Chapter 4. Planning of Infrastructure

4.1 Demand Forecast

4.1.1 Objectives

For the planning and design of intermodal facilities in accordance with urban development at Dukuh Atas, future traffic demand is required. For this, the traffic demand forecast is executed in 2 steps

1. Future traffic demand for the Dukuh Atas Project calculated by the traffic assignment model prepared by the "JABODETABEK Urban Transportation Policy Integration : JUTPI (2012, JICA)".
The traffic assignment model includes future road/transit network and traffic demand in Jabodetabek area, considering its large impact of ridership and transit volume in Dukuh Atas from MRT and railway plans. The demand esitamated in these forecasts are including the weekdays peak time passenger volume of stations and bus stops in the Dukuh Atas area

2. Demand forecast from the maximum station area development of Dukuh Atas, and adding it onto the 1. Future traffic demand for the Dukuh Atas Area.
This includes the ridership increase of the transport modes of Dukuh Atas from the effect from the station area development of new office and commercial buildings in the area., to be added to the 1. Future traffic demand for the Dukuh Atas Project. The volume of office and commercial development differs in the floor volume setting under the spatial development, and for this reason is to be calculated at later chapter of the study.

4.1.2 Methodology and Precondition

Future traffic demand for the Dukuh Atas Project is calculated by the traffic assignment model prepared by the "JABODETABEK Urban Transportation Policy Integration : JUTPI (2012, JICA)". The traffic assignment model includes future road/transit network and traffic demand in Jabodetabek.
Table 4.1.1 shows the preconditions of traffic demand forecast in relevant studies, namely, Engineering Consulting Services for Jakarta Mass Rapid Transit System Project (Jan 2011, JMEC, DGR) and JUTPI.

Table-4.1.1 Summary of Precondition of Traffic Demand Forecast

	Engineering Consulting Services for Jakarta Mass Rapid Transit System Project (Jan 2011, JMEC, DGR)	JABODETABEK Urban Transportation Policy Integration :JUTPI (2012 JICA)	Jakarta Integrated Urban Transport Hub Development
Traffic Demand	- Based on future traffic demand forecasted by SITRAMP-2 (2002, JICA). - Total traffic demand in Jabodetabek is about 40 million person trip/day in 2020.	- Based on the results of the mini-person trip survey conducted by JUTPI in 2011, SITRAMP-2 traffic demand data is adjusted. - Total traffic demand in Jabodetabek is about 73 million person trip/day in 2020.	
Railway	- Tangerang - Duri, - Rangkas Bitung - Tanah Abang, - Sukabumi - Jakarta Kota, - Bandung - Manggarai, - Tg, Priok - Kota, - Jatinegara - jatinegara (Loop)	- Operation proposed by the "Preparatory Survey for JABODETABEK Railways Capacity Enhancement Project (2012, JICA)". (See Figure 4.1.1)	
MRT North -	- Lebak Bulus - Bunderan HI (2017)		

<table>
<tr><td>South Corridor</td><td colspan="3">- Bunderan HI - Kp. Bandan (2020)</td></tr>
<tr><td>MRT East - West Corridor</td><td>- Perumnas - Pulogebang (2024)</td><td colspan="2">- Phase 1 : Kembangan - Ujun Menteng (2020)
- Phase 2: Balaraja - Kembangan, Ujun Menteng - Chikarang (2027)</td></tr>
<tr><td rowspan="2">TransJakarta (BRT)</td><td rowspan="2">- Existing and planned 15 Corridors except Corridor 1 (Blok M - Kota) overlapping with MRT-N-S.</td><td colspan="2">Proposed Corridors by the "Project for the Study on JABODETABEK Public Transportation Policy Implementation Strategy ("JAPTraPIS", 2012, JICA)" except Corridor 1. (See Figure 4.1.2)</td></tr>
<tr><td></td><td>BRT section overlapping with MRT N-S is removed.</td></tr>
<tr><td>Monorail</td><td>Green Line (2020)</td><td>Green Line Extension to Ragnan (2020)</td><td>Green Line (Bus Way) Extension to Ragnan (2020).</td></tr>
<tr><td>Road Network</td><td colspan="3">Major existing development plan are involved in highway network for demand forecast model. (See Figure 4.1.3)</td></tr>
</table>

Source: JICA Study Team

4.1.3 Network for Demand Forecast

(1) Railway Network

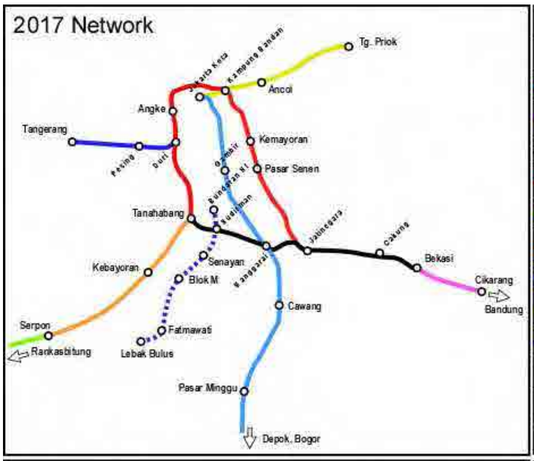
Railway network for the demand forecast includes heavy railway, MRT and elevated bus-way through suspended Monorail Green line. Network and operation of heavy rail is based on the "Preparatory Survey for JABODETABEK Railways Capacity Enhancement Project (2011, JICA)" and JUTPI. Route and operation of MRT South-North Line and East-West Line are based on the route and operation plan by MRTJ and "Preparatory Survey for Jakarta Mass Rapid Transit East-West Line Project (2012, JICA)". Figure 4.1.1.shows the future operation for demand forecast in this study.

DKI Jakarta has the plan to reuse existing properties of suspended Monorail Green line as an elevated bus way, and JUTPI proposed extension of Green Line to Rangan. In this study, Green line is included in the transit network as a bus way and which extent to Ragnan on the view of expected passenger volume.

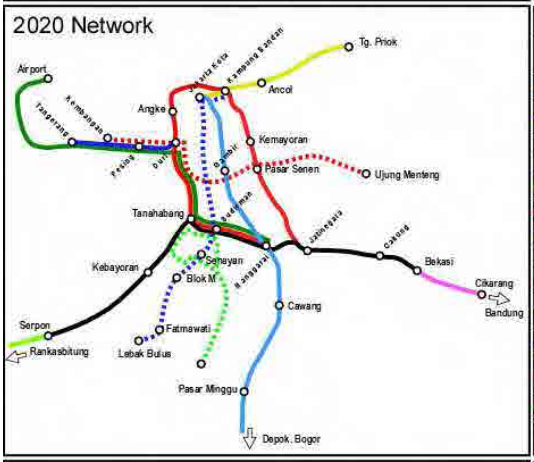
Table-4.1.2 Future Demand Forecast of Green Line (Bus Way)

		2020	2030
(a) Daily Boarding (1,000 passenger / day)	Circular	82.7	107.0
	Extension	208.3	283.2
(b) Passenger * km (1,000 passenger*km)	Circular	165.1	225.5
	Extension	733.4	1,123.1
(c) Route Length (km)	Circular	14.3	14.3
	Extension	21.9	21.9
(d) = (b)/(c) Ave. Passenger per km (1,000 passenger / km)	Circular	11.5	15.8
	Extension	33.4	51.2
(e) = (b)/(a) Ave. Trip Length (km)	Circular	2.0	2.1
	Extension	3.5	4.0

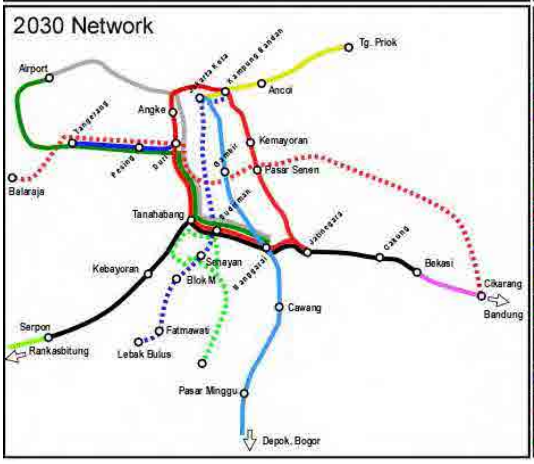
Source: JICA Study Team



	Line	Section	Headway (min)
-	Central / Bogor	Bogor - Depok	7.5
		Depok - Kota	5
	Bekasi / East / West	Cikaran- Bekasi	30
		Bekasi - Tanahabang	10
		Tanahabang - Jatinegara	15
	Serpong	Rankasbitung - Serpong	22
		Serpong - Tanahabang	11
	Tangerang	Tangerang - Duri	20
	Tg.Priok	Kota - Tanjungpriuk	15
	MRT South-North Corridor	Lebak Bulus - Bundaran HI	5



	Line	Section	Headway (min)
-	Central / Bogor	Bogor - Depok	7.5
		Depok - Kota	5
	Bekasi / West / Serpong	Cikaran- Bekasi	9
		Bekasi - Serpong	6
		Serpong - Rankasbitung	20
	West / East (Loop)	Jatinegara - Jatinegara	15
	Tangerang	Tangerang - Duri	10
	Tg.Priok	Kota - Tanjungpriuk	15
	Airport Service (Tangerang)	Airport - Manggarai	15
	MRT South-North Corridor	Lebak Bulus - Kp. Bandan	5
	MRT East-West Corridor	Ujung Menteng - Kembangan	5
	Elevated Bus Way	Tendean - Ragunan	5



