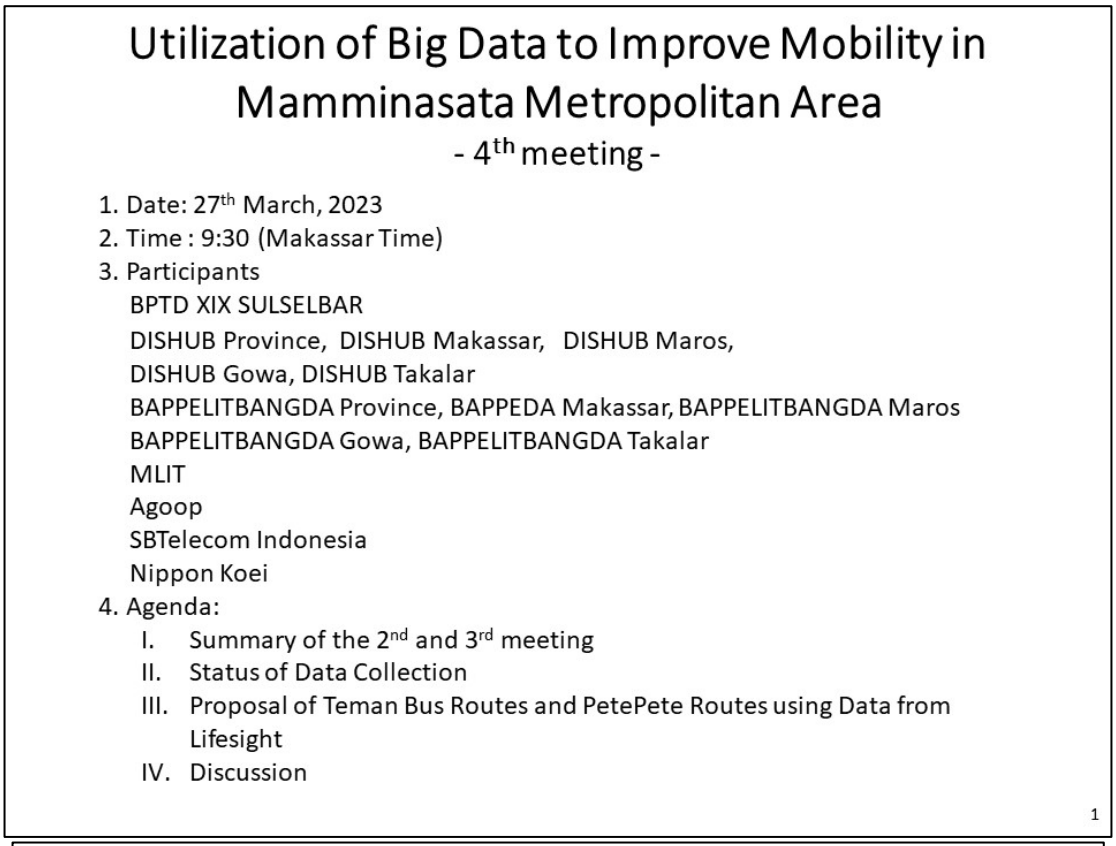
- International Policy Division, Policy Bureau, Ministry of Land, Infrastructure, Transport and Tourism
  - Nami Sato(International Transport Strategy Officer), Akitsugu Ookuma(International Cooperation Officer), Kodai Ozawa (Officer)
- Nippon Koei Co., Ltd
  - Hisanari Ushirooka, Atsushi Mochizuki, Keita Hirayanagi, Ryoma Yae, Kenta Kikuchi, Djamaluddin Ibrahim, Miftahul Khaer, Irma Anriany Rusli
- Agoop Corp.
  - Kotaro Kiyoshi
- PT. SBTelecom Indonesia
  - Kim Takkun, Sugimoto Ayae, Akane Yamada, Aprillia, James Panjaitan, Rahma, Revita

2) Findings and Comments on MBD Analysis Results

- The Makassar City Transportation Office commented that Corridor 2 has a history of being rerouted due to competition with Pete Pete, which is now a route via the expressway. They also requested that study team review once 17 Pete Pete routes in Makassar on a zero-based basis, and if necessary, propose new routes.
- South Sulawesi Province Transportation Office commented that the total length of Teman Bus corridors is contractually limited to 200 km. However, they commented that the contract can be re-signed and extended beyond 200 km, if necessary.
- The Gowa Regency Transportation Office commented that the road through the Gowa Twin Bridges in the Pallannga area is heavily congested throughout the day. They also commented that they are seeking a solution and asked if a Teman Bus corridor that would operate from T.C. Buganya to Makassar City could be considered.
- The Maros Regency Transportation Office commented that since the new corridor of Teman Bus in the Maminasata Metropolitan Area is under consideration, the proposed route of this study should also reflect this plan.
- The Takalar Regency Transportation Office commented that it is necessary to consider the proposal that extends Teman Bas Corridor 1 from the Galesong area to the main terminal (center) of Takalar Regency.

3) Meeting Materials

The meeting materials are as follows:

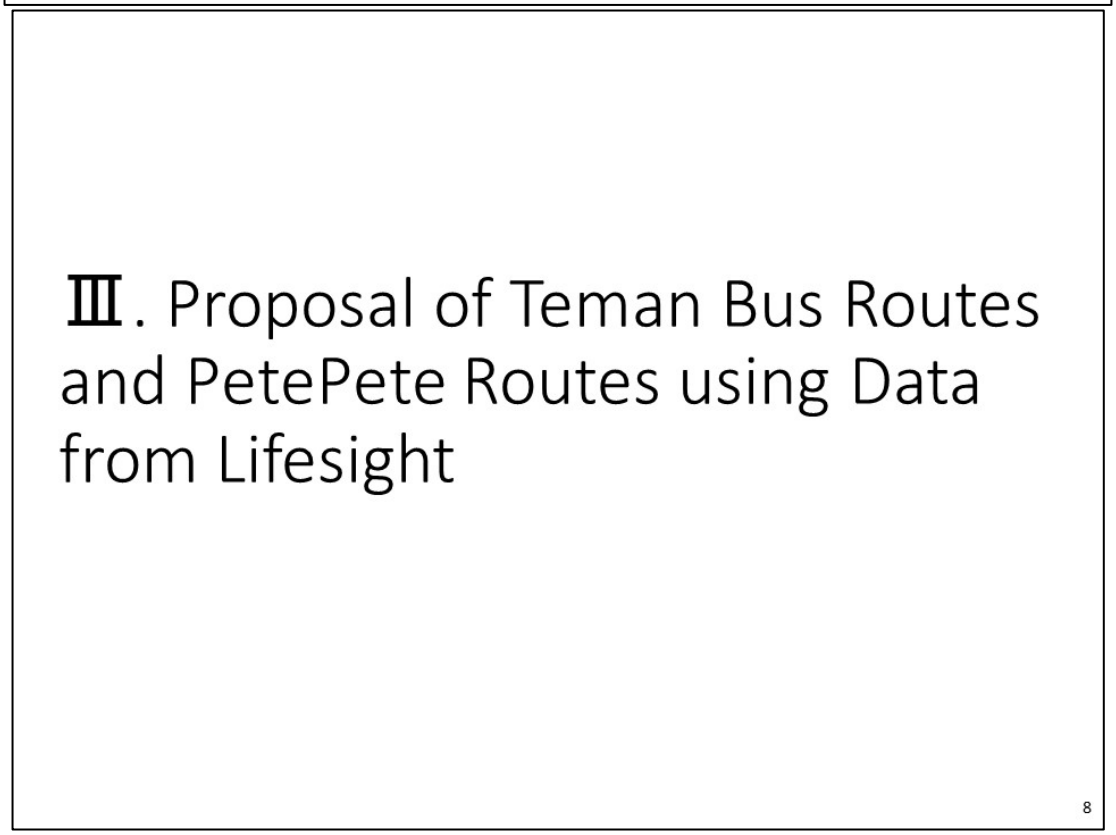


Utilization of Big Data to Improve Mobility in Mamminasata Metropolitan Area

- 4th meeting -

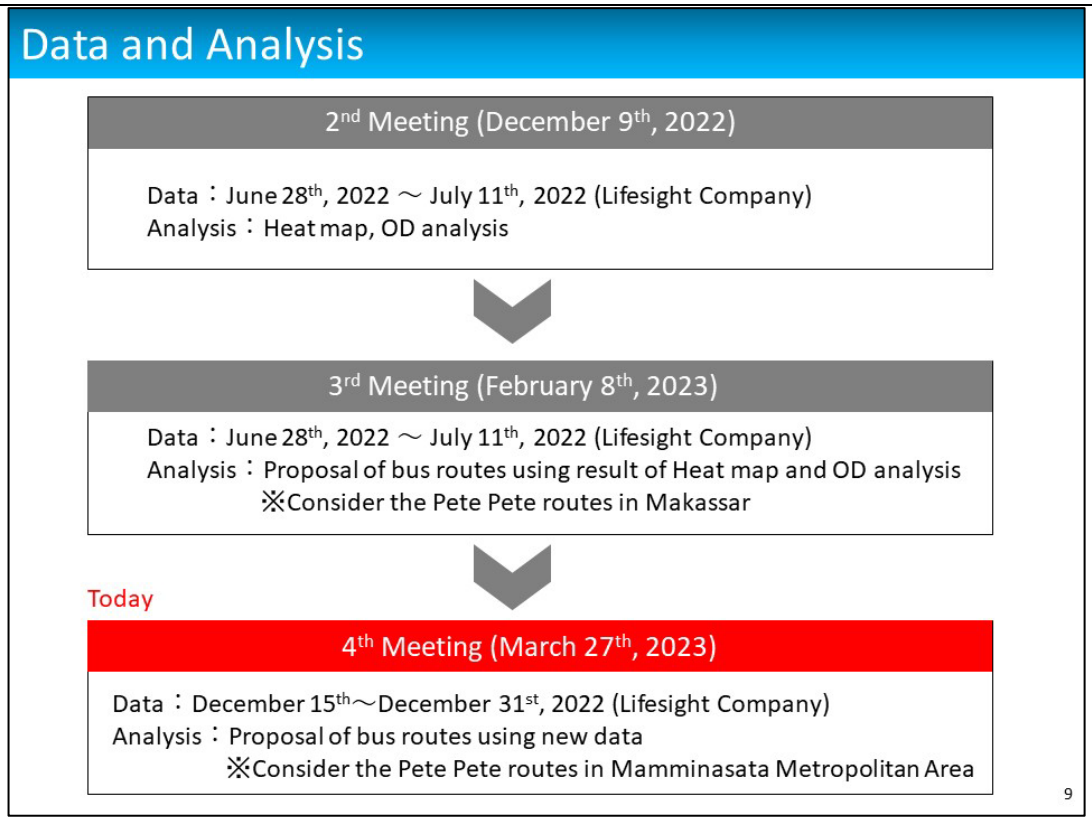
1. Date: 27th March, 2023
2. Time : 9:30 (Makassar Time)
3. Participants
   BPTD XIX SULSELBAR
   DISHUB Province, DISHUB Makassar, DISHUB Maros,
   DISHUB Gowa, DISHUB Takalar
   BAPPELITBANGDA Province, BAPPEDA Makassar, BAPPELITBANGDA Maros
   BAPPELITBANGDA Gowa, BAPPELITBANGDA Takalar
   MLIT
   Agoop
   SBTelecom Indonesia
   Nippon Koei
4. Agenda:
   I. Summary of the 2nd and 3rd meeting
   II. Status of Data Collection
   III. Proposal of Teman Bus Routes and PetePete Routes using Data from Lifesight
   IV. Discussion

1

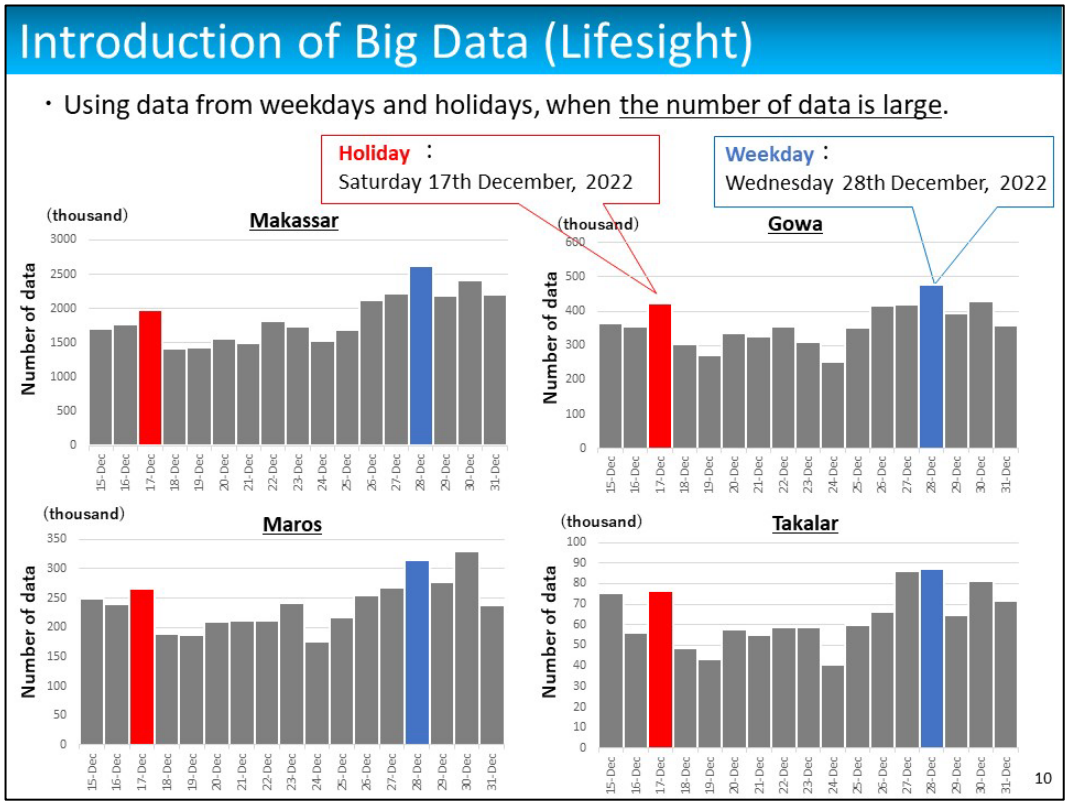


Ⅲ. Proposal of Teman Bus Routes and PetePete Routes using Data from Lifesight

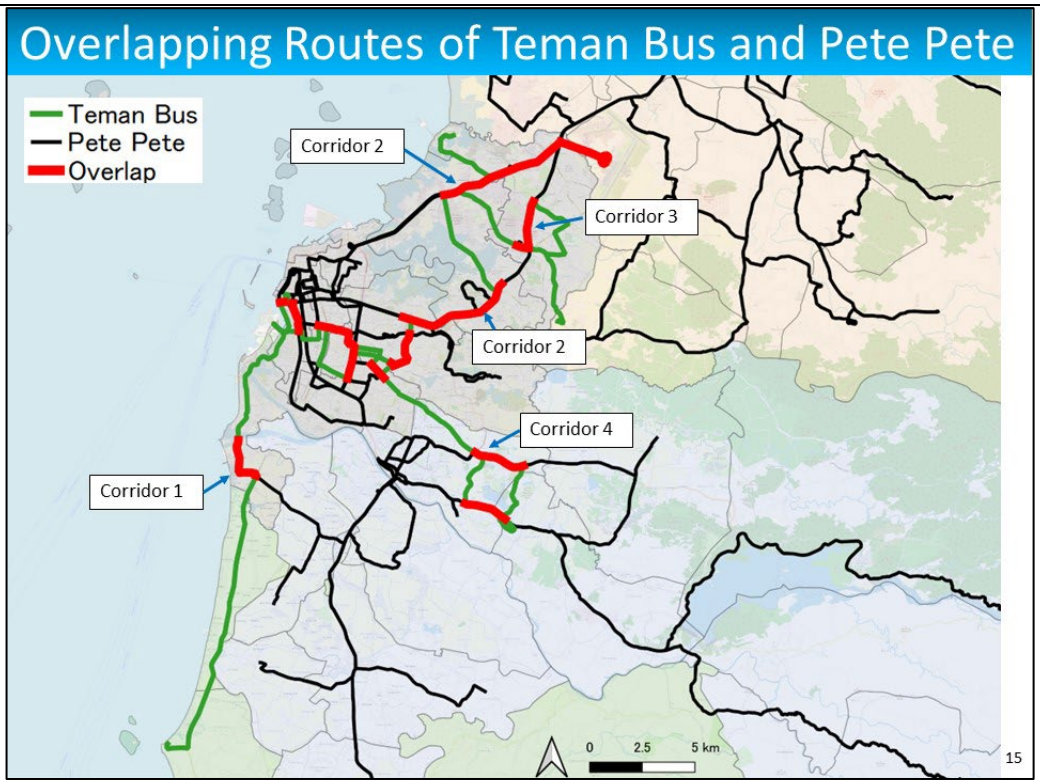
8



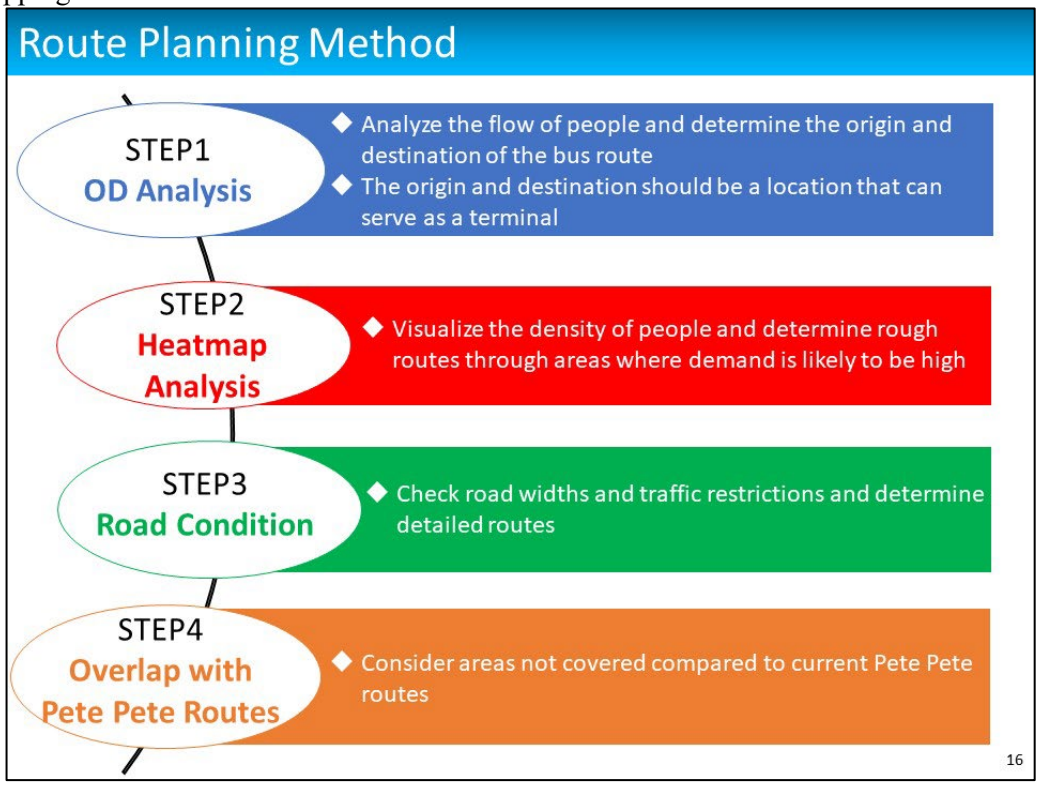
In the 2nd and 3rd meetings, data from June-July 2022 was utilized. In the 4th meeting, data from 15/12/2022 to 31/12/2022 was utilized as the most recent data.