	Line	Section	Headway (min)
-	Central / Bogor	Bogor - Depok	4.5
		Depok - Kota	3
	Bekasi / West / Serpong	Cikaran- Bekasi	4.5
		Bekasi - Serpong	3
		Serpong - Rankasbitung	20
	West / East (Loop)	Jatinegara - Jatinegara	6
	Tangerang	Tangerang - Duri	3
	Tg.Priok	Kota - Tanjungpriuk	6
	Airport Service (Tangerang)	Airport - Manggarai	15
	Airport Service (Harbor)	Airport - Manggarai	30
	MRT South-North Corridor	Lebak Bulus - Kp. Bandan	5
	MRT East-West Corridor	Chikarang - Balaraja	5
	Elevated Bus Way	Tendean - Ragunan	5

Source: JICA Study Team

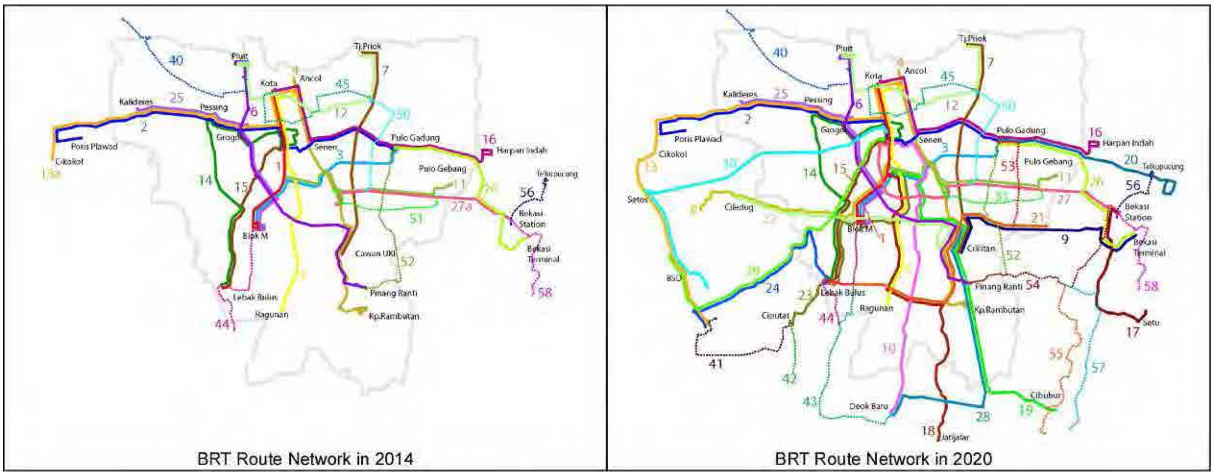
Note: Headway is in peak headway per direction

Figure-4.1.1 Railway Network and Operation Plan for the Demand Forecast

(2) BRT Network

Since January 2004, Bus Rapid Transit System (BRT) in Jakarta named "TransJakarta" has started service at corridor 1 (Jln. Sudirman) and it is extended to 11 corridors (total length 184 km) as of 2012. In near future, another four corridors will be opened.

"Project for the Study on JABODETABEK Public Transportation Policy Implementation Strategy : JAPTraPIS (2012, JICA)" has conducted to formulate an implementation strategy for priority road-based public transport projects for JABODETABEK up to year 2014 based on the review of existing master plan and current situation. In this study, future BRT network in 2014 and 2020 are proposed and future ridership is forecasted by modified traffic demand forecast model originated in SITRAMP 2.



Source: JAPTraPIS

Figure-4.1.2 Proposed Future BRT Network

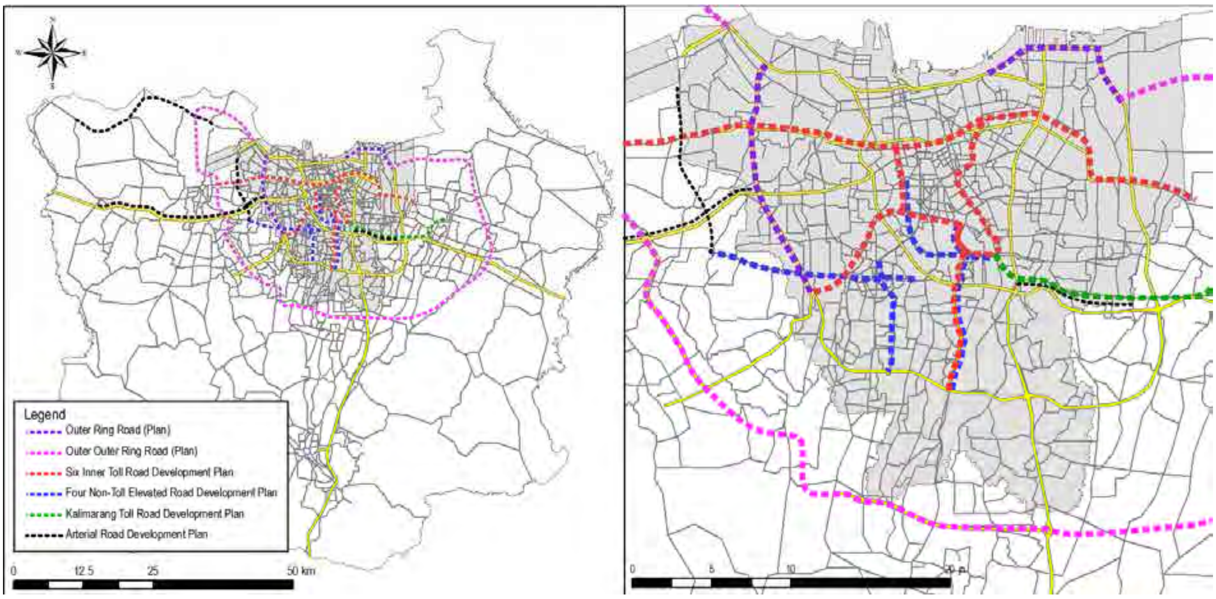
Future BRT network for the demand forecast at Dukuh Atas area is defined based on the proposed BRT route by JAPTraPIS and with following modifications;

- BRT network in 2017 includes proposed BRT routes in 2014 except between Blok M and Bundaran HI where is an overlapping section with MRT North-South Phase 1.
- BRT network after 2020 includes proposed BRT route in 2020 except between Blok M and Kota along BRT North-South Corridor (Lebak Bulus - Kp. Bandan).

(3) Road Network

Traffic volume of private vehicle and trucks effect on the service level of ordinary buses such as travel speed. For the calculation of future vehicular traffic volume by the traffic assignment model, future road network prepared by JUTPI is adopted. Future road network, as shown in Figure 4.1.3, includes following development and improvement plans.

- Outer Ring Road,
- Outer Outer Ring Road,
- Six Inner Toll Road,
- Four Non-Toll Elevated Road,
- Arterial Road Development Parallel to Jakarta - Merak Toll Road,
- Kali Malang Toll Road (Bekasi - Kampung Melayu), and
- Kali Malang Arterial Road Development.



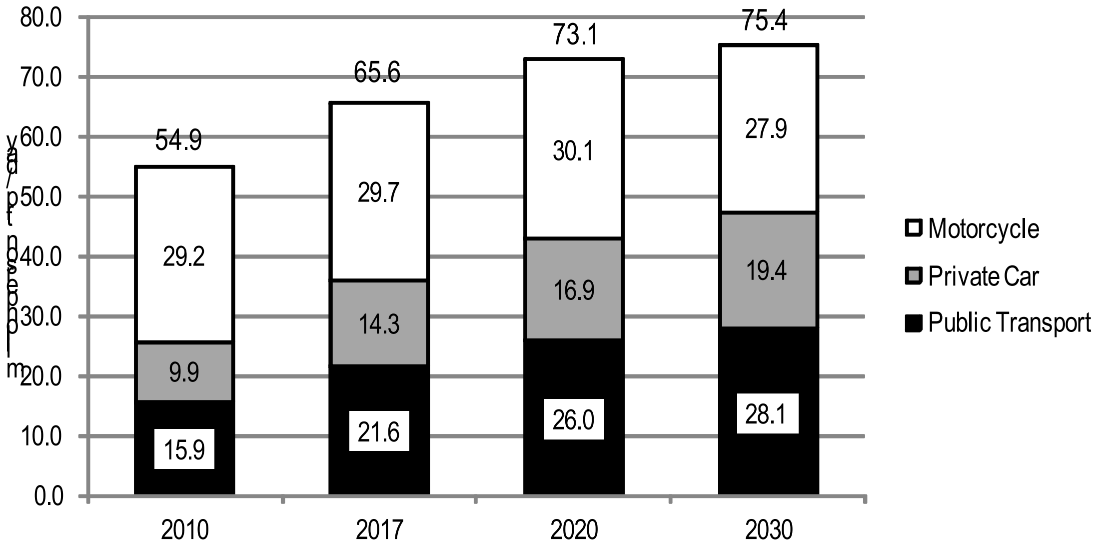
Source: JICA Study Team

Figure-4.1.3 Road Network for Demand Forecast

4.1.4 Future Traffic Demand for Assignment

Future traffic demand prepared by JUTPI is in OD matrices comprises 632 traffic analysis zones including external zones of JABODETABEK. The OD matrices consist of public transport passenger, motorcycle, private car and trucks.

Future traffic demand for Dukuh Atas in 2017 is calculated by average growth rate between 2010 and 2020 as shown in following Figure.

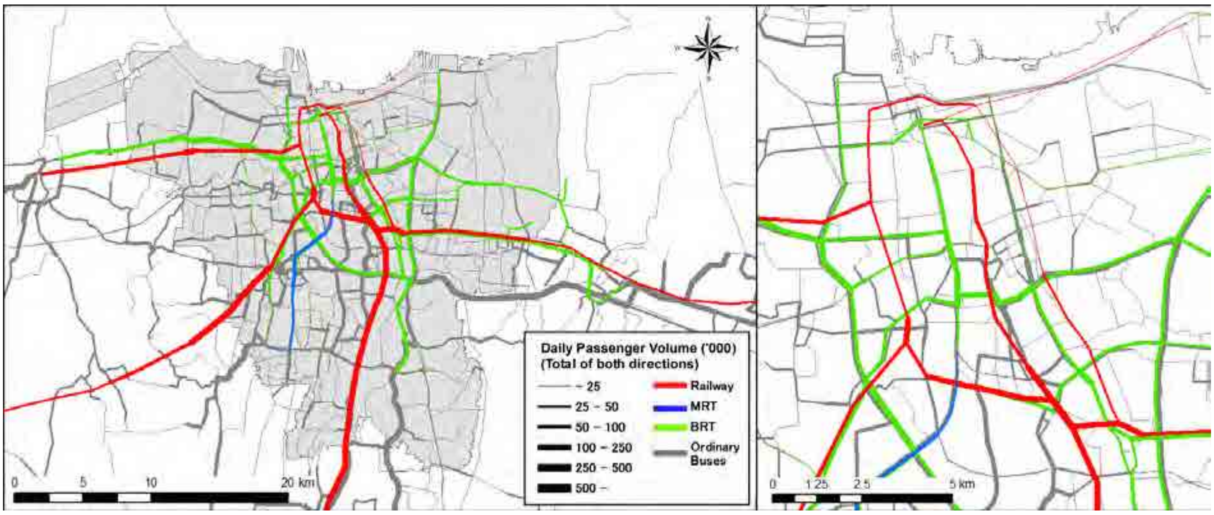


Source: Future traffic demand forecasted by JUTPI (as of April 2012)

Figure-4.1.4 Future Traffic Demand in JABODETABEK

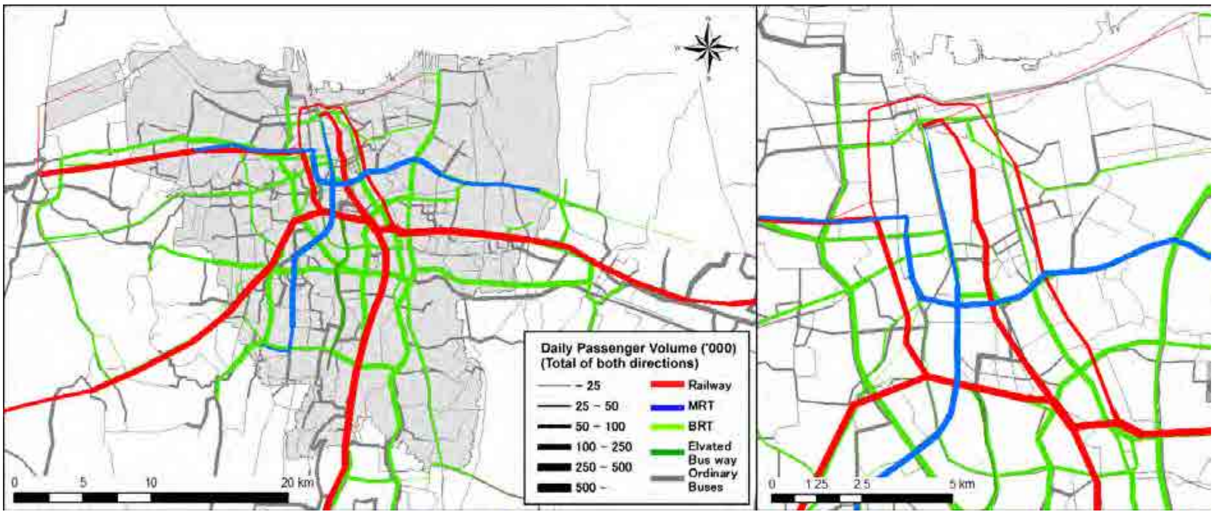
4.1.5 Forecasted Future Public Transport Demand

Future traffic volume is calculated by traffic assignment model using traffic demand in OD matrix and road/transit network. Figure 4.1.5 to 4.1.7 show the results of traffic assignment of public transport by mode.



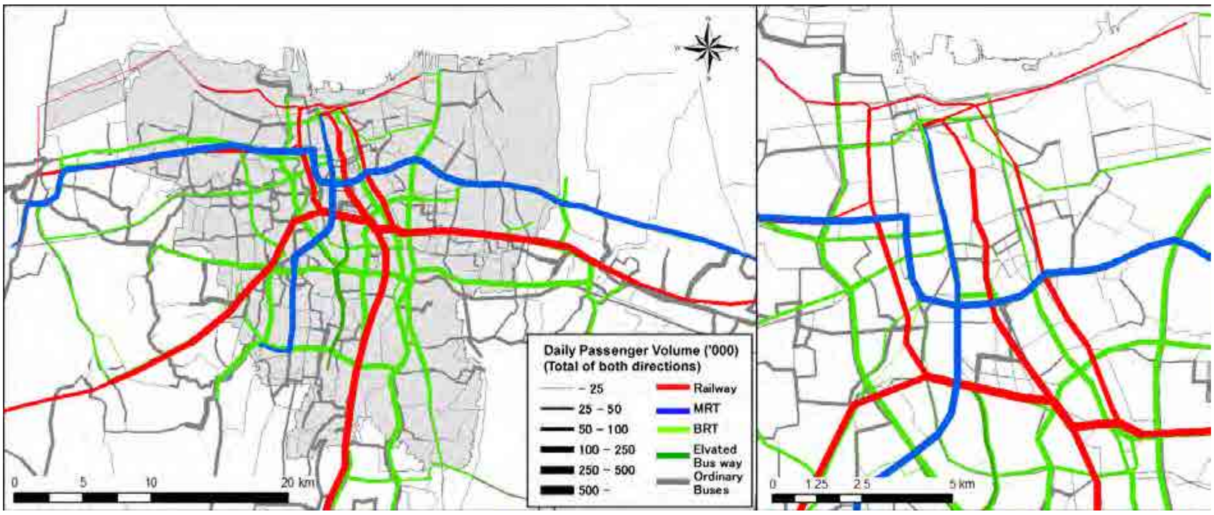
Source: JICA Study Team

Figure- 4.1.5 Public Transport Passenger Volume in 2017



Source: JICA Study Team

Figure-4.1.6 Public Transport Passenger Volume in 2020



Source: JICA Study Team

Figure- 4.1.7 Public Transport Passenger Volume in 2030

To contribute for the planning of intermodal facilities at Dukuh Atas, detailed passenger flow is calculated by a ramp analysis at Dukuh Atas. Table 4.1.3 to 4.1.5 show the summary of passenger volume at Dukuh Atas.

Passenger demands in peak hour is calculated by daily passenger demand and peak ratio relevant to Dukuh Atas and surrounding zones. The peak ratio is defined by origin-destination pair based on the database of person trip survey in SITRAMP 2.

Table-4.1.3 Passenger Demand Flow at Dukuh Atas in 2017

unit:1000 person trips

Alighting from	Transfer or Boarding to	Daily	AM Peak	PM Peak	Boarding to	Transfer or Alighting from	Daily	AM Peak	PM Peak
Railway Bekasi - Tanah Abang	MRT	4.8	0.5	0.2	Railway Bekasi - Tanah Abang	MRT	5.4	0.4	0.4
	BRT	2.7	0.3	0.1		BRT	2.2	0.2	0.2
	Bus, Walk & Others	23.4	5.3	0.4		Bus, Walk & Others	15.5	0.3	2.8
		30.9	6.1	0.7			23.1	0.9	3.4
MRT	Railway	5.4	0.4	0.4	MRT	Railway	4.8	0.5	0.2
	BRT	6.4	0.5	0.5		BRT	9.0	0.8	0.6
	Bus, Walk & Others	1.3	0.3	0.0		Bus, Walk & Others	1.2	0.0	0.2
		13.1	1.2	0.9			15.0	1.3	1.0
BRT	Railway	2.2	0.2	0.2	BRT	Railway	2.7	0.3	0.1
	MRT	9.0	0.8	0.6		MRT	6.4	0.5	0.5
	Bus, Walk & Others	1.3	0.3	0.0		Bus, Walk & Others	7.8	0.2	1.2
		12.5	1.3	0.8			16.9	1.0	1.8
Bus, Walk and Others	Railway	15.5	0.3	2.8	Bus, Walk and Others	Railway	23.4	5.3	0.4
	MRT	1.2	0.0	0.2		MRT	1.3	0.3	0.0
	BRT	7.8	0.2	1.2		BRT	1.3	0.3	0.0
		24.5	0.5	4.2			26.0	5.9	0.4