Weekdays (28/12/2022) and holidays (17/12/2022) with the largest number of data were utilized for the analysis.

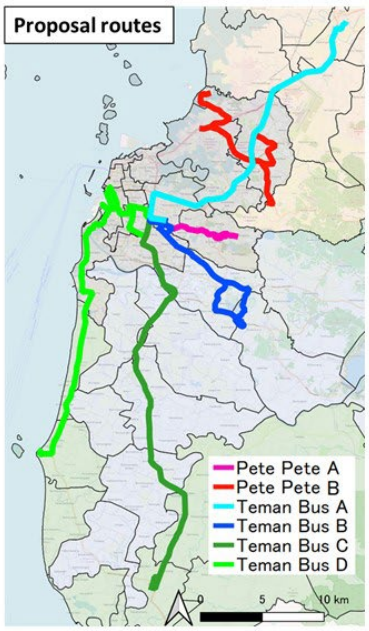


The above figure shows the overlapping routes of Teman Bus and Pete Pete. The red lines indicate overlapping sections.



The above figure shows the analysis methodology for the Teman Bus and Pete Pete route consideration. The steps up to step 3 are the same as in the 3rd meeting. In this analysis, a new Step 4 was added to check for overlap with the current Pete Pete route and to examine routes through areas not covered by Pete Pete.

Route Planning Method



Consideration Method of each Proposal Corridor

Corridor	STEP1	STEP2	STEP3	STEP4
Pete Pete A	✓	✓	✓	✓
Pete Pete B*		✓		✓
Teman Bus A	✓	✓	✓	✓
Teman Bus B	✓	✓	✓	✓
Teman Bus C	✓	✓	✓	✓
Teman Bus D	✓	✓	✓	✓

*same as Teman Bus Corridor3

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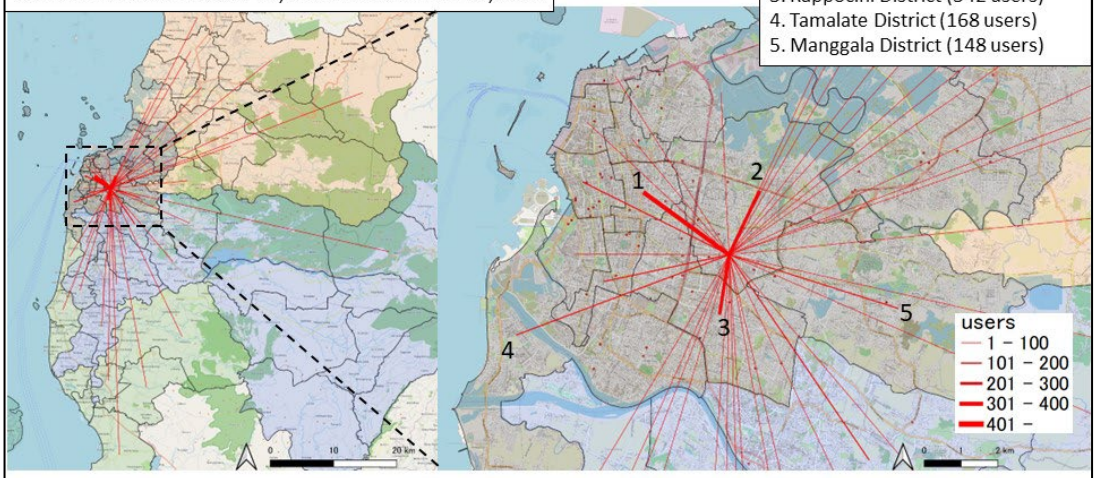
STEP1 (OD Analysis): Pete Pete A

Analysis condition
Origin: Assumed residence (Location at 10PM~5AM)
Destination: Mall Panakkukang (Location at 10AM~2PM)
Period: Between December 15, 2022 and December 31, 2022

Total: 3,221 users
1. Makassar District (1,199 users)
2. Panakkukang District (358 users)
3. Rappocini District (342 users)
4. Tamalate District (168 users)
5. Manggala District (148 users)



- Mall Panakkukang is the base of the bus routes as a transport hub.
- Large number of OD between Mall Panakkukang and Manggala District, but not covered by the current routes.

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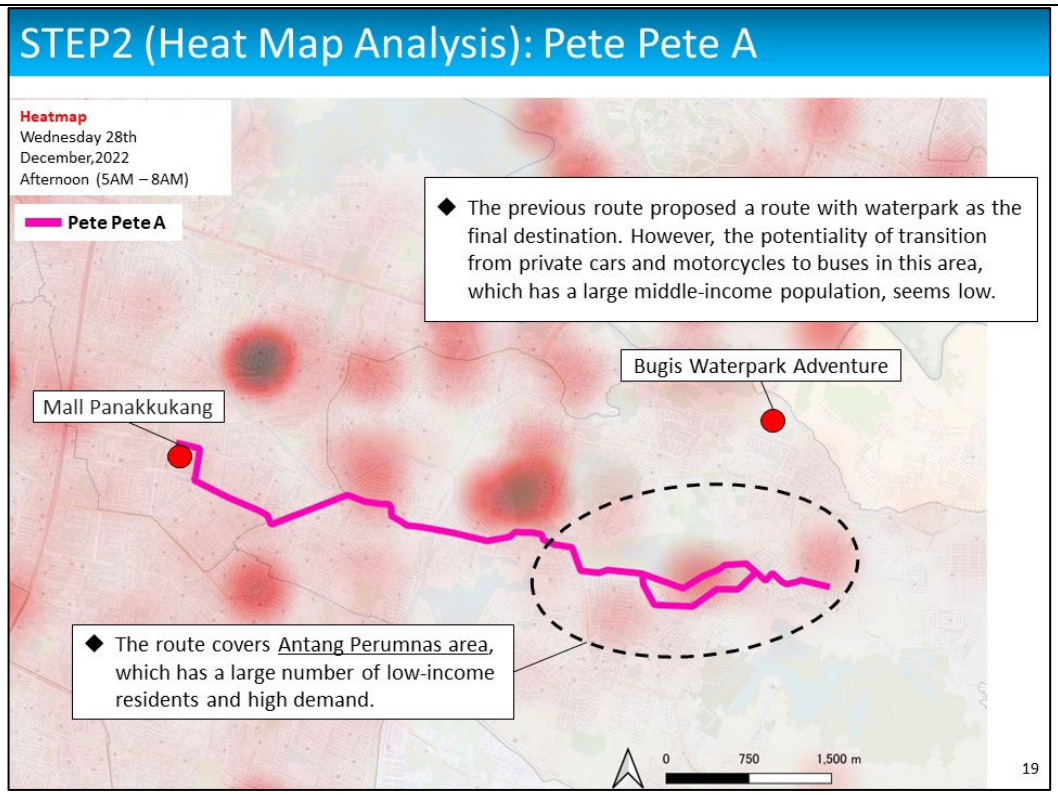
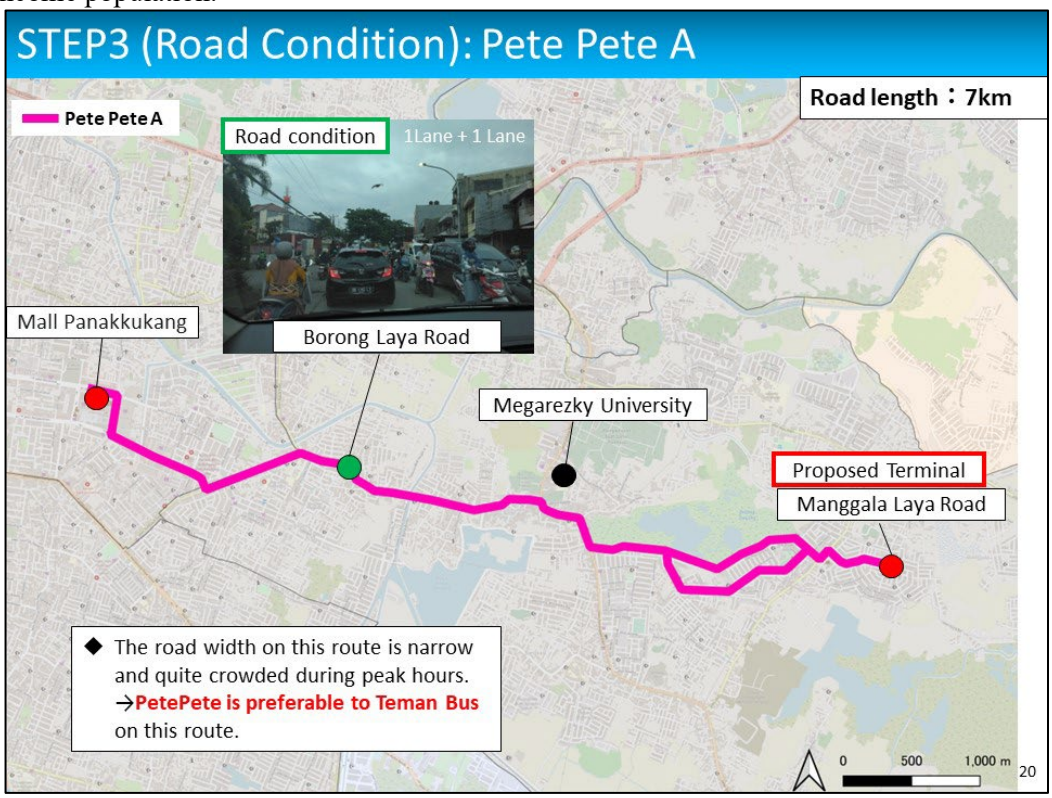
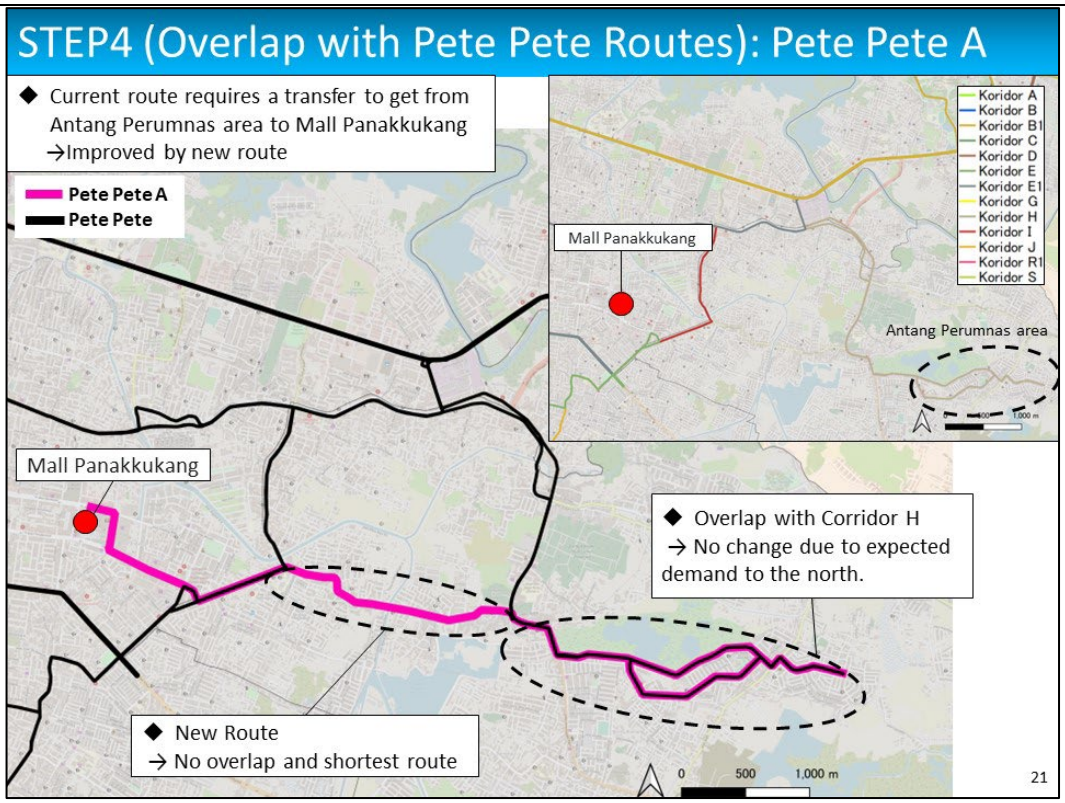
The above figure shows the results of the OD analysis for the newly proposed Pete Pete A, with Mall Panakkukang as the endpoint. Pete Pete A focused on the Mangala area, which is poorly served by public transportation.



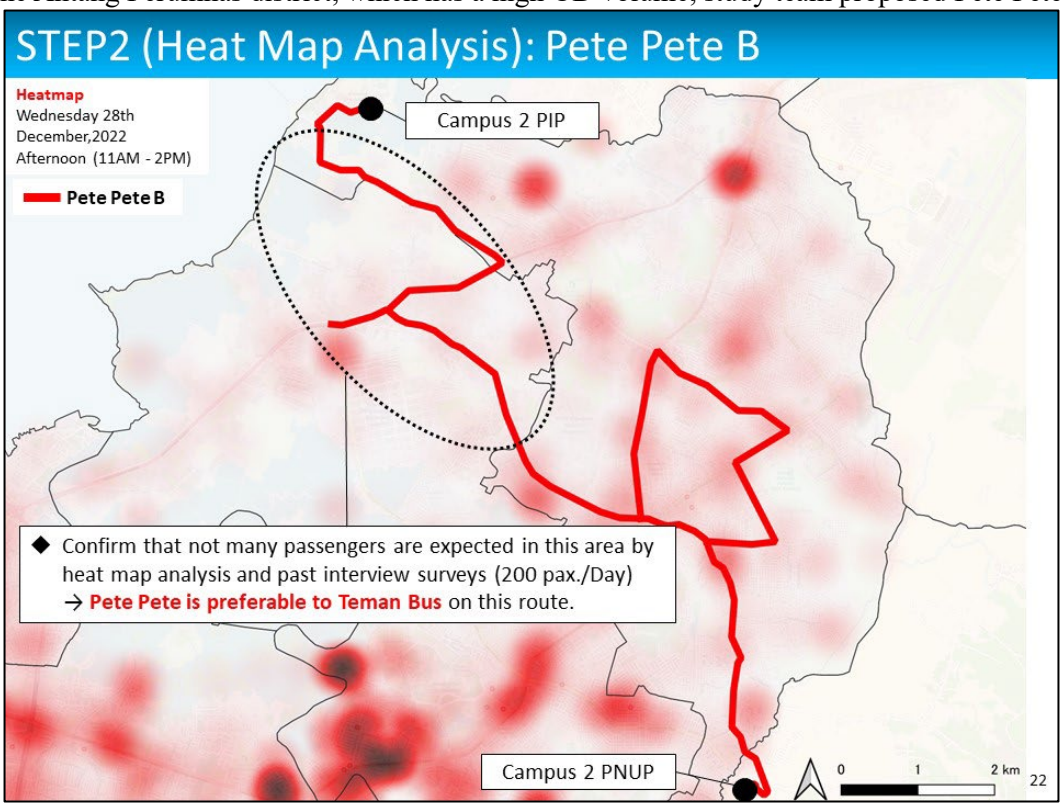
In the last meeting, the water park was proposed as a terminal. However, based on the previous discussions, study team selected to use the Antang Perumnas district as the terminal, which has a large low-income population.



Road conditions were checked in Step 3. As a result, study team decided that this proposed route would be better for Pete Pete operation than Teman Bus operation because the road width is narrow and roads are congested during peak hours.

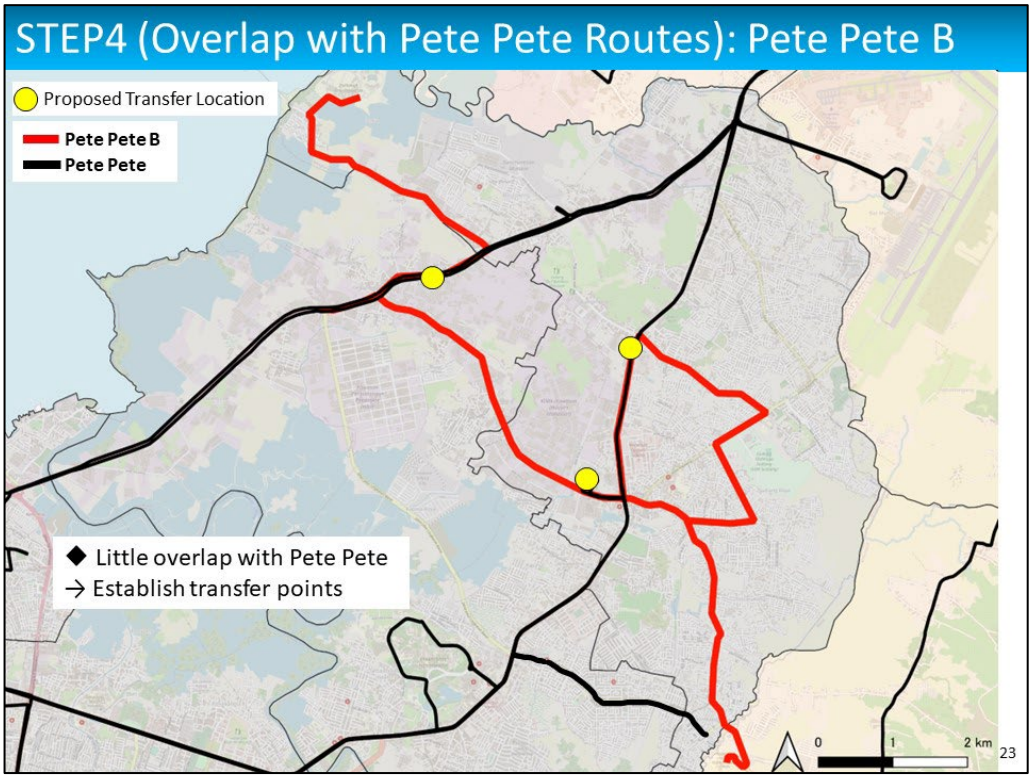


Study team confirmed the overlap with the existing Pete Pete route. There is an overlapping section with Pete Pete Corridor H. However, Corridor H serves demand in a different direction than demand in the Mall Panakkukang direction. Considering the easiness of travel between Mall Panakkukang and the Antang Perumnas district, which has a high OD volume, study team proposed Pete Pete A.

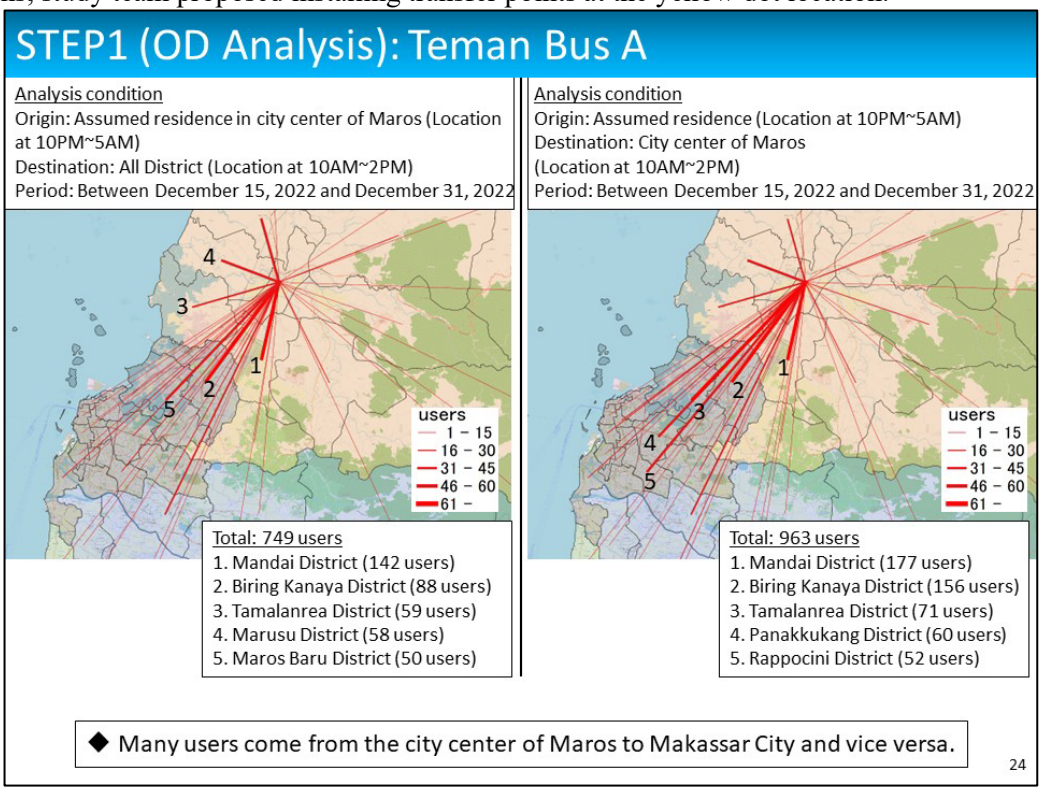


In the Pete Pete B, study team suggested changing from the Teman Bus corridor to the Pete Pete

route.