Source: JICA Study Team

Table-4.1.4 Passenger Demand Flow at Dukuh Atas in 2020

unit:1000 person trips

Alighting from	Transfer or Boarding to	Daily	AM Peak	PM Peak	Boarding to	Transfer or Alighting from	Daily	AM Peak	PM Peak
Railway Bekasi - Serpong	Loop Line	0.0	0.0	0.0	Railway Bekasi - Serpong	Loop Line	0.0	0.0	0.0
	Airport (Tangerang)	0.2	0.0	0.1		Airport (Tangerang)	0.0	0.0	0.0
	MRT	26.8	4.9	1.1		MRT	27.6	1.2	4.5
	BRT	2.8	0.4	0.1		BRT	4.0	0.2	0.5
	Green Line	7.1	1.6	0.2		Green Line	4.5	0.1	0.8
	Bus, Walk & Others	38.6	8.7	1.0		Bus, Walk & Others	37.1	1.1	7.3
		75.5	15.6	2.5			73.2	2.6	13.1
Railway Loop Line	Bekasi-Serpong	0.0	0.0	0.0	Railway Loop Line	Bekasi-Serpong	0.0	0.0	0.0
	Airport (Tangerang)	0.0	0.0	0.0		Airport (Tangerang)	0.0	0.0	0.0
	MRT	0.0	0.0	0.0		MRT	0.0	0.0	0.0
	BRT	0.1	0.0	0.0		BRT	0.2	0.0	0.0
	Green Line	0.6	0.1	0.1		Green Line	0.6	0.1	0.1
	Bus, Walk & Others	1.9	0.3	0.1		Bus, Walk & Others	1.5	0.1	0.2
		2.6	0.4	0.2			2.3	0.2	0.3
Airport Service (Tangerang)	Bekasi-Serpong	0.0	0.0	0.0	Airport Service (Tangerang)	Bekasi-Serpong	0.2	0.0	0.1
	Loop Line	0.0	0.0	0.0		Loop Line	0.0	0.0	0.0
	MRT	1.7	0.4	0.0		MRT	0.8	0.0	0.1
	BRT	1.9	0.2	0.1		BRT	2.0	0.1	0.2
	Green Line	2.8	0.6	0.1		Green Line	2.9	0.1	0.5
	Bus, Walk & Others	8.4	2.0	0.2		Bus, Walk & Others	9.3	0.2	1.9
		14.8	3.2	0.4			15.2	0.4	2.8
MRT	Bekasi-Serpong	27.6	1.2	4.5	MRT	Bekasi-Serpong	26.8	4.9	1.1
	Loop Line	0.0	0.0	0.0		Loop Line	0.0	0.0	0.0
	Airport (Tangerang)	0.8	0.0	0.1		Airport (Tangerang)	1.7	0.4	0.0
	BRT	35.9	3.6	3.9		BRT	41.1	5.4	3.1
	Green Line	9.5	1.4	0.6		Green Line	9.3	0.7	1.2
	Bus, Walk & Others	7.2	1.4	0.2		Bus, Walk & Others	11.5	0.6	1.7
		81.0	7.6	9.3			90.4	12.0	7.1
BRT	Bekasi-Serpong	4.0	0.2	0.5	BRT	Bekasi-Serpong	2.8	0.4	0.1
	Loop Line	0.2	0.0	0.0		Loop Line	0.1	0.0	0.0
	Airport (Tangerang)	2.0	0.1	0.2		Airport (Tangerang)	1.9	0.2	0.1
	MRT	41.1	5.4	3.1		MRT	35.9	3.6	3.9
	Green Line	1.4	0.3	0.1		Green Line	1.3	0.1	0.2
	Bus, Walk & Others	10.1	2.1	0.3		Bus, Walk & Others	7.2	0.4	1.2
		58.8	8.1	4.2			49.2	4.7	5.5
Green Line (Elevated Bus Way)	Bekasi-Serpong	4.5	0.1	0.8	Green Line (Elevated Bus Way)	Bekasi-Serpong	7.1	1.6	0.2
	Loop Line	0.6	0.1	0.1		Loop Line	0.6	0.1	0.1
	Airport (Tangerang)	2.9	0.1	0.5		Airport (Tangerang)	2.8	0.6	0.1
	MRT	9.3	0.7	1.2		MRT	9.5	1.4	0.6
	BRT	1.3	0.1	0.2		BRT	1.4	0.3	0.1
	Bus, Walk & Others	6.6	0.9	0.4		Bus, Walk & Others	4.4	0.3	0.5
		25.2	2.0	3.2			25.8	4.3	1.6
Bus, Walk and Others	Bekasi-Serpong	37.1	1.1	7.3	Bus, Walk and Others	Bekasi-Serpong	38.6	8.7	1.0
	Loop Line	1.5	0.1	0.2		Loop Line	1.9	0.3	0.1
	Airport (Tangerang)	9.3	0.2	1.9		Airport (Tangerang)	8.4	2.0	0.2
	MRT	11.5	0.6	1.7		MRT	7.2	1.4	0.2
	BRT	7.2	0.4	1.2		BRT	10.1	2.1	0.3
	Green Line	4.4	0.3	0.5		Green Line	6.6	0.9	0.4
		71.0	2.7	12.8			72.8	15.4	2.2

Source: JICA Study Team

Table- 4.1.5 Passenger Demand Flow at Dukuh Atas in 2030

unit:1000 person trips

Alighting from	Transfer or Boarding to	Daily	AM Peak	PM Peak	Boarding to	Transfer or Alighting from	Daily	AM Peak	PM Peak
Railway Bekasi - Serpong	Loop Line	0.0	0.0	0.0	Railway Bekasi - Serpong	Loop Line	0.0	0.0	0.0
	Airport (Tangerang)	0.3	0.0	0.2		Airport (Tangerang)	0.0	0.0	0.0
	Airport (Harbor)	0.0	0.0	0.0		Airport (Harbor)	0.0	0.0	0.0
	MRT	61.6	10.9	3.4		MRT	66.2	4.7	9.9
	BRT	11.1	1.8	0.7		BRT	9.2	0.5	1.3
	Green Line	16.4	3.7	0.5		Green Line	11.4	0.3	2.2
	Bus, Walk & Others	55.2	12.5	1.6		Bus, Walk & Others	54.3	1.7	10.7
		144.6	28.9	6.4			141.1	7.2	24.1
Railway Loop Line		0.0	0.0	0.0	Railway Loop Line	Bekasi-Serpong	0.0	0.0	0.0
	Airport (Tangerang)	0.0	0.0	0.0		Airport (Tangerang)	0.0	0.0	0.0
	Airport (Harbor)	0.0	0.0	0.0		Airport (Harbor)	0.0	0.0	0.0
	MRT	0.8	0.1	0.0		MRT	0.6	0.0	0.1
	BRT	0.7	0.1	0.1		BRT	0.6	0.1	0.0
	Green Line	1.4	0.2	0.1		Green Line	1.2	0.1	0.1
	Bus, Walk & Others	3.4	0.6	0.2		Bus, Walk & Others	3.0	0.2	0.4
		6.3	1.0	0.4			5.4	0.4	0.6
Railway Airport Service (Tangerang)	Bekasi-Serpong	0.0	0.0	0.0	Railway Airport Service (Tangerang)	Bekasi-Serpong	0.3	0.0	0.2
	Loop Line	0.0	0.0	0.0		Loop Line	0.0	0.0	0.0
	Airport (Harbor)	0.0	0.0	0.0		Airport (Harbor)	0.0	0.0	0.0
	MRT	0.0	0.0	0.0		MRT	0.0	0.0	0.0
	BRT	0.7	0.1	0.0		BRT	1.0	0.1	0.1
	Green Line	1.1	0.2	0.1		Green Line	1.6	0.1	0.3
	Bus, Walk & Others	1.8	0.4	0.1		Bus, Walk & Others	1.6	0.1	0.3
		3.6	0.7	0.2			4.5	0.3	0.9
Railway Airport Service (Harbor)	Bekasi-Serpong	0.0	0.0	0.0	Railway Airport Service (Harbor)	Bekasi-Serpong	0.0	0.0	0.0
	Loop Line	0.0	0.0	0.0		Loop Line	0.0	0.0	0.0
	Airport (Tangerang)	0.0	0.0	0.0		Airport (Tangerang)	0.0	0.0	0.0
	MRT	0.1	0.0	0.0		MRT	0.0	0.0	0.0
	BRT	0.2	0.0	0.0		BRT	0.1	0.0	0.0
	Green Line	0.3	0.0	0.0		Green Line	0.2	0.0	0.0
	Bus, Walk & Others	0.8	0.0	0.1		Bus, Walk & Others	0.4	0.0	0.1
		1.4	0.0	0.1			0.7	0.0	0.1
MRT	Bekasi-Serpong	66.2	4.7	9.9	MRT	Bekasi-Serpong	61.6	10.9	3.4
	Loop Line	0.6	0.0	0.1		Loop Line	0.8	0.1	0.0
	Airport (Tangerang)	0.0	0.0	0.0		Airport (Tangerang)	0.0	0.0	0.0
	Airport (Harbor)	0.0	0.0	0.0		Airport (Harbor)	0.1	0.0	0.0
	BRT	39.7	4.7	3.8		BRT	37.7	4.5	3.3
	Green Line	20.2	3.5	1.1		Green Line	18.2	1.1	2.7
	Bus, Walk & Others	7.6	1.6	0.3		Bus, Walk & Others	15.5	0.7	2.8
		134.3	14.5	15.2			133.9	17.3	12.2
BRT	Bekasi-Serpong	9.2	0.5	1.3	BRT	Bekasi-Serpong	11.1	1.8	0.7
	Loop Line	0.6	0.1	0.0		Loop Line	0.7	0.1	0.1
	Airport (Tangerang)	1.0	0.1	0.1		Airport (Tangerang)	0.7	0.1	0.0
	Airport (Harbor)	0.1	0.0	0.0		Airport (Harbor)	0.2	0.0	0.0
	MRT	37.7	4.5	3.3		MRT	39.7	4.7	3.8
	Green Line	2.0	0.3	0.2		Green Line	1.7	0.2	0.2
	Bus, Walk & Others	9.2	1.9	0.3		Bus, Walk & Others	7.8	0.4	1.3
		59.8	7.4	5.2			61.9	7.3	6.1
Green Line (Elevated Bus Way)	Bekasi-Serpong	11.4	0.3	2.2	Green Line (Elevated Bus Way)	Bekasi-Serpong	16.4	3.7	0.5
	Loop Line	1.2	0.1	0.1		Loop Line	1.4	0.2	0.1
	Airport (Tangerang)	1.6	0.1	0.3		Airport (Tangerang)	1.1	0.2	0.1
	Airport (Harbor)	0.2	0.0	0.0		Airport (Harbor)	0.3	0.0	0.0
	MRT	18.2	1.1	2.7		MRT	20.2	3.5	1.1
	BRT	1.7	0.2	0.2		BRT	2.0	0.3	0.2
	Bus, Walk & Others	5.3	0.8	0.3		Bus, Walk & Others	5.5	0.4	0.7
		39.6	2.6	5.8			46.9	8.3	2.7
Bus, Walk and Others	Bekasi-Serpong	54.3	1.7	10.7	Bus, Walk and Others	Bekasi-Serpong	55.2	12.5	1.6
	Loop Line	3.0	0.2	0.4		Loop Line	3.4	0.6	0.2
	Airport (Tangerang)	1.6	0.1	0.3		Airport (Tangerang)	1.8	0.4	0.1
	Airport (Harbor)	0.4	0.0	0.1		Airport (Harbor)	0.8	0.0	0.1
	MRT	15.5	0.7	2.8		MRT	7.6	1.6	0.3
	BRT	7.8	0.4	1.3		BRT	9.2	1.9	0.3
	Green Line	5.5	0.4	0.7		Green Line	5.3	0.8	0.3
		88.1	3.5	16.3			83.3	17.8	2.9

Source: JICA Study Team

4.1.6 Future Demand for CAT Service at Dukuh Atas

The airport service railway between Soekarno-Hatta International Airport and Manggarai by the extension of Tangerang Line is planned, and new airport service railway along Prof. Sediyatmo Toll Road is considered. Airport service railway will stop at Dukuh Atas, therefore, City Air Terminal (CAT) function is expected to add Dukuh Atas station of airport service.

In this study, additionally, expected passenger demand of airport service railway at Dukuh Atas is calculated to consider the necessity and required scale of CAT.

Future transport demand relevant to Soekarno-Hatta International Airport is forecasted by the Airport Master Plan conducted by JICA as shown in Table 4.1.6. The person trip demand is calculated by two cases, namely, with airport express railway case an without case.

Table-4.1.6 Future Traffic Demand relevant to Airport

unit: 1,000 passenger trip / day

		2010	2015	2020	2025	2030
by Public Transport	with railway case	63	89	112	112	112
	without railway case	41	58	73	73	73
by Car & Taxi	with railway case	78	106	134	134	134
	without railway case	98	133	168	168	168
by Motorcycle	with railway case	10	20	24	24	24
	without railway case	12	24	30	30	30

Source: "Master Plan Study on Multiple-Airport Development for Greater Jakarta Metropolitan Area in the Republic of Indonesia (JICA)"

Future traffic demand relevant to airport is calculated by traffic assignment model using airport passenger OD matrices. The airport passenger OD matrices for the traffic assignment are calculated based on the forecasted future demand with airport express railway and trip distribution by the interview survey at airport conducted by Airport Master Plan.

Table 4.1.7 shows forecasted future boarding / alighting passenger of airport services (total of Tangerang route and Harbor route) at Dukuh Atas from/to the Soekarno-Hatta International Airport. A peak ratio 8.2% is calculated by observed number of airplane and estimated on-board passenger by departure time surveyed by Airport Master Plan.

Table -4.1.7 Forecasted Airport Service Railway Passenger at Dukuh Atas

	Year	Boarding	Alighting
Daily Passenger (1,000 person trip / day)	2020	3.81	4.11
	2030	5.88	6.27
Peak Hour (1,000 person trip / hour)	2020	0.15	0.15
	2030	0.21	0.21

Source: JICA Study Team

From the outputs above, passenger and CAT(City Air Terminal) user volume can be well handled inside the current station design, so there is no need for an additional CAT(City Air Terminal) facility.

4.2 Planning Policy of Infrastructure

4.2.1 Planning Conditions

1) Geographical Issues

The Dukuh Atas area is located in the center of Jakarta. This area was left out of development, which proceeded along Thamrin/Sudirman Street (which is the focus of intensive use) because of its location in an area crisscrossed by rivers and railways and the presence of congested residential areas with complex land use rights. On the other hand, even in its current state, it is an important transit node with roads and railways and the like connecting in all directions. Moreover, its importance is expected to increase with the start of MRT service in a few years and the future construction of the Airport Express Line, Serpong-Bekasi Line, and Elevated BRT, which are expected to increase the development potential of Dukuh Atas as a Transit Oriented Development (TOD) area.

But currently Dukuh Atas area is separated in 4 areas by the canal and the railway running east-west and the Thamrin/Sudirman Boulevard running north-south and the bridge crossing the canal causing elevation differences, and also casing the bottle-neck structure to the whole area. Also the area in the north consists of low volume high density housings with expected complex landownership, leading to an another issue for the development in Dukuh Atas, hard to happen.

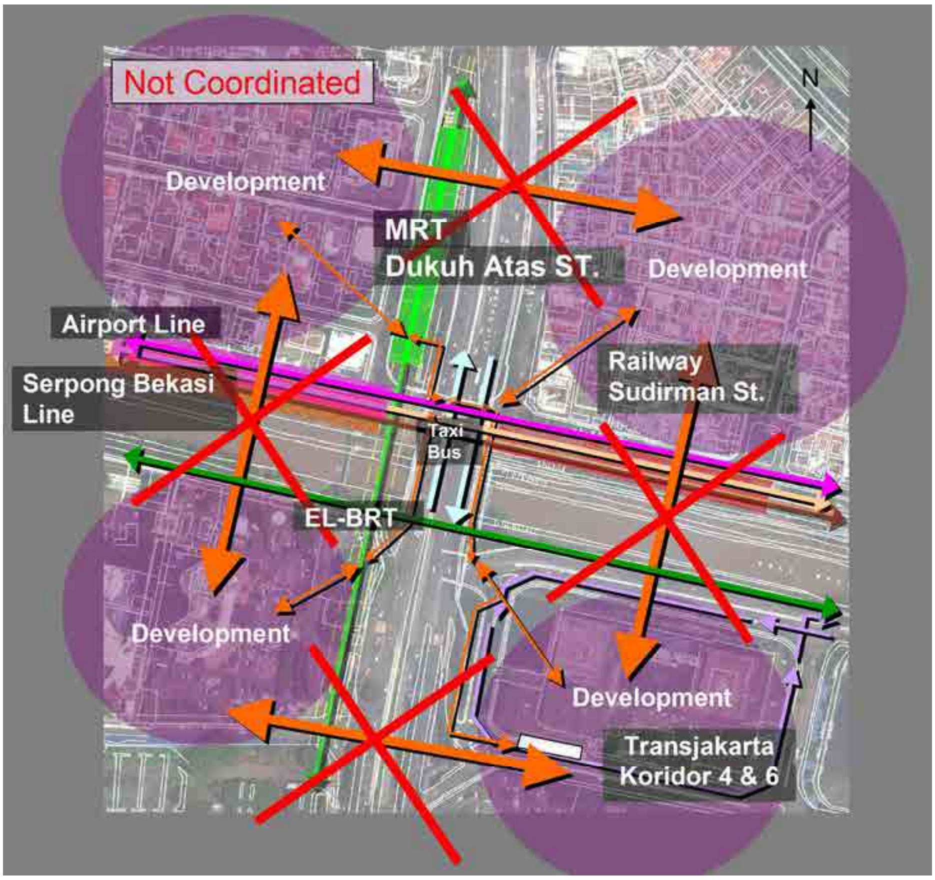


Fig-4.2.1 Divided 4 areas and the bottle-neck structure （Source：Study Team）

2) Transportation Facility Issues

As the condition from the ridership estimation for the 4-1. paragraph, in 2017 after completion of MRT North-South line in Phase1, the BRT Koridor1 running along the same line would be discontinued, an MRT North-South line will take over completely for this route section.

The current crucial issue that is not considered in the current plan for MRT is the maintaining the important connection between MRT Dukuh Atas station and BRT koridor 4&6, as this would be the new equivalent for the current important connection between BRT koridor 1 and BRT koridor 4&6. In the current situation, the transit passengers of BRT koridor1 and BRT koridor 4&6 are using the 260m connection passage inside the ticket gate, and this passage allows the passengers to transit safely without any interference with road vehicles. For the MRT North-South line does not provide any of this connection at the stage of the station opening, and the transit passengers would have to walk through the tunnel running under Thamrin, then walk across the Sudirman bridge, a route of 430m that is unable to achieve the safe space for pedestrians, leading to the decrease of service level from the current situation.

Also, the current BRT Koridor 4&6 Dukuh Atas station does not provide enough passenger space, as in case of peak rush hour time with delay of operation occurring, the connection passage between BRT Koridor1 and BRT Koridor 4&6 is congested with passengers. As the MRT North-South Line, which brings more passenger volume at a time than the BRT Koridor 1, BRT Koridor 4&6 station in Dukuh Atas should have the capacity and space to hold the future volume.