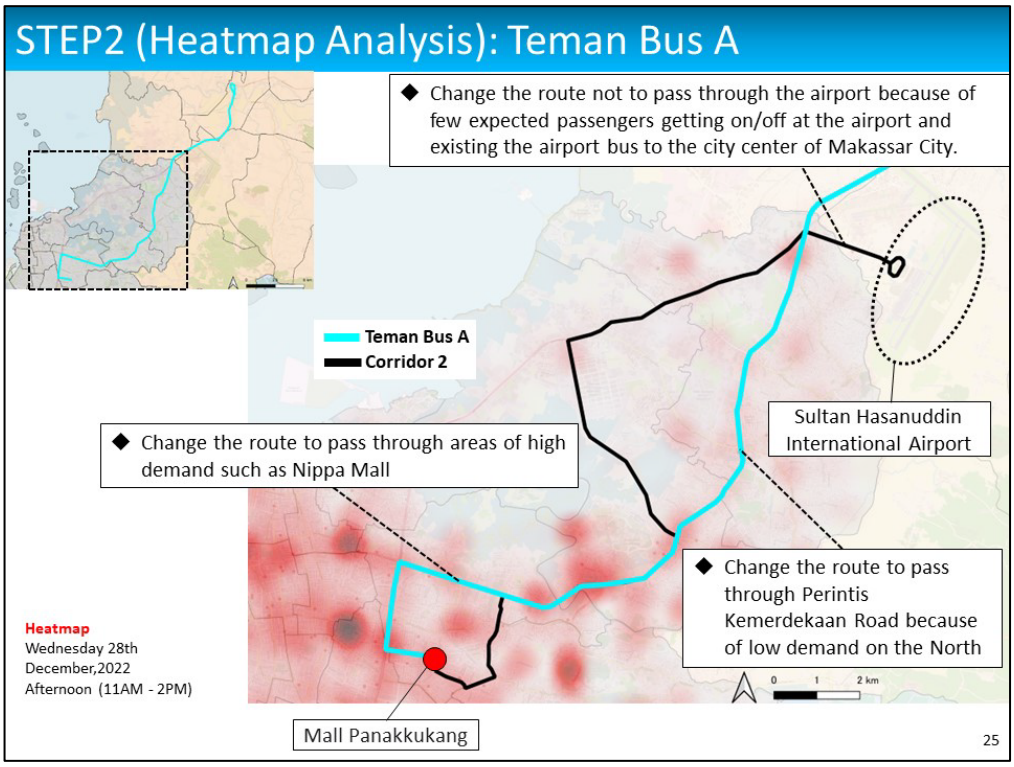


Study team confirmed the overlap with the existing Pete Pete route. Due to the overlap in some sections, study team proposed installing transfer points at the yellow dot location.

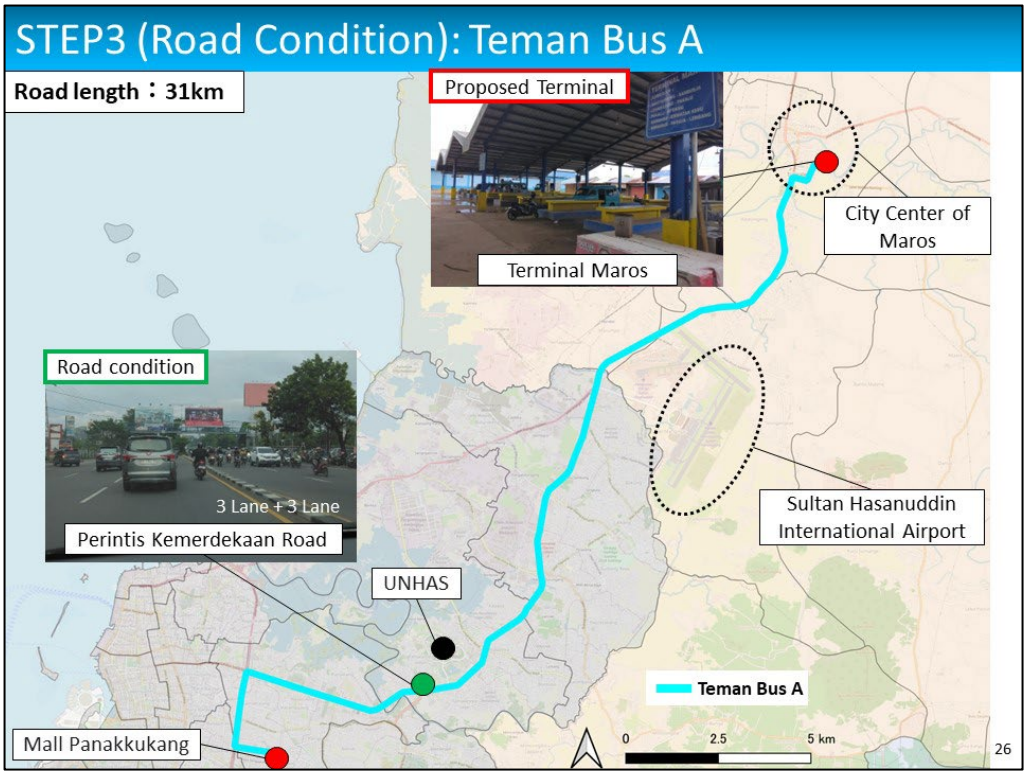


The above figure shows the proposal for Teman Bus A. The left figure shows the OD with the starting point in the center of Maros and the right figure shows the OD with the ending point in the center of Maros. Study team proposed changing the end point of Corridor 2 of the existing Teman

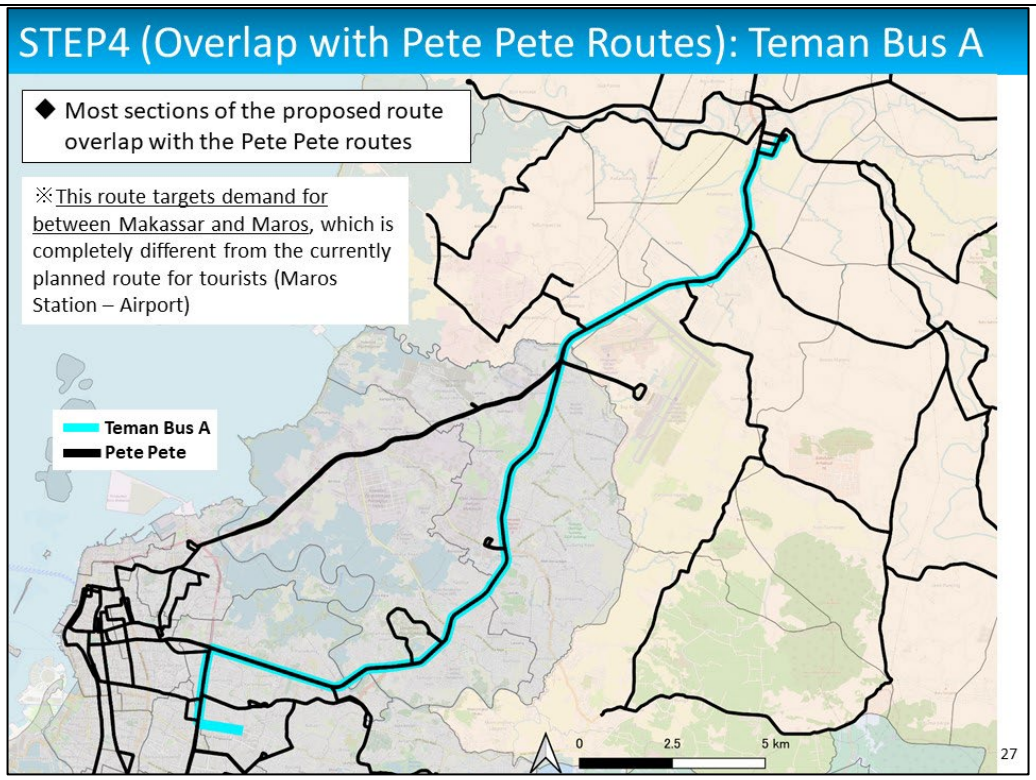
Bus since the analysis showed that many people travel between the center of Maros and Makassar City.



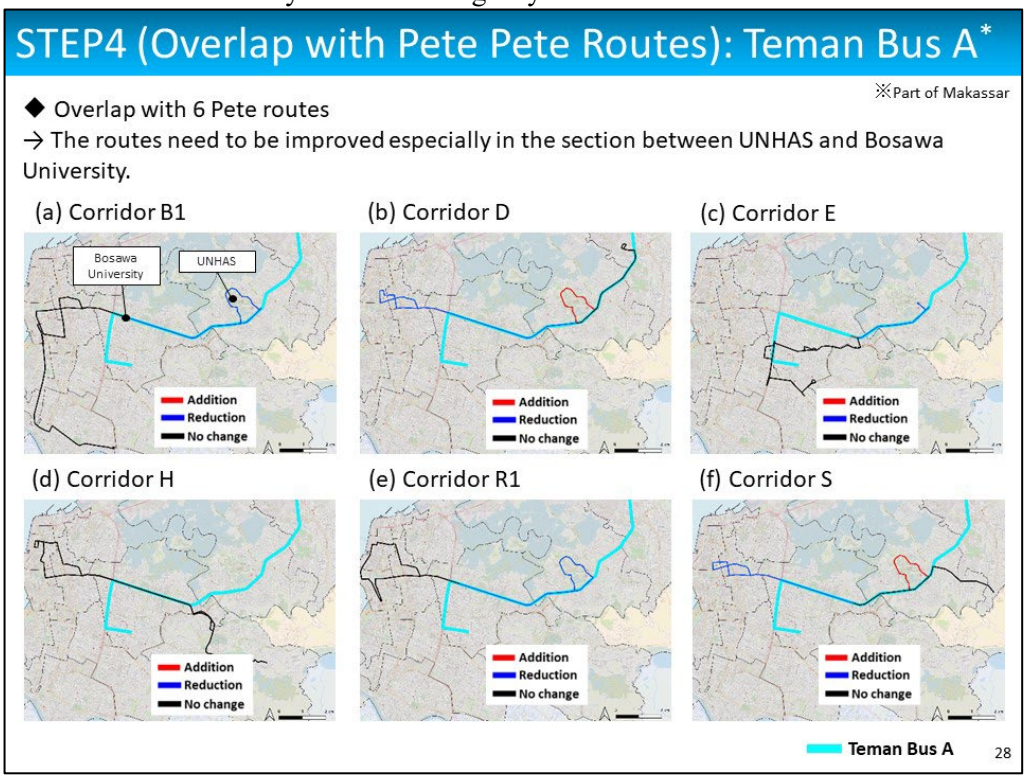
Heat map analysis showed that the existing Teman Bus corridor （Corridor 2 (black)) runs through less densely populated areas. So study team proposed Corridor B (light blue), which has potential demand.



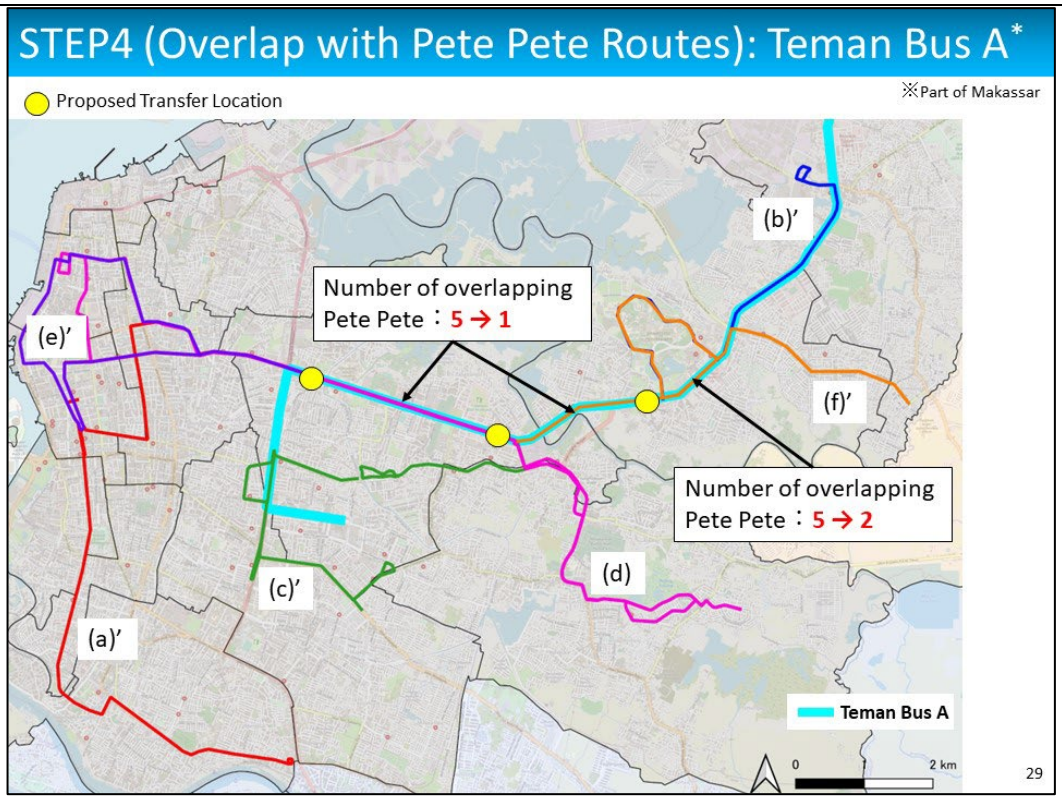
Study team checked the road width and traffic regulations and proposed a corridor that buses could drive on.



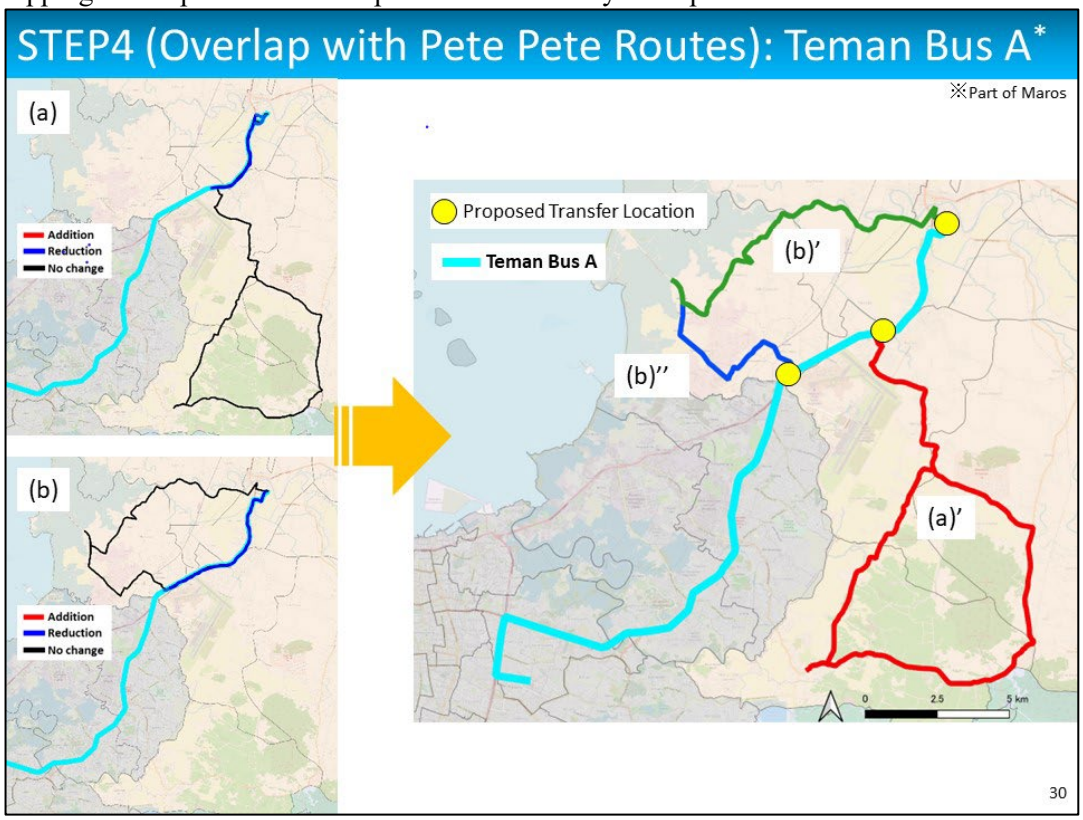
Study team checked the overlap and most of the sections overlap with the proposed corridor. In the last meeting, some agencies pointed out the need to consider the overlap between the Maros station and the route connecting it to the airport. However, study team thinks that the proposed Teman Bus corridor will not compete with it because this route is designed to meet the travel demand between Makassar City and Maros Regency.



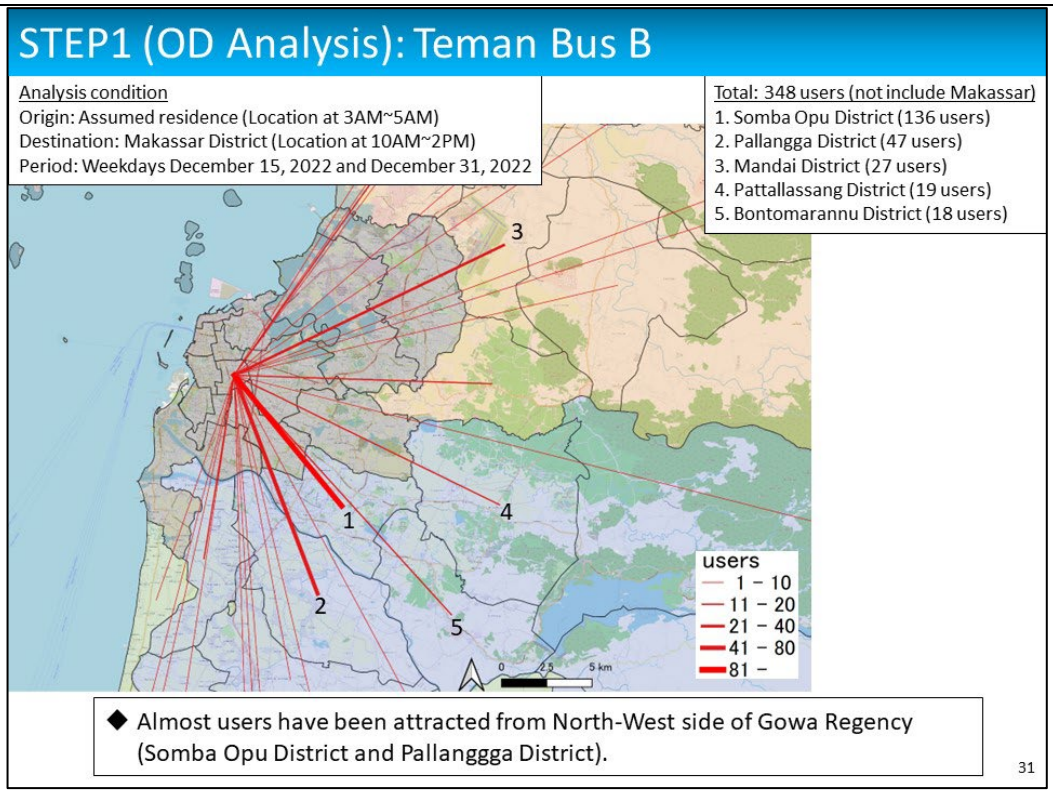
The above figure shows the overlap between Teman Bus A and Pete Pete route.



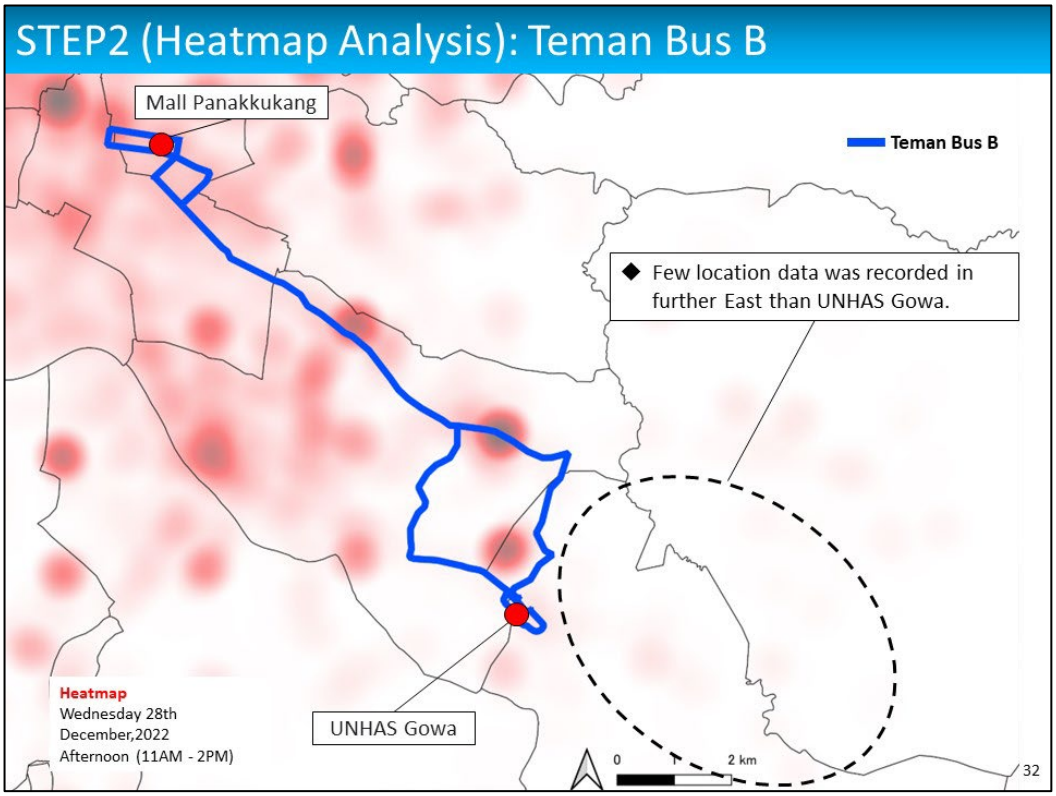
Focusing on the overlapping sections, study team proposed to improve the route to avoid overlapping and to provide transfer points at the above yellow point locations.



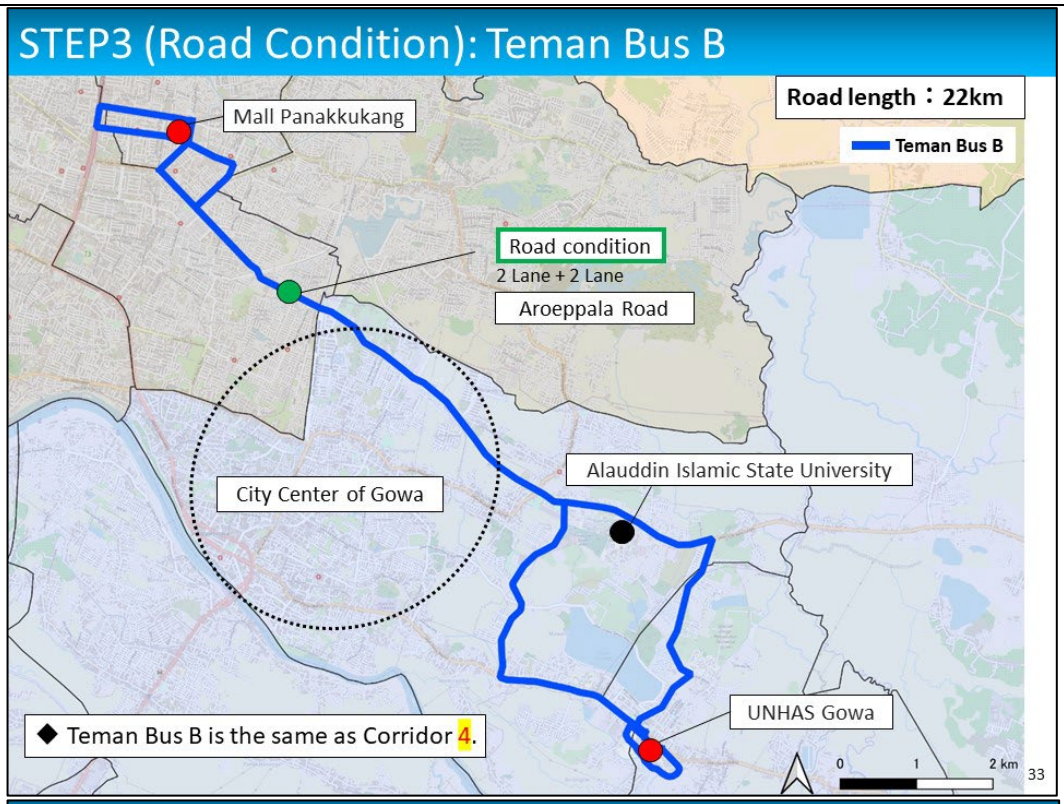
Focusing on Pete Pete in Maros Regency, the two routes overlap with the proposed route. Study team proposed to set up transfer points to facilitate the transfer to and from Teman Bus and also proposed to abolish the Pete Pete route on the Teman Bus corridor.

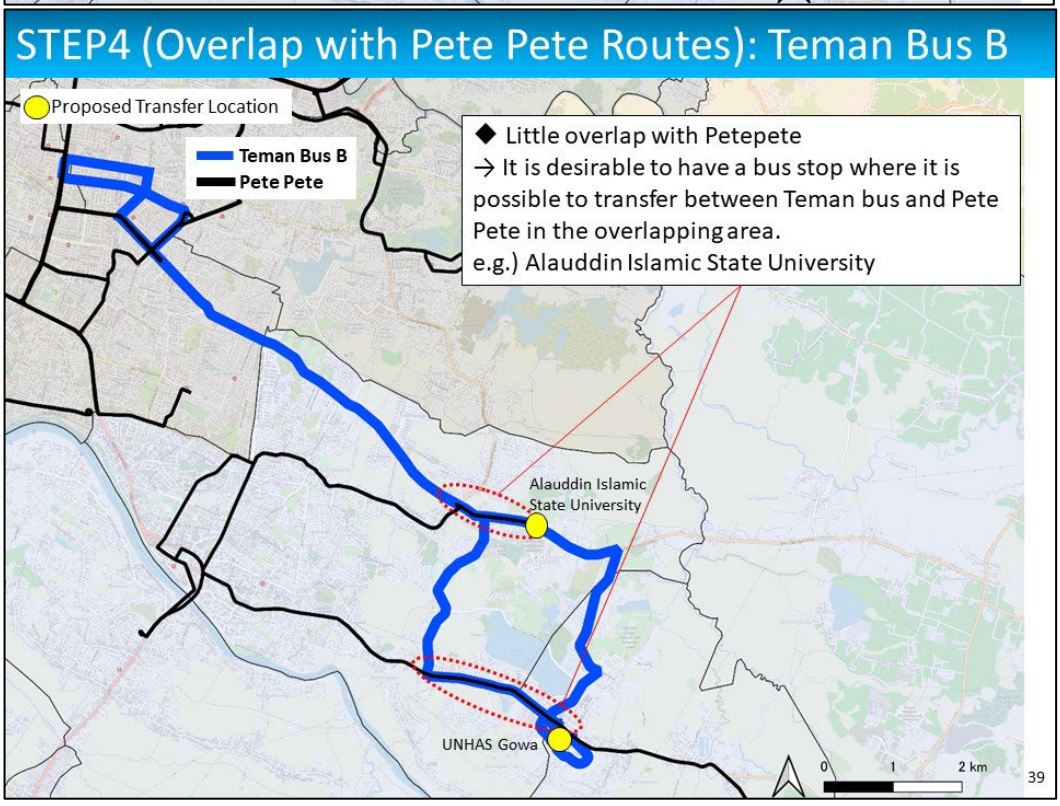


The above figure shows the result of the OD analysis of Teman Bus B terminating in Makassar district. It can be seen that many people are traveling from the western part of Gowa Regency to Makassar District.

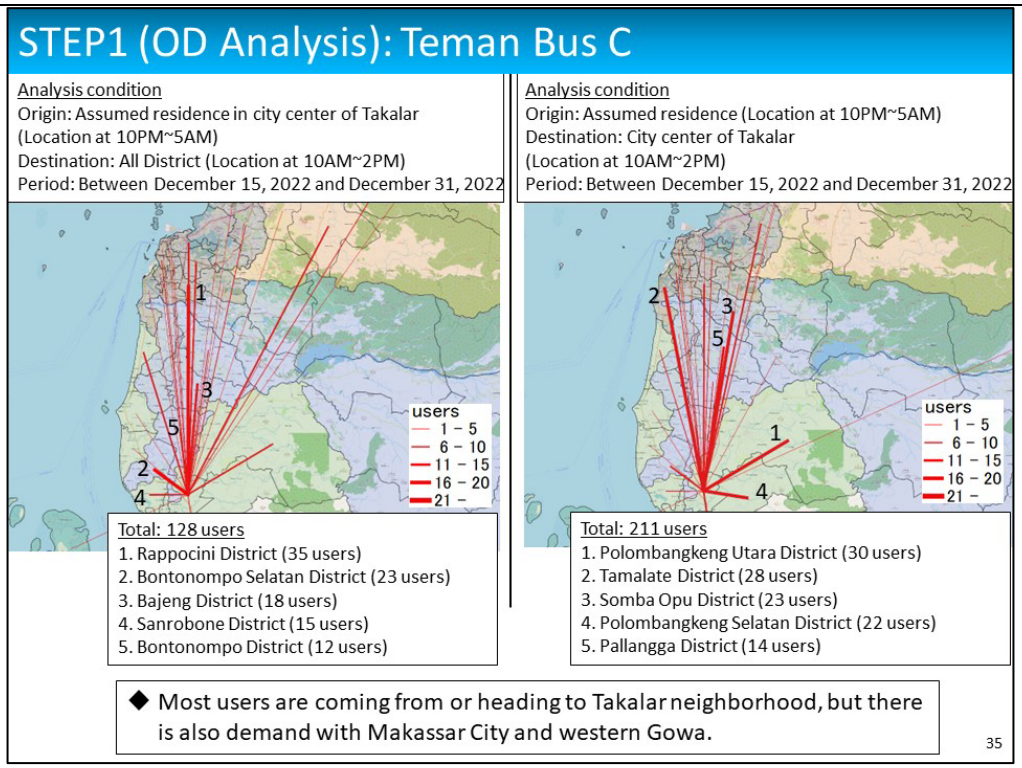


The heat map analysis results showed that the data is not distributed in the eastern area of UNHAS Gowa. Therefore, study team proposed to utilize the existing Corridor 4 without any changes.

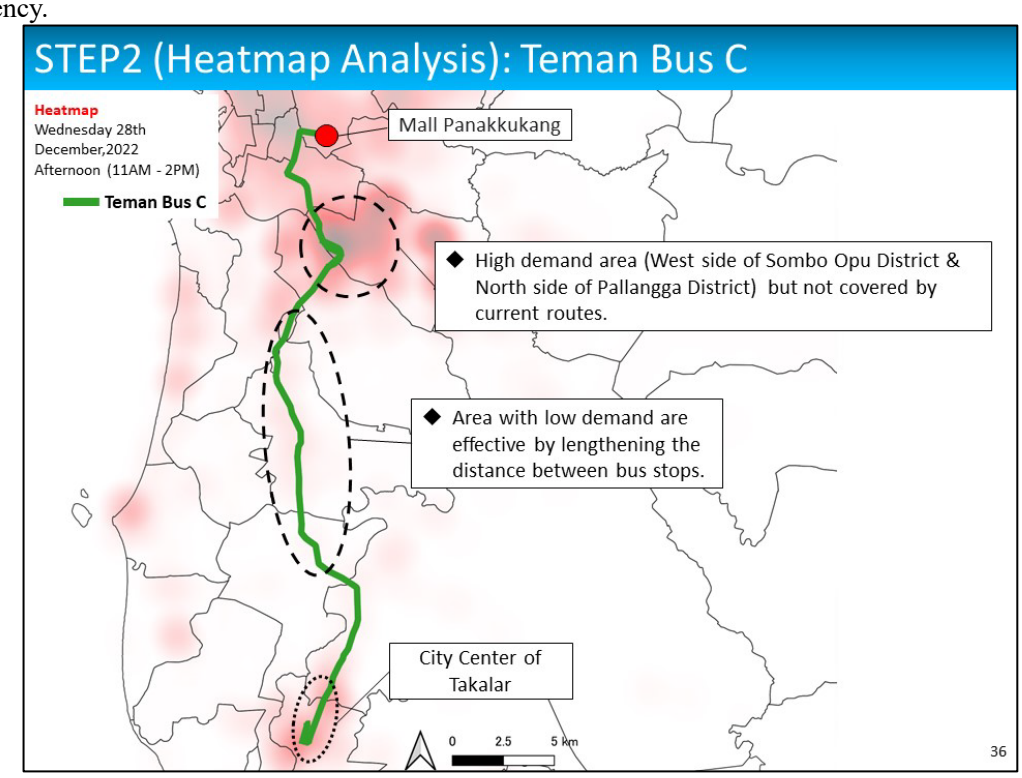




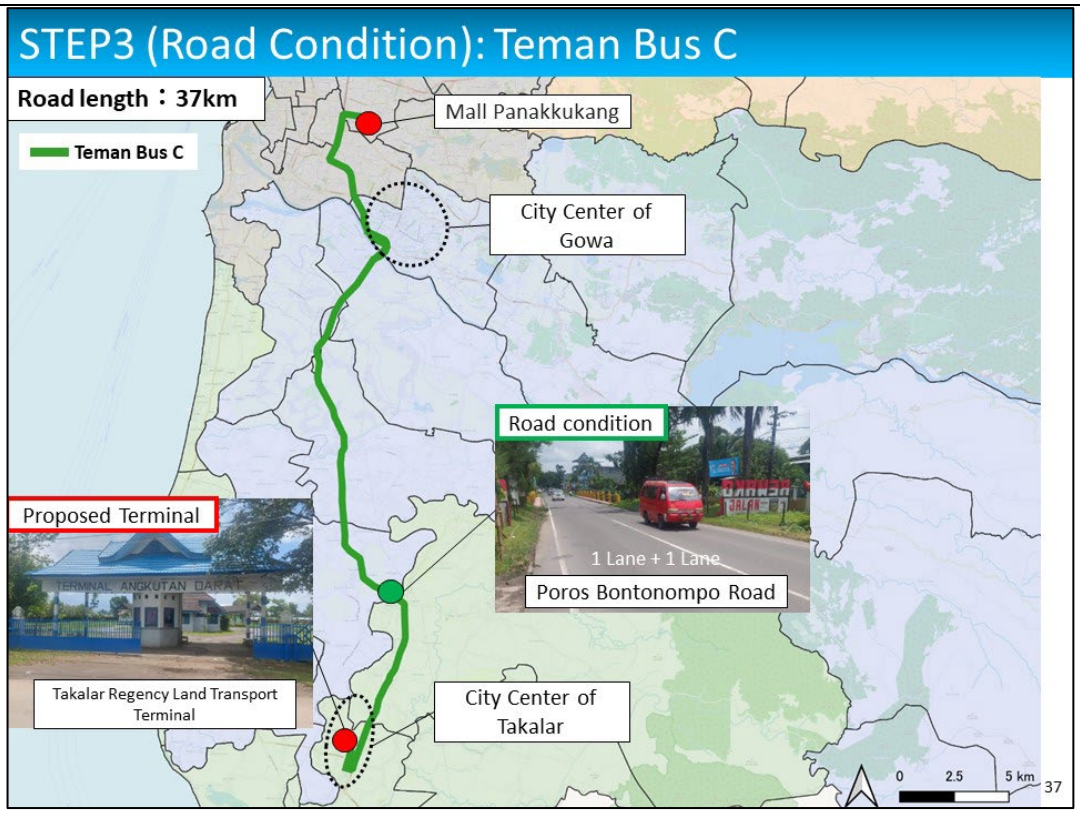
The overlap with Pete Pete was checked. Study team proposed that some transfer points be established in those sections since there is overlap in some sections.



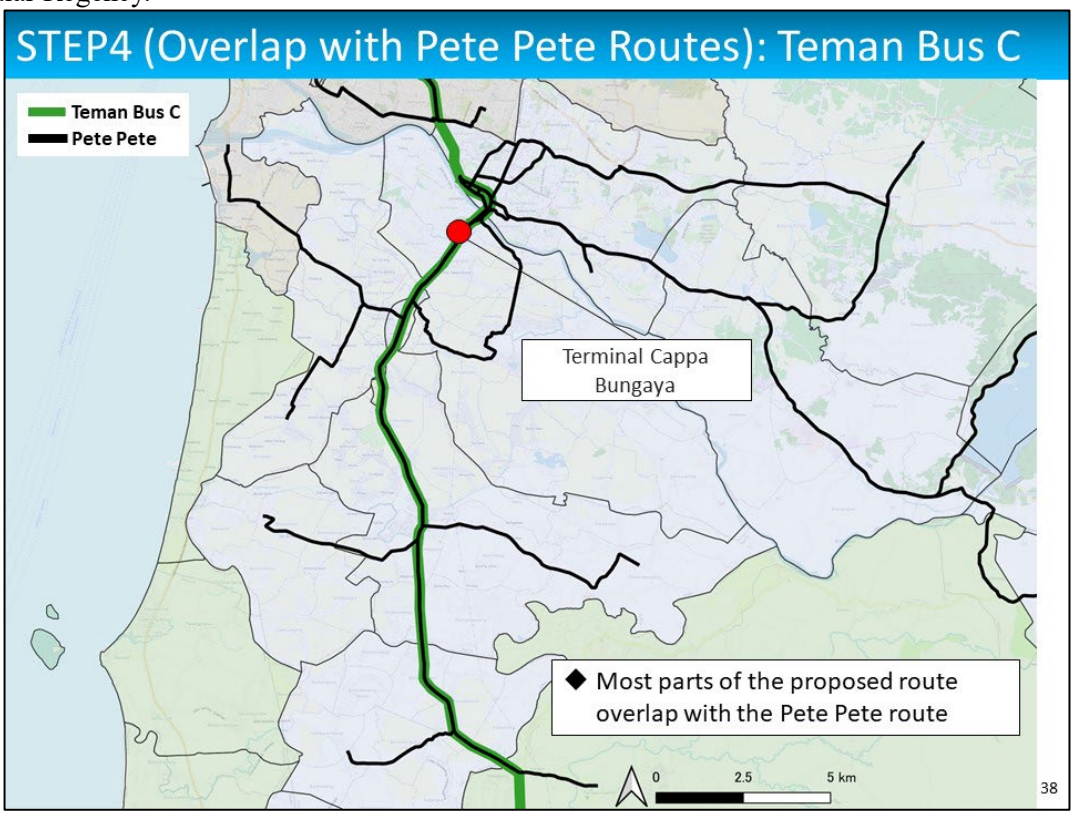
The above figure shows the proposed Teman Bus C. The left figure shows the OD with the starting point in the center of Takalar Regency and the right figure shows the OD with the ending point in the center of Takalar Regency. As a result of the analysis, many people moved to areas adjacent to the center of Takalar Regency. This study also found high travel demand to Makassar City and the western districts of Gowa Regency.