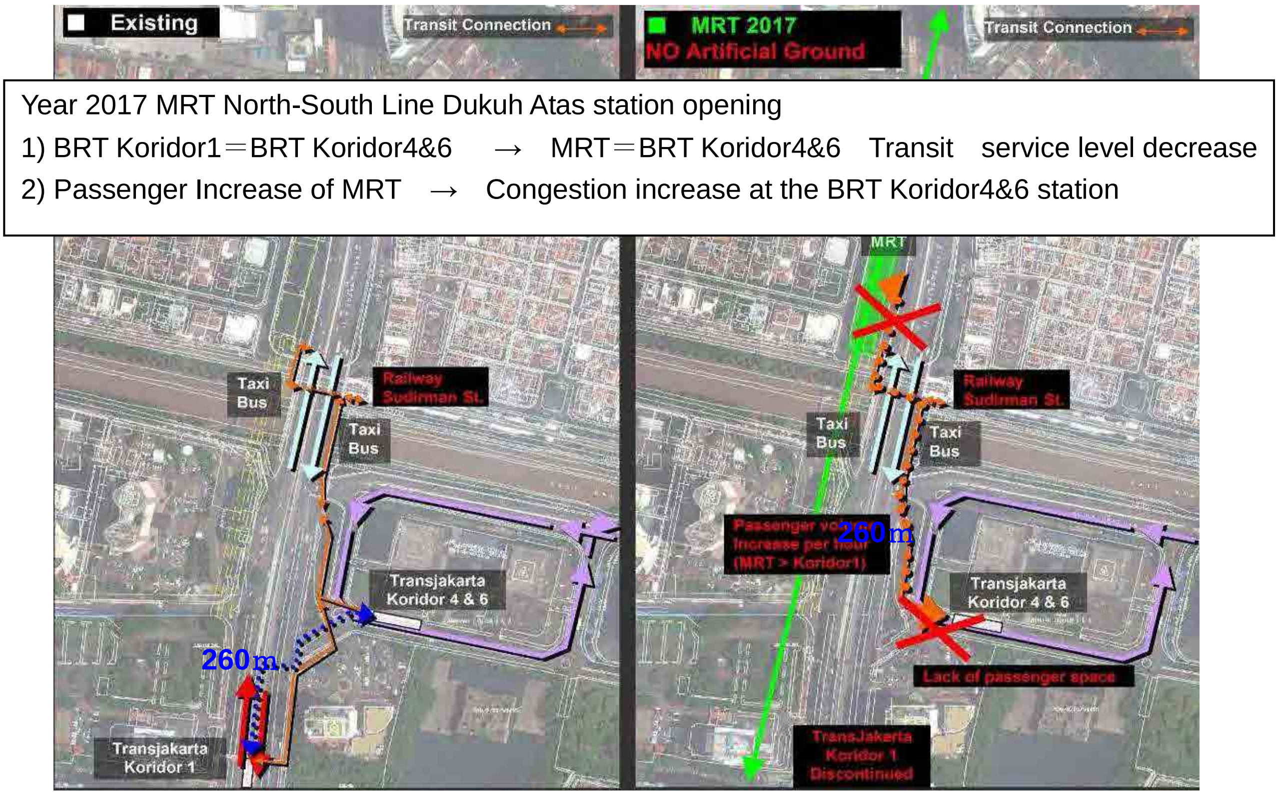


Figure-4.2.2 Current・Future Transit of passengers (Source：Study Team)

Figure-4.2.3 Transit passage of Dukuh Atas in peak time delay (Source：infopublik.kominfo.go.id)

In the future, expected to be in 2020, The Airport Express Line, Serpong Bekasi Line, Elevated BRT facilities are planned in the area.

But if these facilities are constructed in a scattered manner, without any coordination at all, there will be no integrated transit passage or any safe smooth access from different areas of Dukuh Atas.

From the 4.1 Demand Forecast of 2020, Dukuh Atas is expected to have a dramatic growth in ridership, and from this prediction, the transit network and the flow-line of passengers cannot be handled by the current bottle-neck, separated area structures. Also the issue to be considered is that the current Dukuh Atas lacks space to handle feeder traffic that is also expected to grow dramatically at this point.

2020 Issues for new transport facilities being built in the area

1)Airport-Line、Serpong Beksi Line、Elevated BRT→ Layered transit flow line
→ Access difficulty from 4 separated areas
→ Space needed for growing feeder traffic

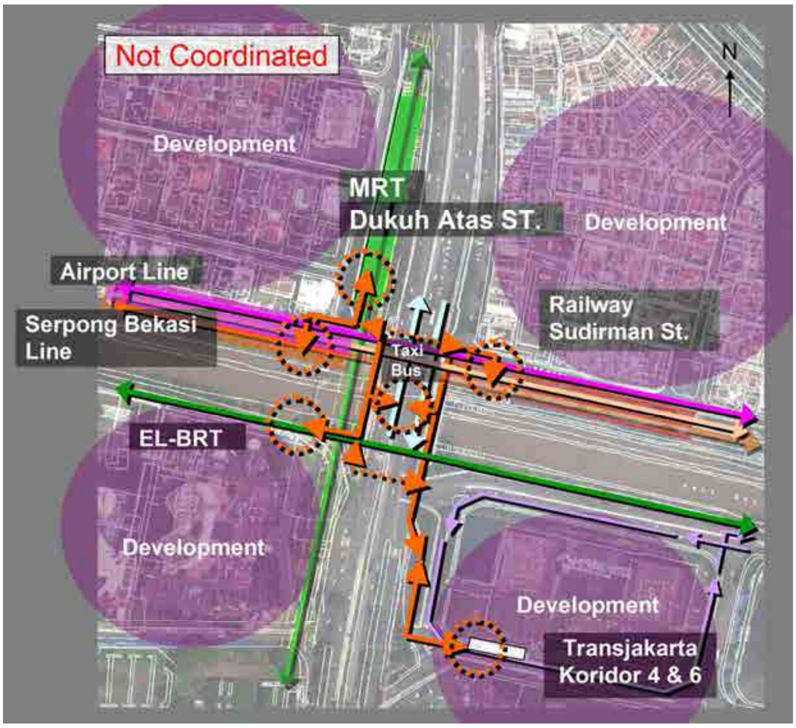


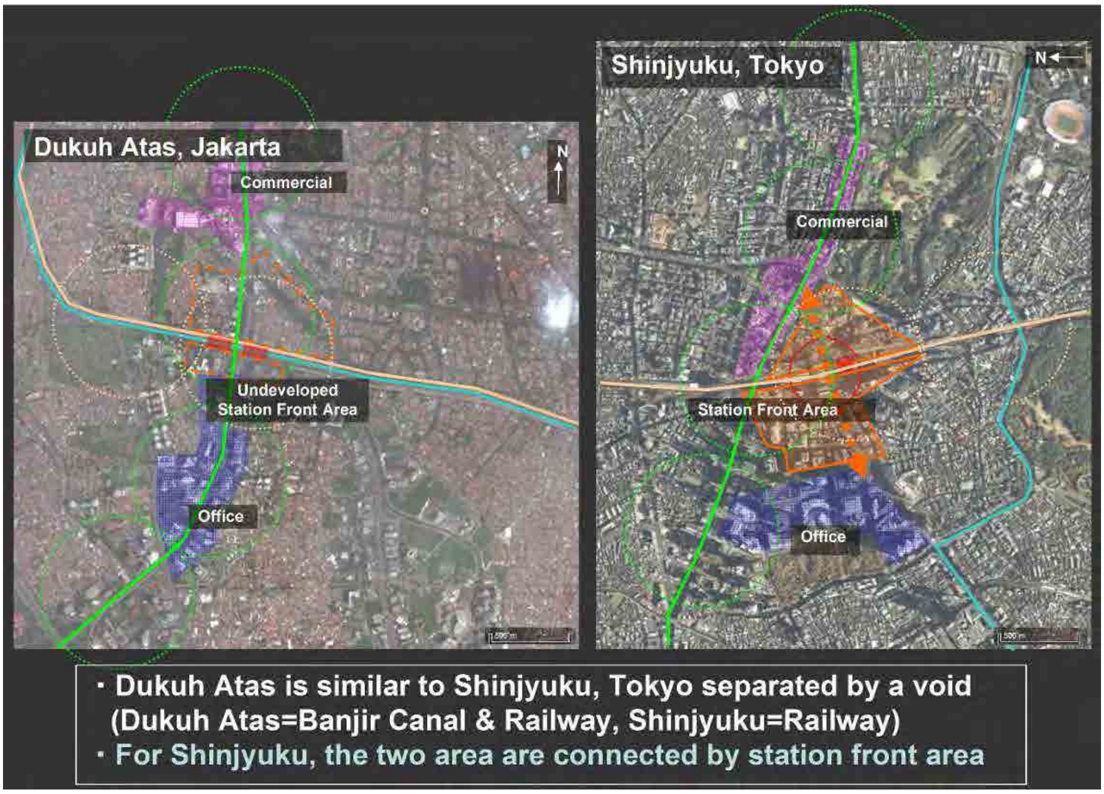
Figure-4.2.4 Future transit line without planning (Source：Study Team)

4.2.2 Solution to the issue

1） Urban Transport Hub Example Case

A study of the urban structure of the Dukuh Atas area as a transit node reveals it to be very similar to the Shinjuku area in Tokyo, one of the major transit nodes in Japan. The convergence of multiple transit networks divides the area around the station into multiple districts. In Shinjuku, there is a commercial area on the east side and business and government administrative areas on the west side. Both areas are divided by railways, but at the same time the station-front area connects both areas.

At Shinjuku Station, the station-front area is integrated by underground passageways, underground shopping malls, aboveground walkways, artificial ground, atriums, sunken gardens, human scale city blocks and other urban devices, which also connect the areas cut off by the station. The result is planning that encourages strolling throughout the area.