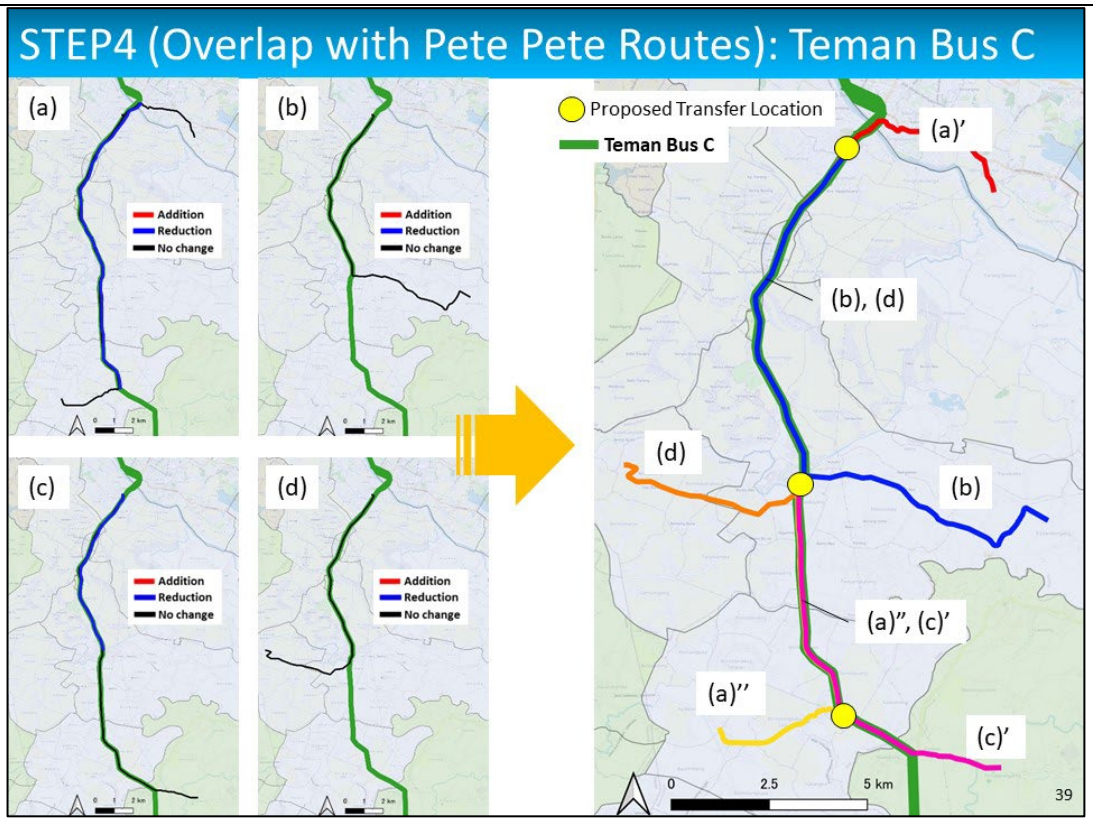
Study team proposed enlarging bus stop space in low-demand sections to improve operational efficiency.



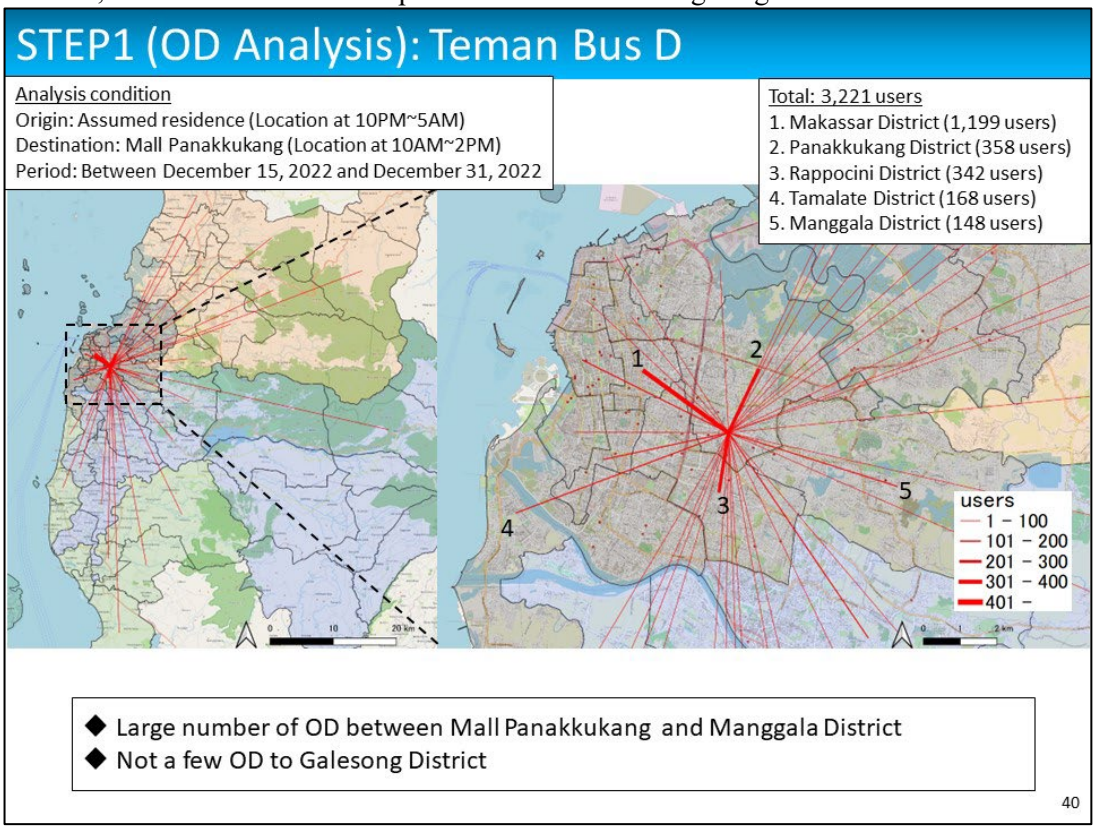
The condition of the road was checked, and it was confirmed that two lanes were secured and there were no problems for bus operation. The proposed terminal is the Land Transport Terminal in Takalar Regency.



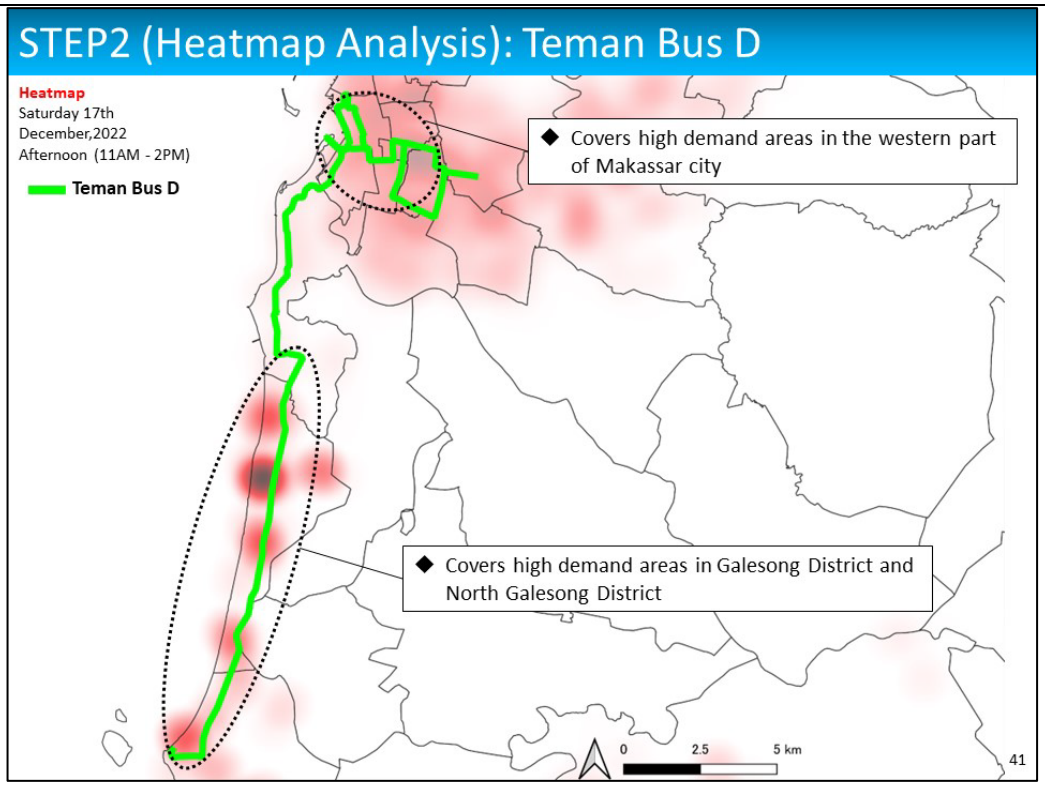
The proposed corridor overlaps with Pete Pete in many sections.



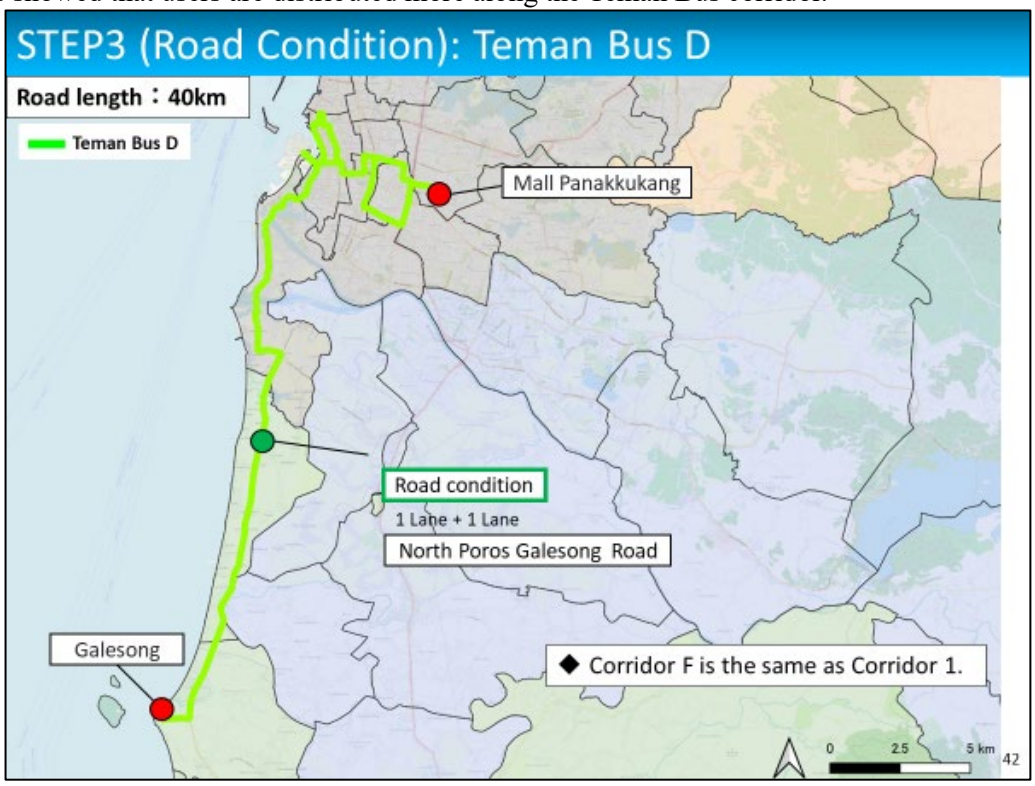
The four Pete Pete routes overlap. Therefore, study team proposed to reduce some sections of a and c, and to establish transfer points as shown on the right figure.



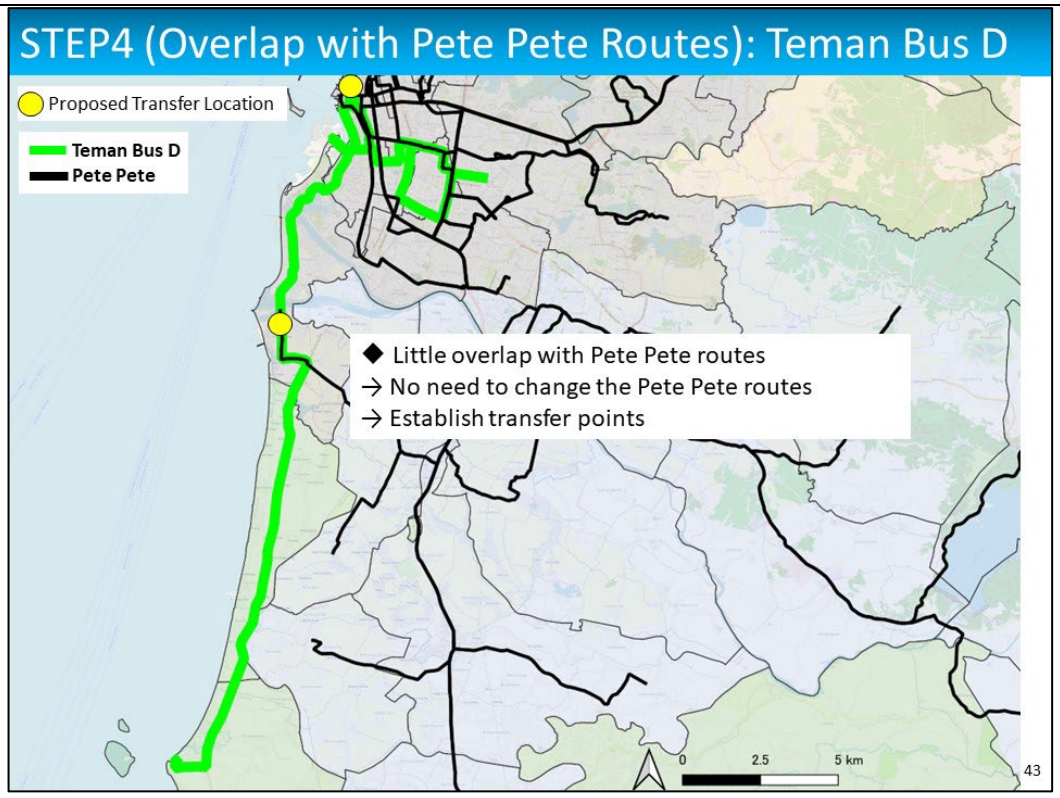
The above figure shows the results of the OD analysis with Mall Panakkukang as the endpoint. It can be seen that there is little movement from the Galesong district.



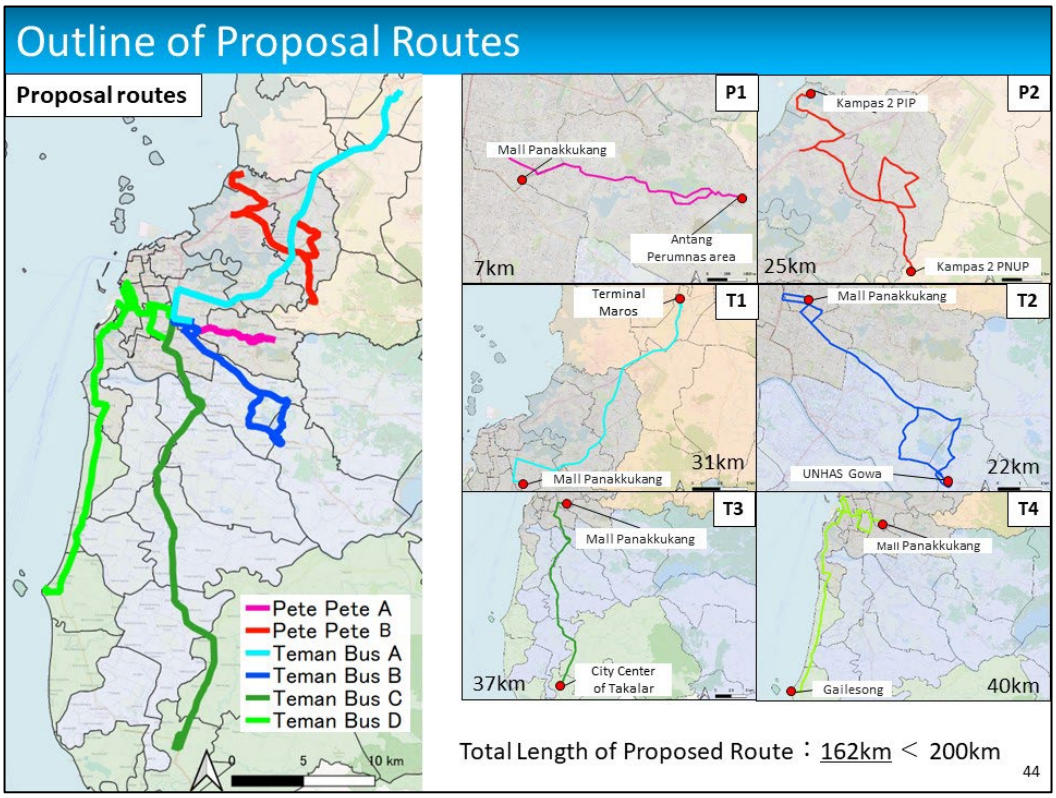
Teman Bus D is a similar corridor to the existing Teman Bus Corridor 1. The heat map analysis results showed that users are distributed more along the Teman Bus corridor.



Road conditions were checked to be fine because the corridor is similar to the existing Teman Bus Corridor 1.



Although there is overlap in some sections, the Pete Pete route was left as it is now. On the other hand, study team proposed to establish transfer points to facilitate the transfer between Teman Bus D and Pete Pete.



The above figure shows a summary of the proposed route. The total length of the proposed corridor is 162 km, which is within the condition since a comment was received during the last

meeting that the total length of Teman Bus should be limited to 200 km.

Outline of Proposal Routes

Comparison Table between Existing Corridor and Proposal Corridor

Existing Corridor	Proposal Corridor	Notes
Corridor 1 (Mall Panakukkang – Pelabuhan Galesong)	Teman Bus D (Mall Panakukkang – Pelabuhan Galesong)	No Change
Corridor 2 (Mall Panakkukang – Bandara Internasional Sultan Hasanuddin)	Teman Bus A (Mall Panakukkang – Terminal Maros)	Partly Changed
Corridor 3 (Kampus 2 PNUP- Kampus 2 PIP)	Pete Pete B (Kampus 2 PNUP- Kampus 2 PIP)	Changed to Pete Pete
Corridor 4 (Kampus Teknik Unhas Gowa – Mall Panakukkang)	Teman Bus B (Kampus Teknik Unhas Gowa – Mall Panakukkang)	No Change
-	Pete Pete A (Mall Panakukkang – Antang Perumnas Area)	New Pete Pete
-	Teman Bus C (Mall Panakukkang – Terminal Angkutan Darat Kab. Takalar)	New Teman Bus

45

The above table shows a comparison table between the current Teman Bus corridor and the proposed routes.

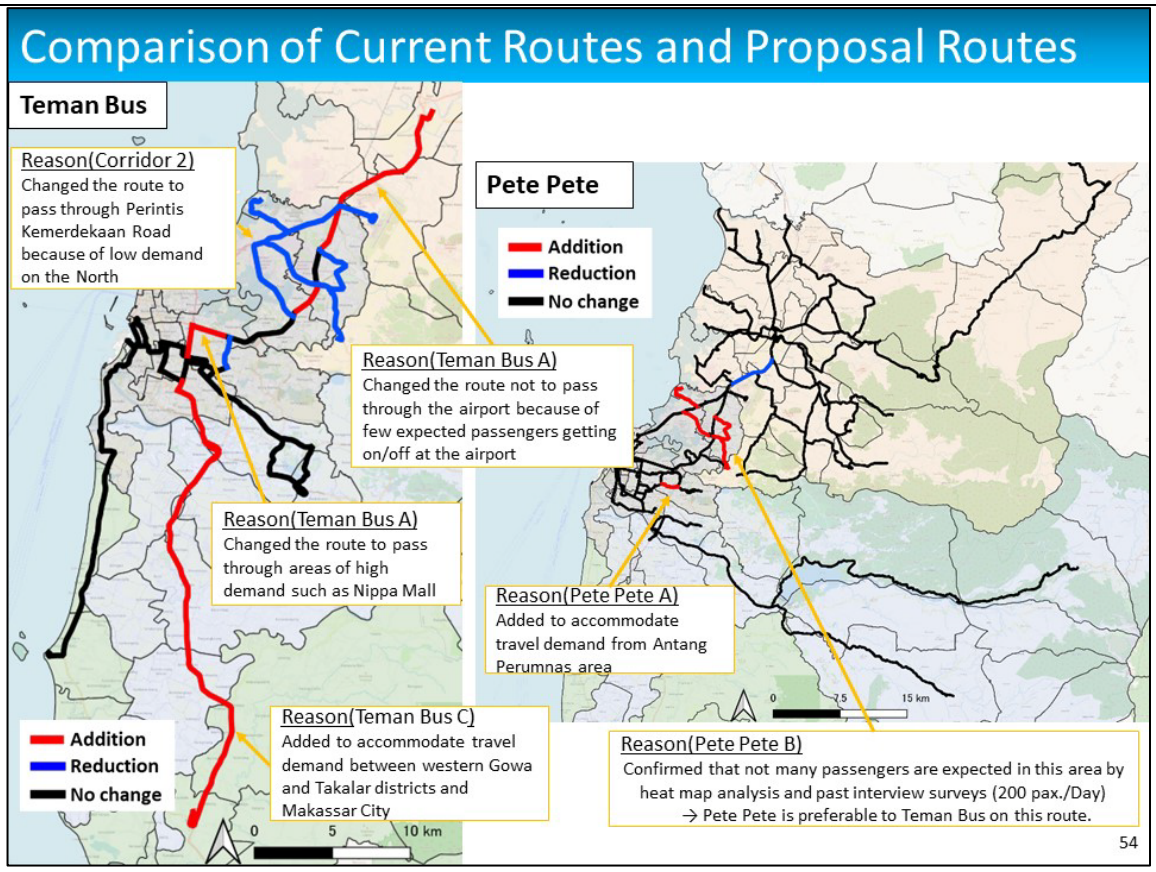
Outline of Proposal Routes

Comparison Table of Advantages and Disadvantages

Proposal Corridor	Notes	Advantages	Disadvantages
Teman Bus D (Mall Panakukkang – Pelabuhan Galesong)	No Change	・Covers high demand areas in the western part of Makassar city ・Covers high demand areas in Galesong District and North Galesong District	–
Teman Bus A (Mall Panakukkang – Terminal Maros)	Partly Changed	・Able to meet the travel demands form and to Maros city center ・Able to meet the travel demands of high-demand areas like Nippamall	・Most sections of the proposed route overlap with the Pete Pete routes →Need to reorganize Pete Pete routes
Pete Pete B (Kampus 2 PNUP-Kampus 2 PIP)	Changed to Pete Pete	・Able to allocate resources (Bus Drivers, Vehicle etc,) to another potential route of Teman Bus	–
Teman Bus B (Kampus Teknik Unhas Gowa – Mall Panakukkang)	No Change	–	・Little overlap with Pete Pete → It is desirable to have a bus stop where it is possible to transfer between Teman bus and Pete Pete in the overlapping area
Pete Pete A (Mall Panakukkang – Antang Perumnas Area)	New Pete Pete	・The route covers Antang Perumnas area, which has a large number of low-income residents and high demand	・The road width on this route is narrow and quite crowded during peak hours ・There is overlap with the existing Pete Pete route
Teman Bus C (Mall Panakukkang – Terminal Angkutan Darat Kab. Takalar)	New Teman Bus	・Able to meet the travel demands of high demand area (West side of Sombo Opu District & North side of Pallangga District) but not covered by current routes ・Able to meet the travel demands between Makassar city and Takalar Regency center	・Most parts of the proposed route overlap with the Pete Pete route ・There are areas of low demand in the middle of the route →Area with low demand are effective by lengthening the distance between bus stops

52

The above table shows the advantages and disadvantages of the proposed route.



The above figure shows a comparison of the existing and proposed routes. The red line indicates a newly added route, the blue line indicates a change route, and the black line indicates that the existing route is proposed to be utilized as is.

6. Proposal of the Possibility of Utilizing MBD in the Transportation Field

6.1 Understanding Traffic Problems

Figure 6-1 shows the routes of Teman Bus, Pete Pete, and the planned BRT in the Mamminasata Metropolitan Area. The three public transportation systems have largely overlapped route configurations. the opposition activities occurred by Pete Pete drivers who fear a decrease in fare revenues since the service route overlap with Pete Pete as shown in Figure 6-2. Therefore, MOT and the South Sulawesi Province Transportation Office are reviewing Teman Bus operation corridors.

As for specific corridors, as shown in Table 6-1, there is a conflict in Corridor 2. On the other hand, Corridor 3, which does not have a route leading to Makassar city center, has only about 200 passengers per day. According to information from local agencies, this Corridor 3 is currently under review.

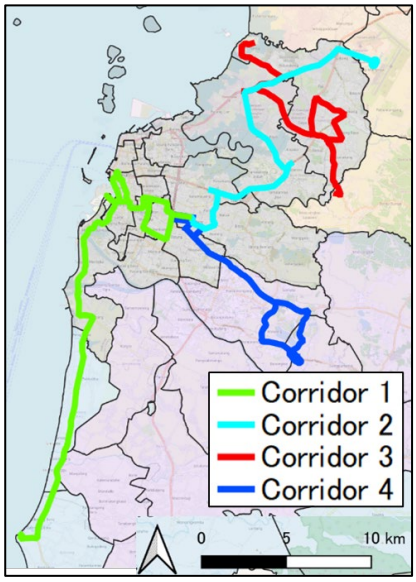
The Land Transportation Management Center Region No.19 also commented that the Pete Pete route has not been reviewed for more than 20 years and does not reflect changes such as the increase in the residential population due to urban development and the rise of ride-hailing services. They also commented that it is assumed that the existing route is not compatible with current travel demand.

The purpose of introducing Teman Bus and BRT is to increase the convenience of public transportation, to shift people from private cars to public transportation, and to reduce traffic congestion in urban areas. The increase in the number of public transportation users is expected to improve the management of public transportation.

It would be important to provide public transportation services that meet demand by dividing roles, with Teman Bus and BRT responsible for trunk transportation and Pete Pete for feeder transportation. In consideration of convenient public transportation services that meet the necessary demand, it would be beneficial to utilize MBD, which can analyze the distribution of people, such as when, where, and how many people gather, as well as the travel demand from places where people are concentrated.

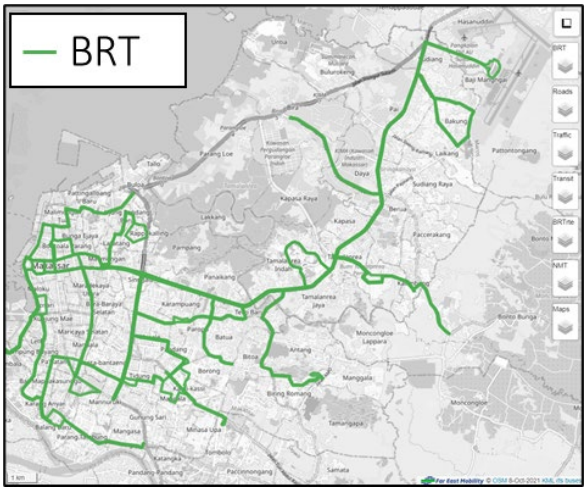
Teman Bus Route

Source: Study Team



BRT Route

Source: Far East Mobility



Pete Pete Route

Source: Study Team

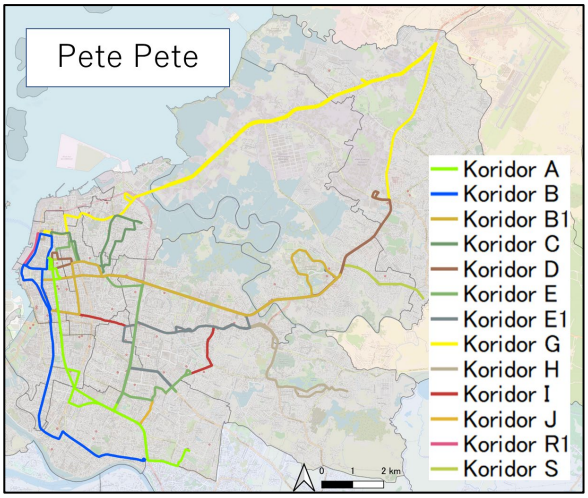
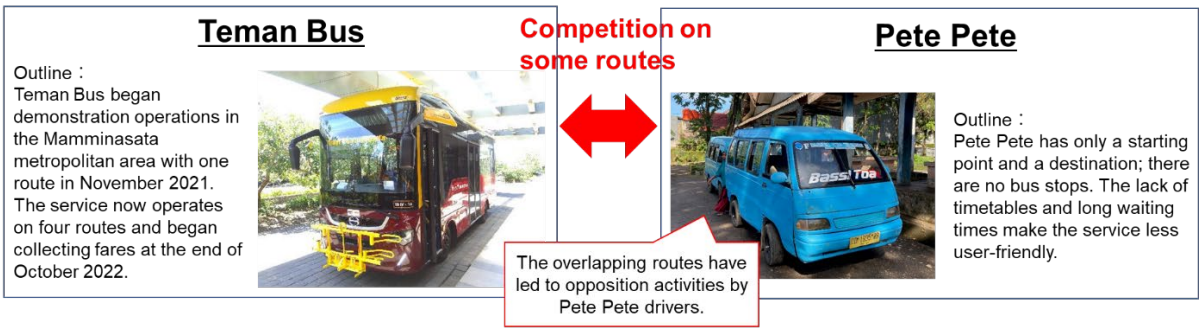


Figure 6-1 Comparison of Teman Bus, BRT, and Pete Pete routes



Source: Study Team

Figure 6-2 Competition between Teman Bus and Pete Pete

Table 6-1 Status of Teman Bus operations (as of August 2022)

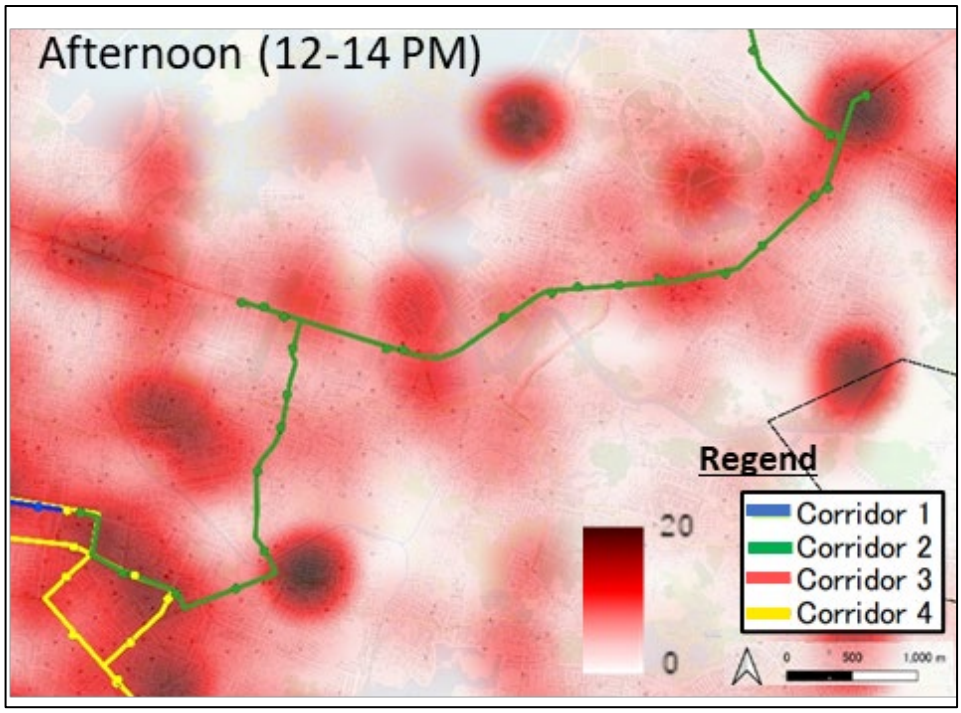
Teman Bus	No. of vehicles in operation	Competition	Outline
Corridor 1	21 units	No	There is a popular tourist destination at the end of the line, and more than 1,000 people use the line on holidays.
Corridor 2	21 units	Yes	Competing on Pete Pete routes connecting the airport area to the center of Makassar City.
Corridor 3	18 units	No	No connection to Makassar city center and few users, about 200 people/day.
Corridor 4	17 units	No	Many students use the route connecting the center of Makassar and the university.
Other	Spare 10 units	・There are over 200 drivers, with two people taking turns driving one car. ・It runs every 7 to 15 minutes from 5:00 to 21:00. ・The operation interval is decided by the supervisor in the terminal. ・The driving speed is monitored in the control room, and fines are imposed for vehicles exceeding 50km/h.	

Source：Study Team

6.2 Utilization for Public Transportation Planning

6.2.1 Use of Heat Maps

Figure 6-3 shows a heat map of the area around Corridor 2 of Teman Bus. From the heat map analysis, it is possible to understand when, where, and how many people gather by plotting the location information of application users' smartphones on a map and shading it according to its distribution density.



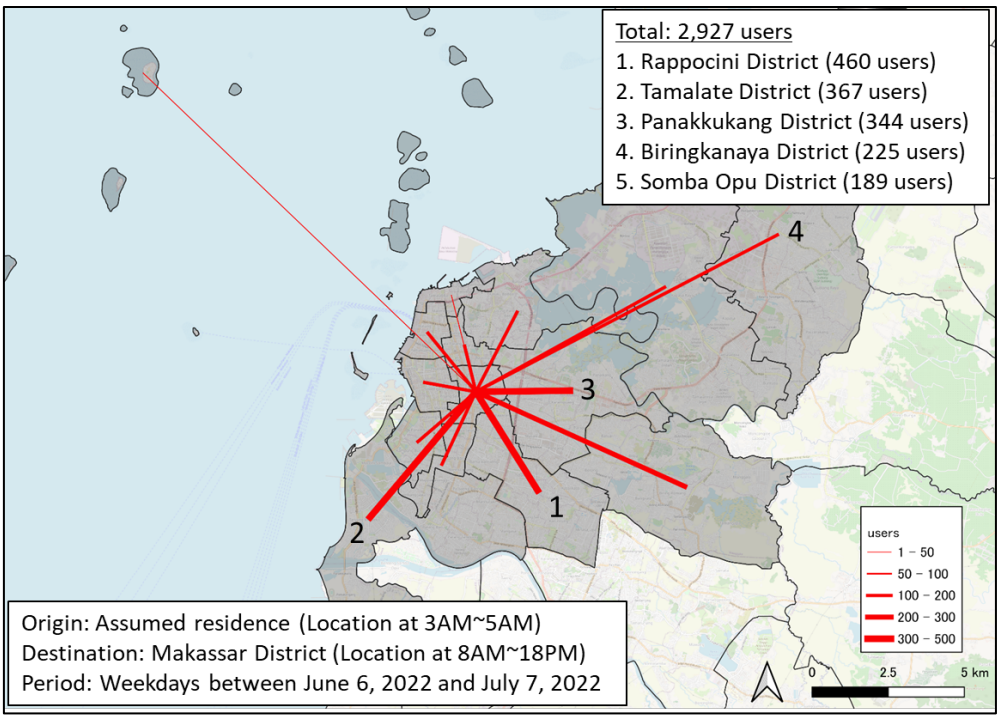
Source:Study Team

Figure 6-3 Heatmap of Nipah Mall area

6.2.2 Use of OD Analysis

Figure 6-4 shows the OD (origin - destination) analysis results for the Makassar region. By performing OD analysis, it is possible to grasp where and how much travel demand exists.

By planning bus routes from locations with high concentrations of people to areas with high travel demand, it is expected that people will switch from private cars to public transportation, thus contributing to an increase in the number of public transportation users.



Source: Study Team

Figure 6-4 OD analysis results for Makassar City

7. Results of the Study

7.1 Support for the Formulation of Public Transportation Plans utilizing MBD in Indonesia

As shown in Table 7-1, five meetings were held with the South Sulawesi Province Transportation Office, the Makassar City Transportation Office, and related agencies. At the 1st and 2nd meetings, the needs for MBD utilization in South Sulawesi Province were identified and the MBD utilization plan was approved. At the 3rd, 4th, and 5th meetings, study team presented the results of the MBD analysis of the target area and proposed a new route for Teman Bus and Pete Pete. Feedback was then obtained from participants.

Table 7-1 Summary of Meetings with Related Agencies

No.	Date and Time	Details	Participants
1	October 6,2022 11:00 to 14:00	＜The 1st meeting＞ 1.Background of the MBD study 2.Outline of the study 3.Exchange of opinions	・Land Transportation Management Center Region No.19 , Ministry of Transportation ・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Transportation Office, Gowa City ・Transportation Office, Maros City ・Transportation Office, Takalar City ・Regional Development Planning Agency, Makassar City ・Regional Development Planning, Research and Development Agency, Gowa City ・Regional Development Planning, Research and Development Agency, Maros City ・Regional Development Planning, Research and Development Agency, Takalar City ・Hasanuddin University
2	November 7,2022 10:00 to 11:00	＜Courtesy call on the Governor of South Sulawesi Province＞ 1.Background of the MBD study 2.Outline of the study 3.Exchange of opinions	・Governer of South Sulawesi Province ・Hasanuddin University
3	December 6,2022 16:00 to 18:30	＜The 2nd meeting＞ 1. Confirmation of comments from 1st meeting 2. Explanation of MBD analysis results 3.Exchange of opinions	・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Cooperation Division, Makassar City

4	February 8,2023 15:20 to 18:00	＜The 3rd meeting＞ 1.Confirmation of comments from 2nd meeting 2.Proposed Teman Bus corridor 3.Exchange of opinions	・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Cooperation Division, Makassar City
5	March 27, 2023 11:00 to13:40	＜The 4th meeting＞ 1. Confirmation of comments from 2nd/3rd meeting 2.Teman Bus corridor, proposed Pete Pete route 3.Exchange of opinions	・Land Transportation Management Center Region No.19 , Ministry of Transportation ・Transportation Office, South Sulawesi Province ・Transportation Office, Makassar City ・Transportation Office, Gowa City ・Transportation Office, Maros City ・Transportation Office, Takalar City ・Regional Development Planning Agency, Makassar City ・Regional Development Planning, Research and Development Agency, Gowa City

Source: Study Team

7.2 Report Presentation at the 16th ASEAN-Japan Experts Group Meeting on Information Platform for Transport Statistics

The ASEAN-Japan Experts Group Meeting on Information Platform for Transport Statistics is a forum for transport officials from Japan, ASEAN countries and the ASEAN Secretariat to share information and exchange opinions related to statistical information in the field of transportation, as part of the "Information Platform for Transport Statistics", which is one of the studies based on ASEAN-Japan Transport Partnership. The 16th ASEAN-Japan Experts Group Meeting on Information Platform for Transport Statistics was held online on March 24, 2023 (Friday).