Source: Study Team

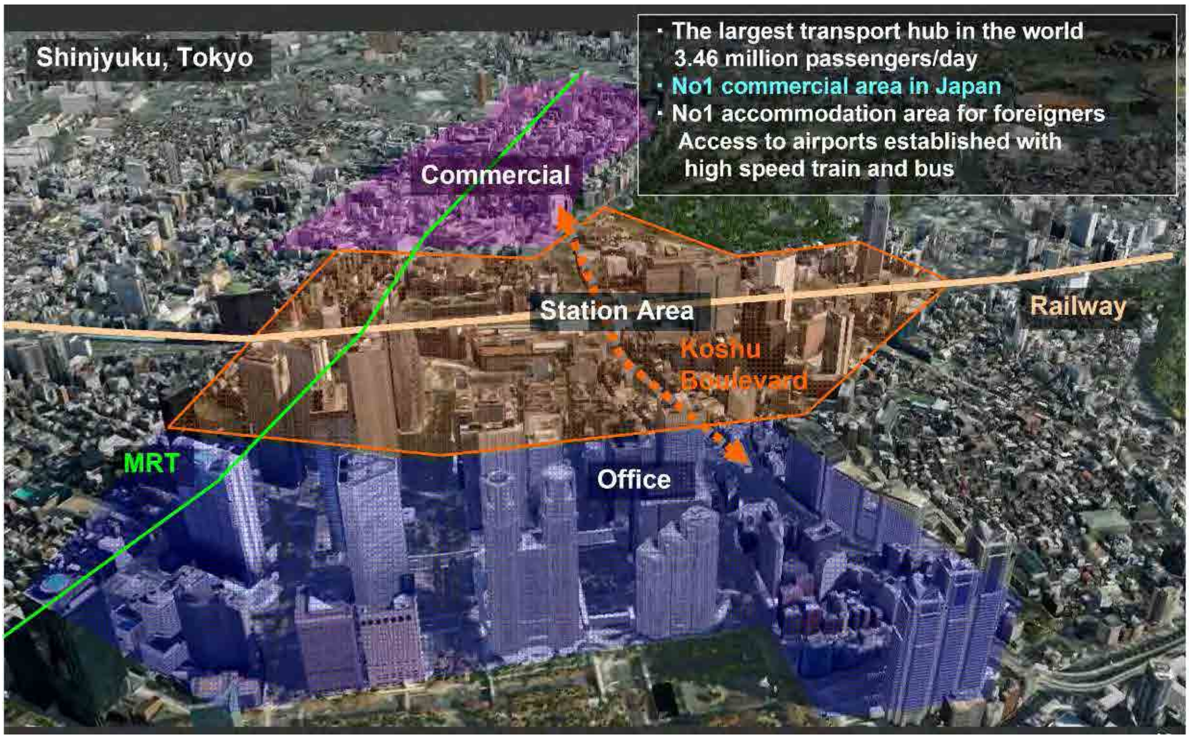
Figure-4.2.5 Planning Conditions

The underground area centering on Shinjuku Station connects the east and west areas by means of underground passageways and underground shopping malls that utilize the area above the Tokyo Metro Marunouchi Line. This area also provides underground access to surrounding areas.

In addition, a network above ground level created by the construction of aboveground walkways and a raised artificial ground above the railways at Shinjuku Takashimaya Department Store and the Southern Terrace commercial zone connects above the ground level those areas cut off by the station. Construction of a bus and taxi terminal is also underway by means of the Shinjuku Station South Entrance Infrastructure Improvement Project.

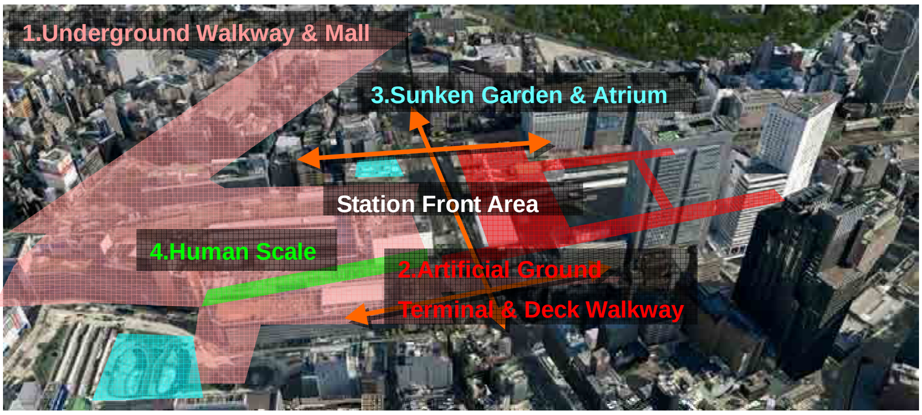
Moreover, in order to eliminate the separation of the area at multiple levels (below ground, at ground level and above-ground), the planning also secures visual linkages of underground and above-ground areas through a sunken garden at the station-front rotary at the Shinjuku Station West Entrance, a stairway pavilion at the Shinjuku Station South Entrance and so on.

In addition, while both underground and above-ground planning is centered on large spaces, a human scale space called “Mosaic Hill” has also been constructed between high-volume city blocks the to provide a comfortable environment for pedestrians.



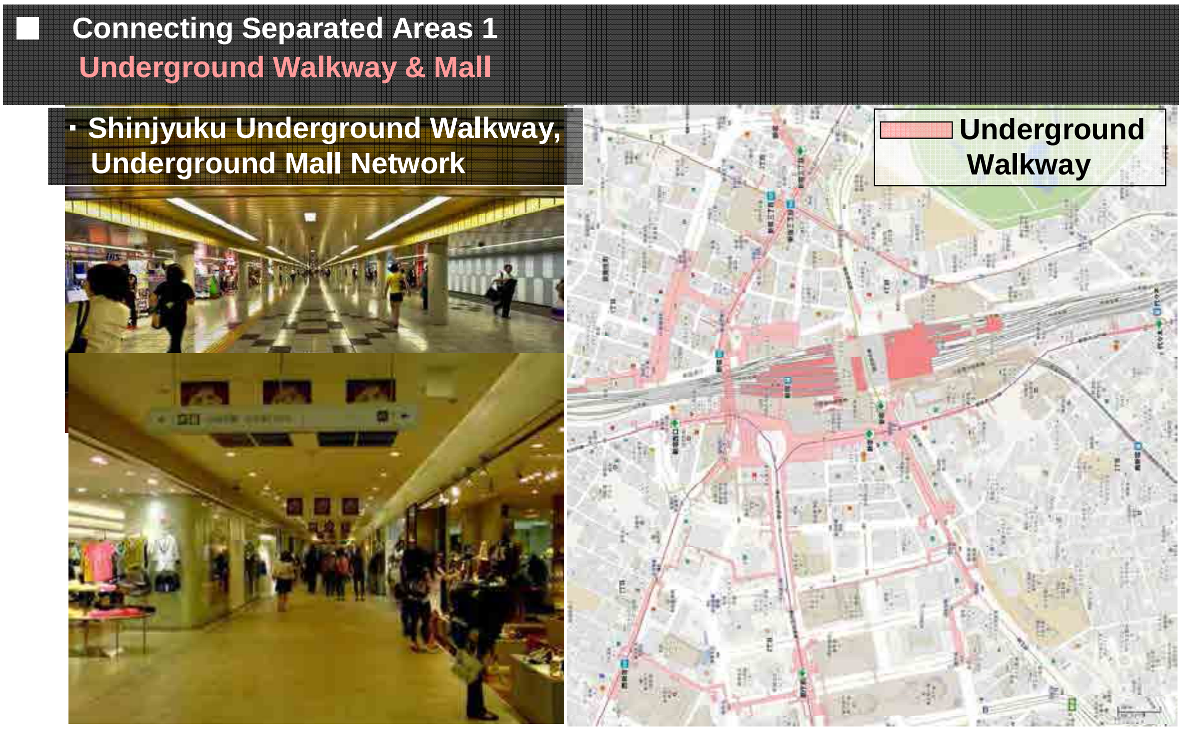
Source: Study Team

Figure-4.2.6 Planning Conditions



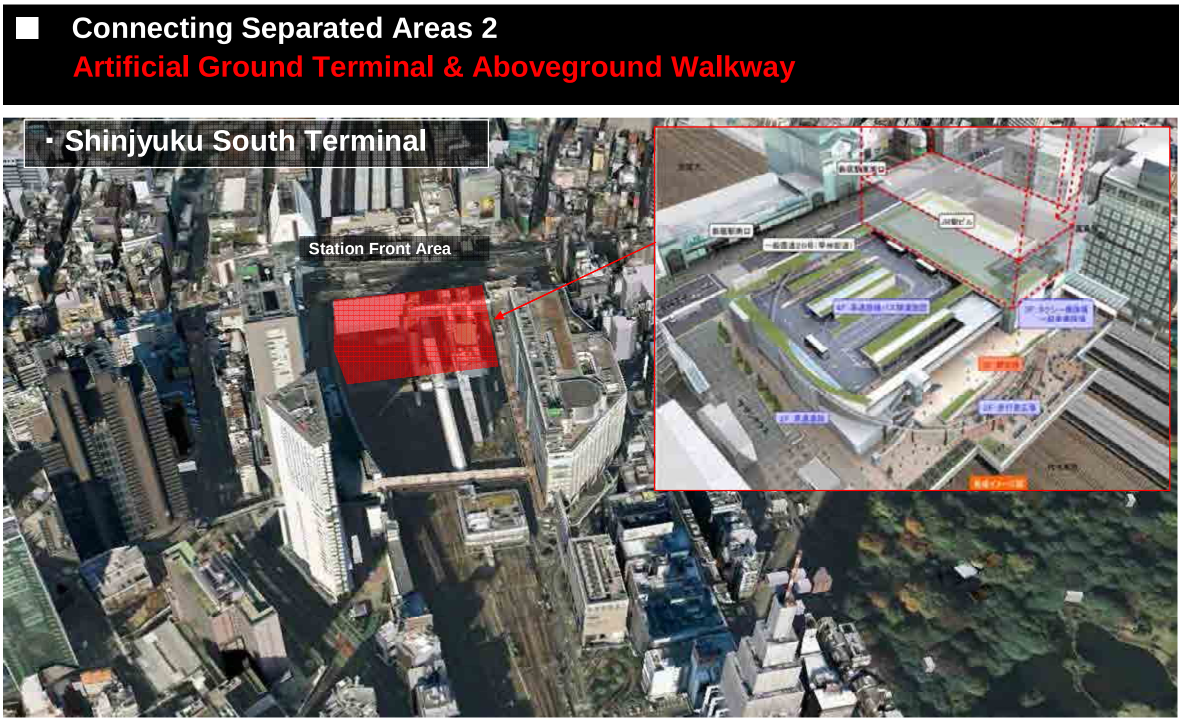
Source: Study Team

Figure-4.2.7 Urban Devices that Encourage Strolling in the Shinjuku Station-front Area