At this experts meeting, the results of this study were presented to report on the utilization of MBD for transportation planning. In response to the report on the results, the following questions were raised by the ASEAN Secretariat's Transportation Administrator.

Table 7-2 Questions and Answers Content

・What kind of information can be obtained from Lifesight's MBD? Also, how did you integrate and utilize route information from different data sources such as MBD and Teman Bus?【ASEAN Secretariat's Transportation Administrator】 →Lifesight's MBD is location data obtained from smartphones, which can determine the latitude and longitude of the user. For data integration, GIS is used for analysis.【Study Team】
・If enough big data can be obtained from local governments and companies like Lifesight, is it possible to conduct analysis and proposals like this in other countries and cities?【ASEAN

Secretariat's Transportation Administrator】

→If sufficient big data can be obtained, study team think it can be applied to other areas. 【Study Team】

・Jakarta is also considering feeder traffic, is it possible to consider using a similar approach? 【ASEAN Secretariat's Transportation Administrator】

→Study team think a similar approach could be applied to the study of feeder traffic. 【Study Team】

Source: Study Team

Below are the presentation materials and photo of the online meeting（Figure 7-1）。

Ⅰ. Outline of the Mamminasata Metropolitan Area

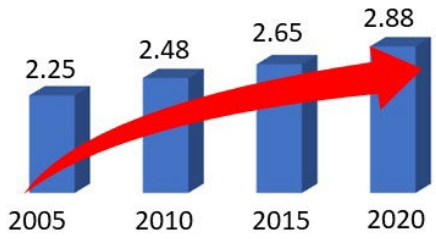
Source:Makassar, Indonesia - Climate Change Vulnerability Assessment（UN-HABItaT, 2014）

1

Current Situation of Mamminasata Metropolitan Area

Population Growth (Million)

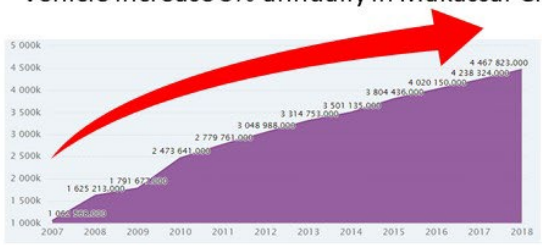
- Mamminasata's population is growing



Source:https://openjicareport.jica.go.jp/pdf/11834090_01.pdf

Vehicle Increase

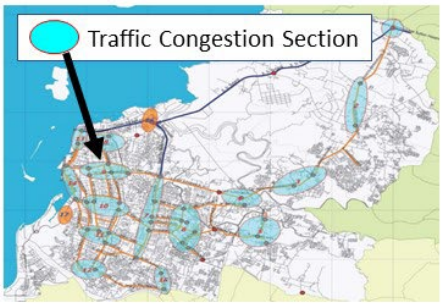
- Vehicle increase 5% annually in Makassar City



Source:https://www.ceicdata.com/en/indonesia/number-of-motor-vehicle-registered/no-of-motor-vehicles-south-sulawesi

Traffic Congestion

- Traffic congestion is occurred entire Makassar city.



Source:Makassar transportation plan

Source:https://kumparan.com/makassar-indeks/sulsel-black-out-kota-makassar-jadi-macet-total-1542373541876269667

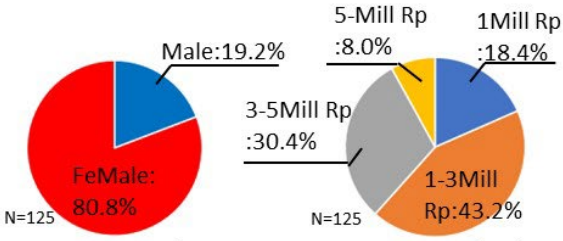
Further traffic congestion may occur in the future

2

Public Transportation in Mamminasata

Pete Pete

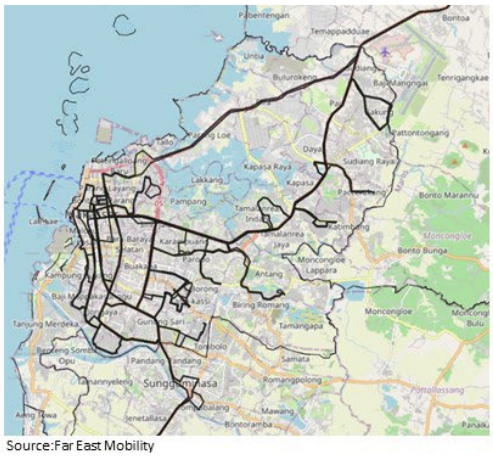
- Only the Pete Pete routes are decided, there is no bus stop and timetable.
- Passengers can get on and off by telling the driver anywhere on the route, and the fare is about 5,000 rupia depending on the distance.
- Vehicles are aging and are often not equipped with air conditioning equipment.



Passengers Ratio by Gender

Passengers Ration by Monthly Income

Source:Far East Mobility



Source:Far East Mobility

Pete Pete Routes in Makassar City

Public Transportation in Mamminasata

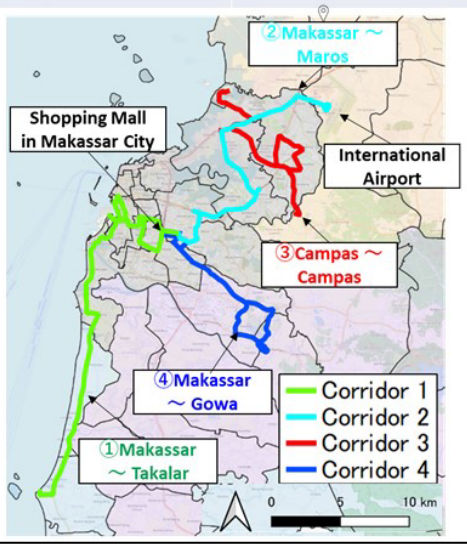
Teman Bus

- Indonesian Bus Rapid Transit System, which has been introduced under the initiative of the Indonesian Ministry of Transport.
- A three-year demonstration project has started in the Makassar city since November 2021, with toll collection started at the end of October 2022.
- There is a Teman Bus app, which has a route search and a timetable display function
- Electronic payment system has been introduced.

Source: Teman Bus HP

Outline and Routes

Item	Contens
Number of route	4 routes
Number of Bus stop	261 bus stops
Operation Interval	7-10 minitutes
Operation time	5:00-22:00



Public Transportation in Makassar City

INDOBUS(BRT) : Indonesia Bus Rapid Transit Corridor Development Project

As part of INDOBUS, F/S for introducing BRT around Makassar City has been implemented from December 2020 to December 2021.

- At this stage, BRT operation on 15 routes(by small, medium, and large buses) around the city is under consideration.
- Pre-F/S has been implemented form October 2019 to June 2020

Image of BRT Station in Makassar

BRT route plan in Pre-F/S

Source:GIZ(https://changing-transport.org/sustainable-urban-transport-Indonesia/), Far East Mobility(https://makassarbrt.net/)

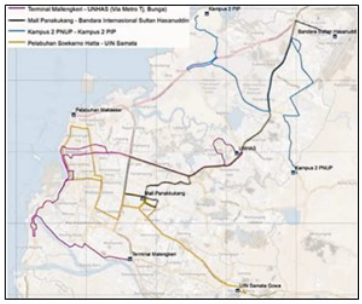
5

Public Transportation in Mamminasata

Three Public Transportations

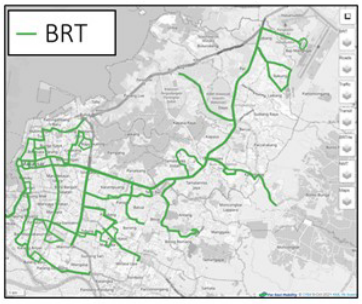
- The figures below are a comparison of the routes of Teman Bus,BRT, Pete Pete
- Three public transports follow similar routes
  - ➢ Each public transportation system may compete with for customers
  - ➢ Since Pete Pete should be played for feeder transportation, it is necessary to reorganize the feeder transportation route

Teman Bus Route※1



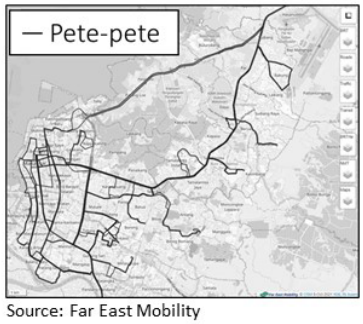
Source:Webinar Program Teman Bus "Untuk Konektifitas Kawasan Perkotaan di Makassar"

BRT Route(INDOBUS)



Source: Far East Mobility

Pete Pete Route



Source: Far East Mobility

※1:Some routes differ from the current route.

6

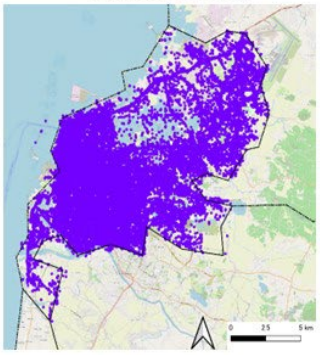
Ⅱ. MBD Utilization Plan 2022

7

MBD Utilization Plan 2022 in Mamminasata

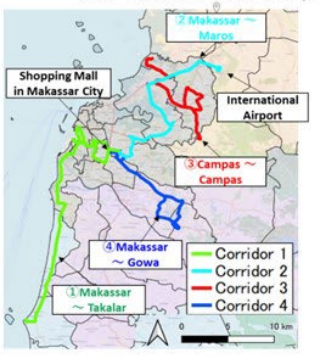
1. Acquiring MBD

- Acquiring MBD
  - Purchased data from Lifesight



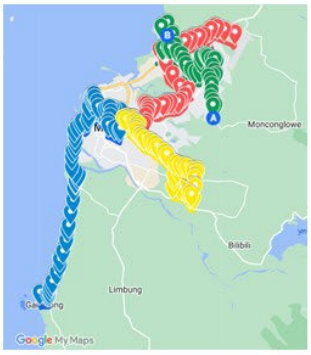
2. Creating Base Data

- GIS data
  - Road Information
  - Bus route / bus stop



3. Collecting Information

- Public Transport Plan
  - Teman Bus Project
  - BRT Project



4. MBD Analysis

5. Propose Public Transport Plan

Proposal of Teman Bus routes and Pete Pete routes based on MBD analysis

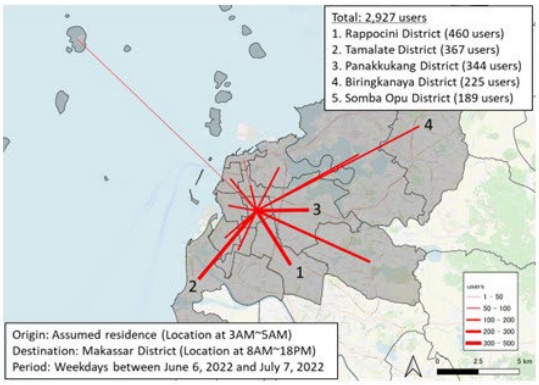
8

MBD Analysis Method

MBD analysis was conducted for the Mamminasata area using July 2022 data

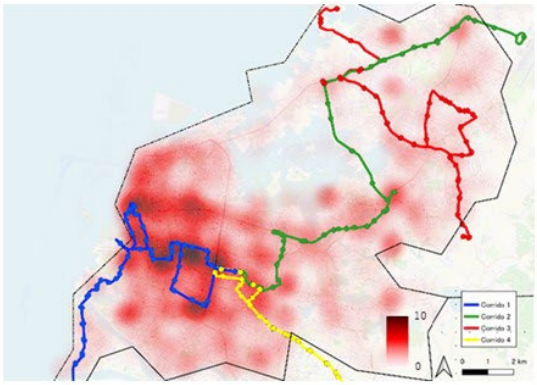
OD analysis

- Origin and Destination point of Users
- High OD volume means high potential for bus routes.



Heat Map

- Understanding the distribution of people.
- High population density means high potential for bus use.



9

Ⅲ. Proposal of Bus Routes using MBD

Acquiring MBD

Outline of Lifesight

Company	Outline	Data Contents	Number of User
Lifesight	Headquartered in Singapore, the company provides offline services for digital advertising, primarily using location-based information.	・GPS data ・Obtain Ad ID	MAU※1 1.4 million (within Indonesia)

※1：MAU(Monthly Active Users):Number of active users per month

Outline of Data

	Makassar	Gowa	Maros	Takalar
Data Acquisition Period	June 28th, 2022～July 11th, 2022			
Number of data (million)	16.3	3.6	2.1	0.6
Number of users (thousand)	185.1	52.6	35.0	9.0
Population(2021) (thousand)	1,427	773	396	302
Data validity (＝Users/Population)	12%	7%	9%	3%

11

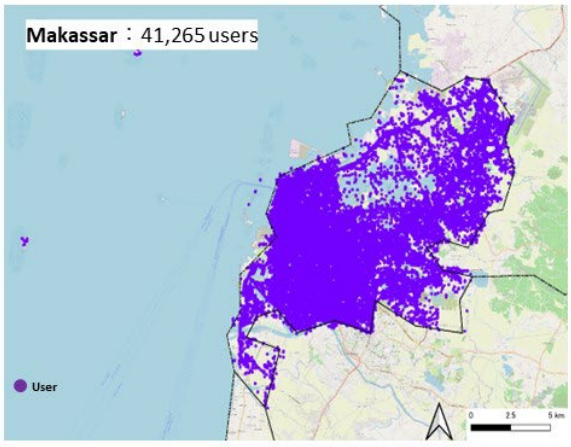
User Distribution

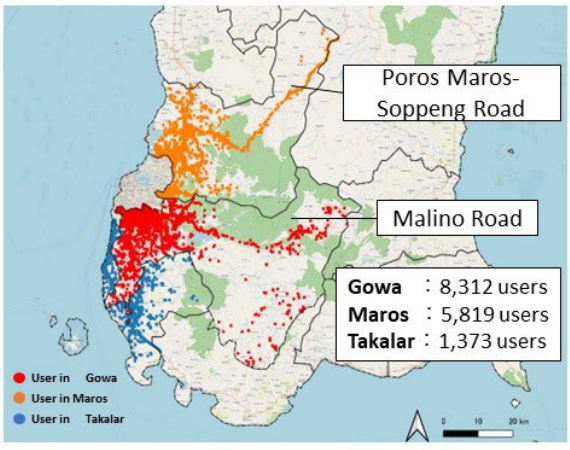
In Makassar

- The users have been confirmed on the whole Makassar city.
- Enough users for MBD analysis in Makassar city.

In Gowa, Maros and Takalar

- The users have been confirmed on the roads to tourist spots and other areas. (ex. Poros Maros-Soppeng Road).





Weekday (Wednesday 29th June,2022)

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New Bus Route Planning Method

STEP1 OD Analysis

- Analyze the flow of people and determine the origin and destination of the bus route
- The origin and destination should be a location that can serve as a terminal

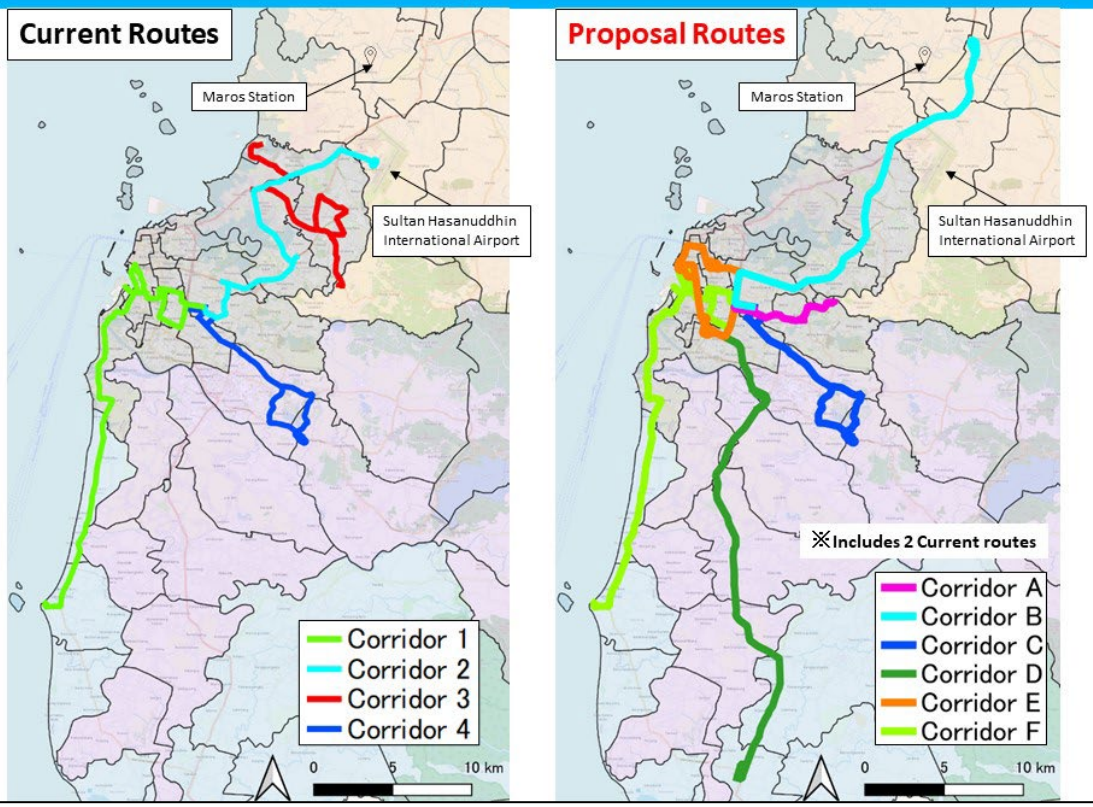
STEP2 Heatmap Analysis

- Visualize the density of people and determine rough routes through areas where demand is likely to be high

STEP3 Road Condition & Pete Pete Route Confirmation

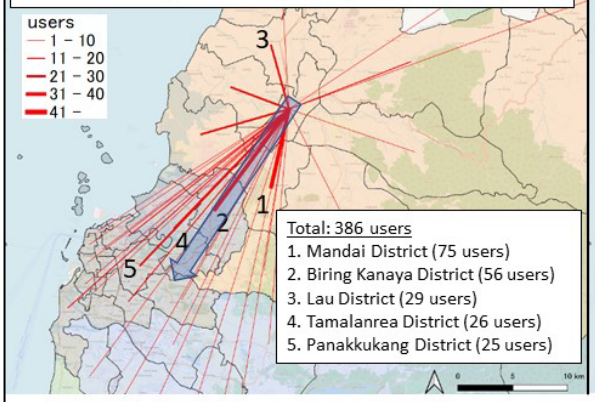
- Check road widths and traffic restrictions and determine detailed routes
- Consider areas not covered compared to current Pete Pete routes

Current Routes and Proposal Routes of Teman Bus



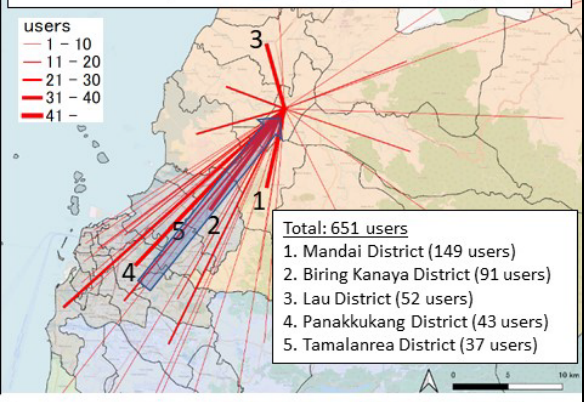
STEP1 (OD Analysis): Corridor B

Analysis condition
Origin: Assumed residence in city center of Maros
(Location at 10PM~5AM)
Destination: All District (Location at 10AM~2PM)
Period: Weekdays between June 28, 2022 and July 7, 2022



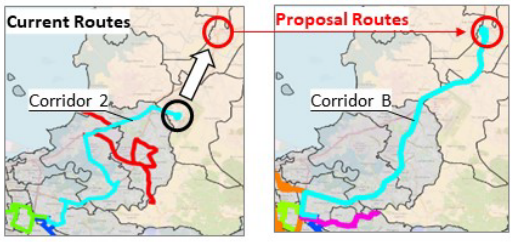
Total: 386 users
1. Mandai District (75 users)
2. Biring Kanaya District (56 users)
3. Lau District (29 users)
4. Tamalanrea District (26 users)
5. Panakkukang District (25 users)

Analysis condition
Origin: Assumed residence (Location at 10PM~5AM)
Destination: City center of Maros
(Location at 10AM~2PM)
Period: Weekdays between June 28, 2022 and July 7, 2022



Total: 651 users
1. Mandai District (149 users)
2. Biring Kanaya District (91 users)
3. Lau District (52 users)
4. Panakkukang District (43 users)
5. Tamalanrea District (37 users)

- Many users go from the city center of Maros to Makassar City.
- Proposed changes to terminal at Teman Bus corridor 2 based on travel demand.



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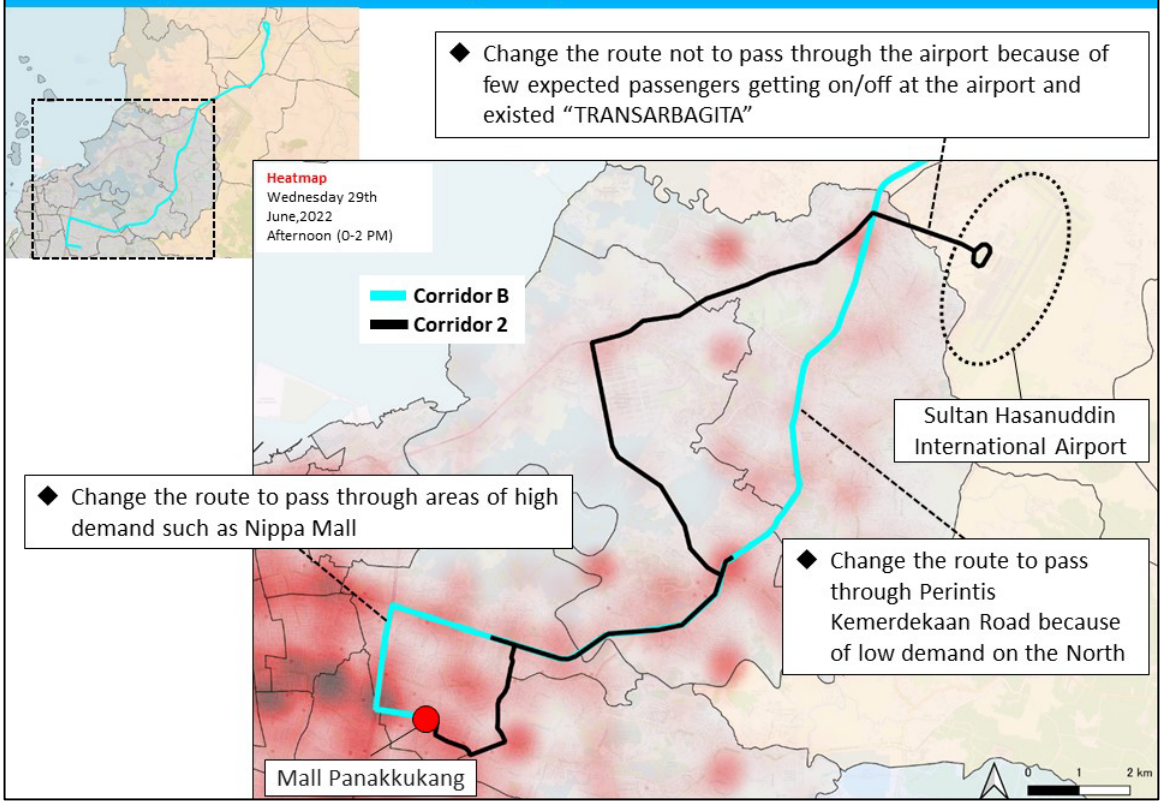
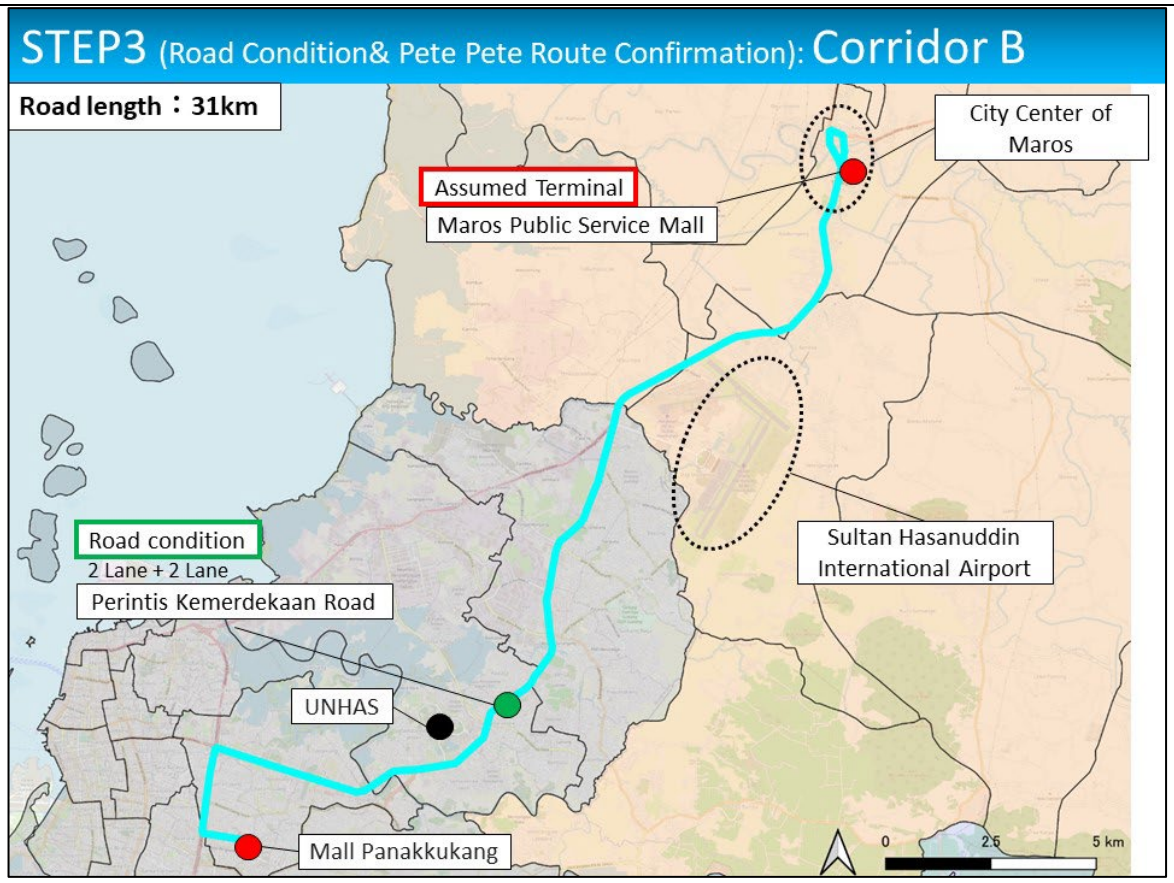
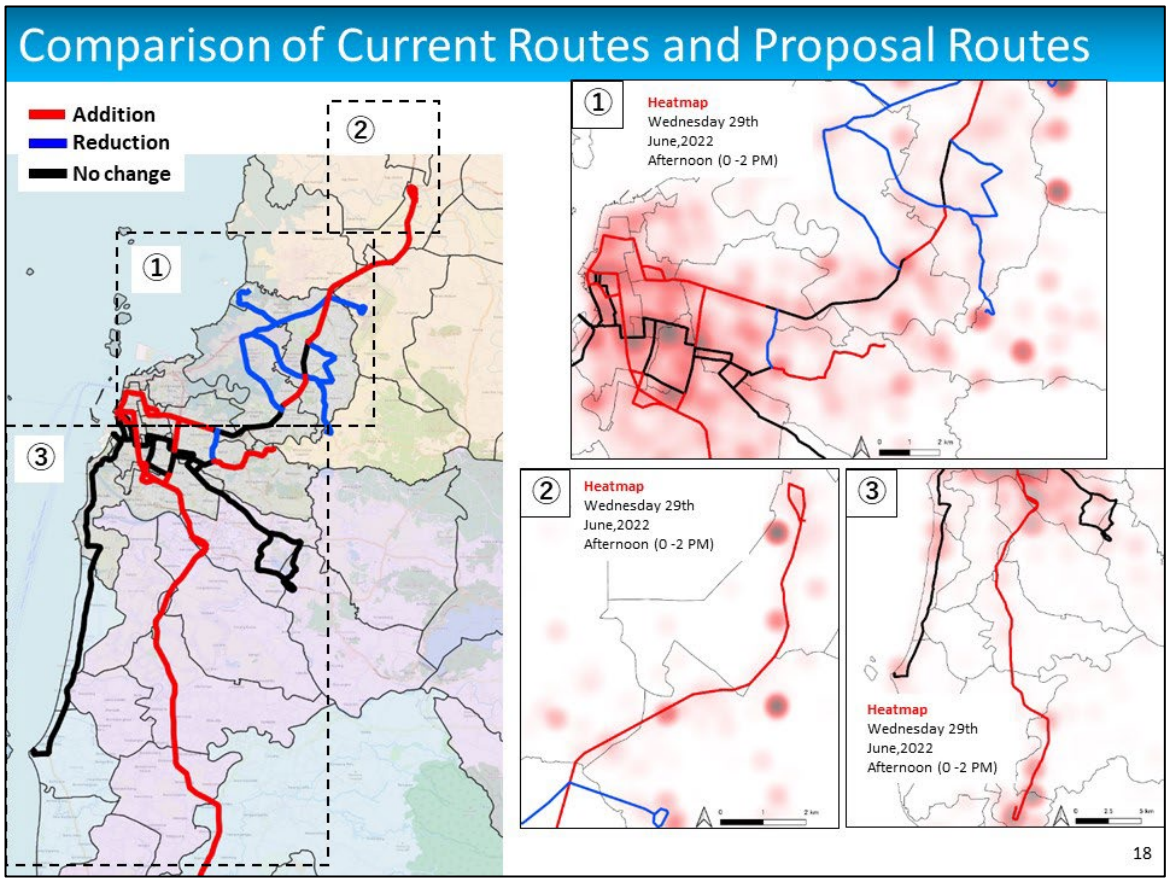
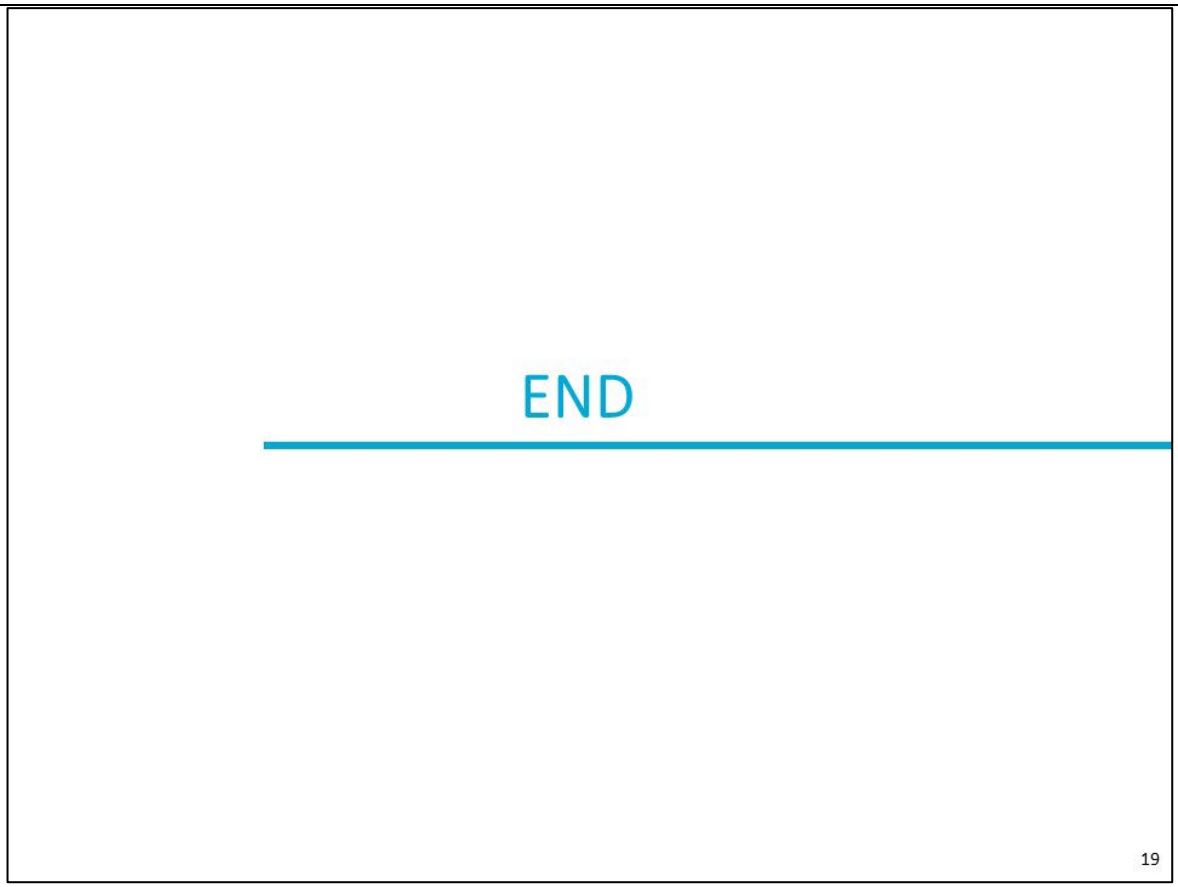
STEP2 (Heatmap Analysis): Corridor B

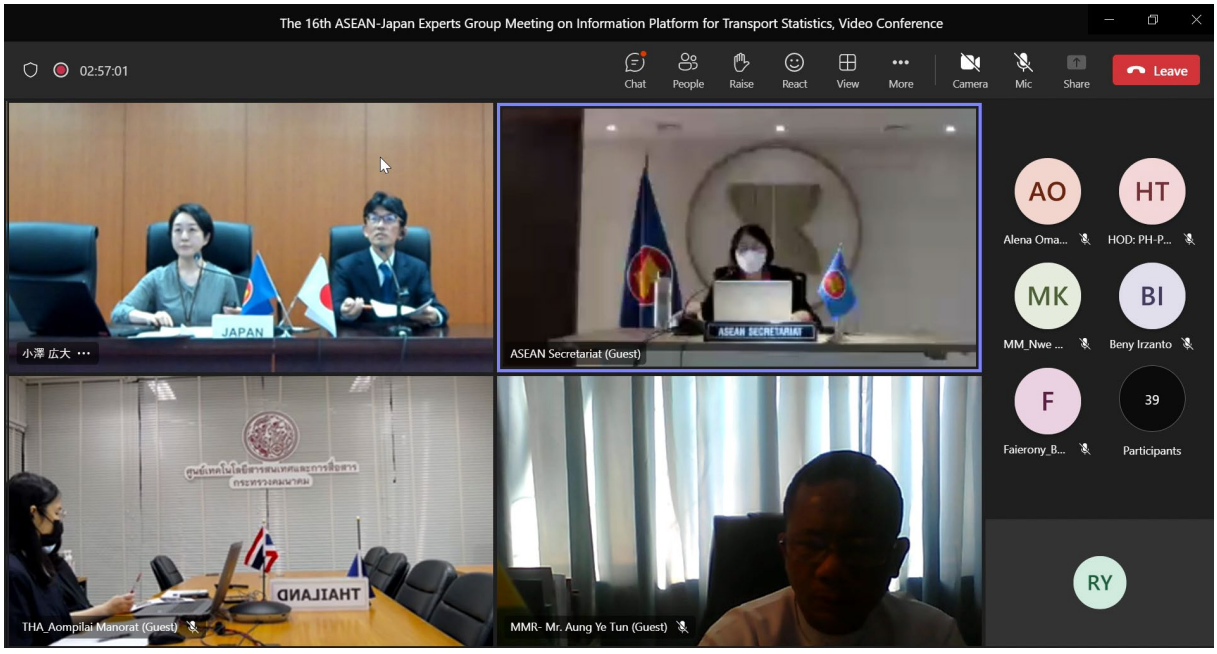


- Change the route not to pass through the airport because of few expected passengers getting on/off at the airport and existed "TRANSARBAGITA"
- Change the route to pass through areas of high demand such as Nippa Mall
- Change the route to pass through Perintis Kemerdekaan Road because of low demand on the North


STEP3 (Road Condition& Pete Pete Route Confirmation): Corridor B
Road length：31km
City Center of Maros
Assumed Terminal
Maros Public Service Mall
Road condition
2 Lane + 2 Lane
Perintis Kemerdekaan Road
Sultan Hasanuddin International Airport
UNHAS
Mall Panakkukang
0
2.5
5 km


Comparison of Current Routes and Proposal Routes
Addition
Reduction
No change
①
②
③
Heatmap
Wednesday 29th
June,2022
Afternoon (0 -2 PM)
Heatmap
Wednesday 29th
June,2022
Afternoon (0 -2 PM)
Heatmap
Wednesday 29th
June,2022
Afternoon (0 -2 PM)
18





Source: Study Team

Figure 7-1 Q&A Session at the ASEAN-Japan Experts Group Meeting (online)

7.3 Future Challenges

7.3.1 Acquiring MBD

In this fiscal year, negotiation with the application vendors failed and the latest MBD could not be received with Agoop SDK, so as an alternative, study team purchased external data and used it for MBD analysis. However, in the case of external data purchase, the details of the original data such as the name of the acquisition application, frequency of acquisition, and acquisition method (background[23]/foreground communication), become a black box. Therefore, it is necessary to check the composition and reliability of the data before use. In addition, bias must be taken into account when considering the results of MBD analysis, since it is possible that the attributes of users (gender, age, etc.) may be biased depending on the original data, not limited to the acquisition of data from the purchase of external data or from the specific application server through the introduction of SDKs.

7.3.2 Personal Data Protection Law

In Indonesia, the PDPL, a uniform law on personal data protection, was enacted on October 17, 2022. This fiscal year, study team obtained the opinion of a lawyer. lawyer said that there is room for interpretation that laws and regulations regarding personal information protection do not apply when only location information is acquired and transferred overseas. However, since specific sub-regulations will be drafted in the future, ongoing monitoring of the progress of the Law will be necessary.

[23] Background communication is communication that is running to acquire and update information, etc., even when the application is not being operated on the screen.