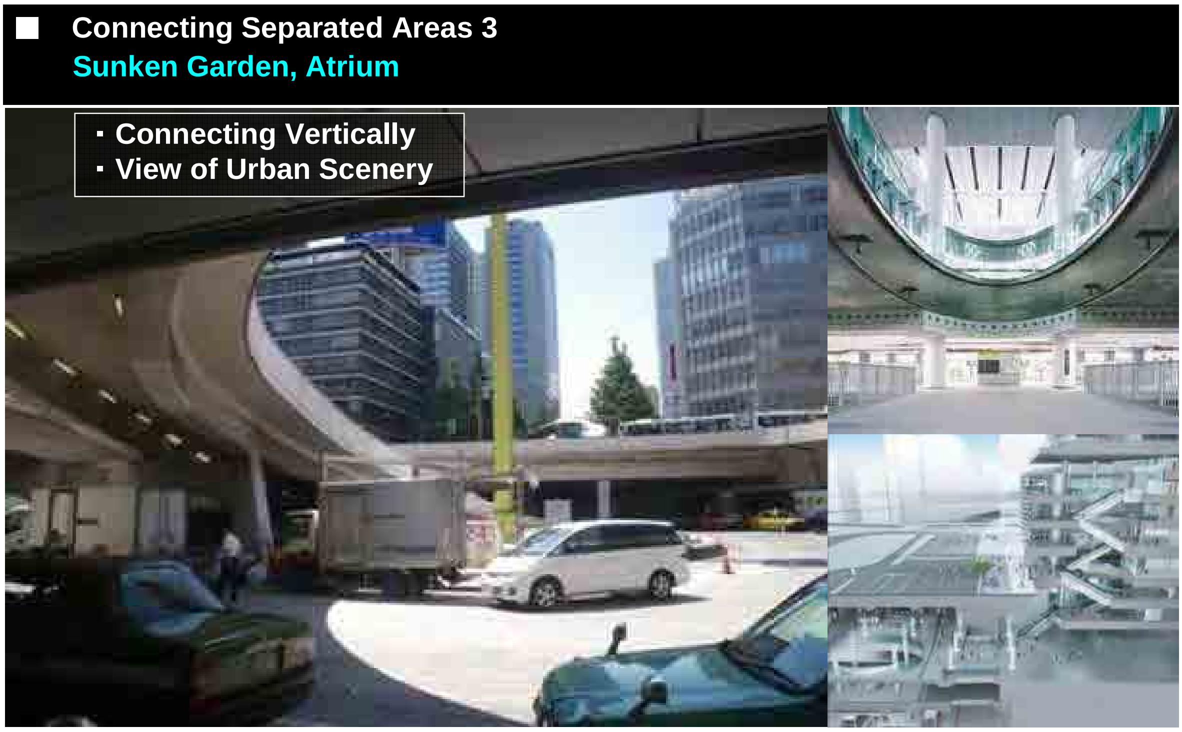
Source: Study Team

Figure 4.2.8 Underground Network in Shinjuku Station-front Area



Source: Study Team

Figure- 4.2.9 Artificial Ground and Aboveground Walkway in Shinjuku Station-front Area



Source: Study Team

Figure- 4.2.10 Sunken Garden in Shinjuku Station-front Area

■ Connecting Separated Areas 4
Human scale Space Design

Source: Study Team

Figure-4.2.11 Human Scale Space Design in Shinjuku Station-front Area

The abovementioned Shinjuku Station area was used as a reference in the planning. These types of urban devices were introduced in the Dukuh Atas area as well to enhance its functions as a transit node while at the same type integrating it with the city blocks in the surrounding area, in an effort to achieve urban planning that encourages strolling in the area.

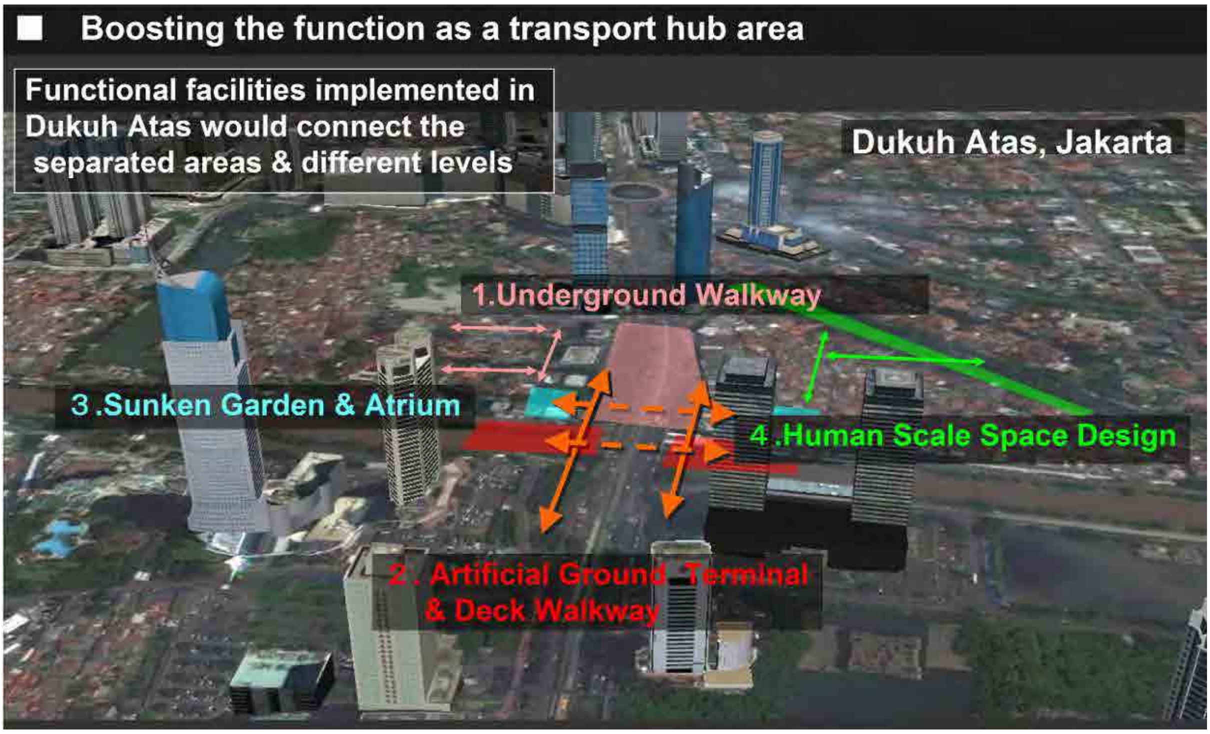
In the Dukuh Atas area, first off the Banjir Kanal that divides the area in northern and southern sections and the area over the train tracks had to be used effectively to connect rather than divide the northern and southern areas, and a mechanism was needed to make it easy to approach the station area from either side and connect to existing transportation facilities.

In addition, a means to enable the movement of people in the east and west directions without obstructing automobile traffic along Thamrin/Sudirman Street was needed.

Furthermore, a means of easing the burden of vertical movement between facilities from the underground MRT station to the level of the Dukuh Atas Bridge was also needed.

Conversely, in contrast to the mechanisms whose main purpose is movement in these directions, urban design that makes people want to walk will be needed in conducting future development of city blocks in the area around the station. For this reason, creation of city blocks in the area around the station on a human scale is also needed.

The following image illustrates these mechanisms.



Source: Study Team

Figure-4.2.12 Human Scale Space Design in Shinjuku Station-front Area

2) The Solution

For the case above, to meet the needs in the current land ownership condition of Dukuh Atas, it is essential to plan the transport facilities within the existing public land around the area to ensure, project implementation minimizing the risk and avoiding project delay.

Also, the location of the facilities should consider the usage and the connection distance between each other, considering the distance of 200m, which is consider to be the average walking distance under the TOD planning. As Dukuh Atas is divided into areas by the Banjir canal and the Thamrin-Sudirman boulevard, it is beneficial to consider the area to plan the transport facility inside the 200m radius centered by the Surdirman Bridge. Inside this area, the area with high-potential is the area above Banjir Kanal, as by constructing an artificial ground over this area in terms of gaining areal surface, it would become an traffic terminal that can be accessed from North, South , East, and West, from all directions.

For the conclusion of the matters above, the condition is to plan the facilities using areas over the Banjir Kanal.

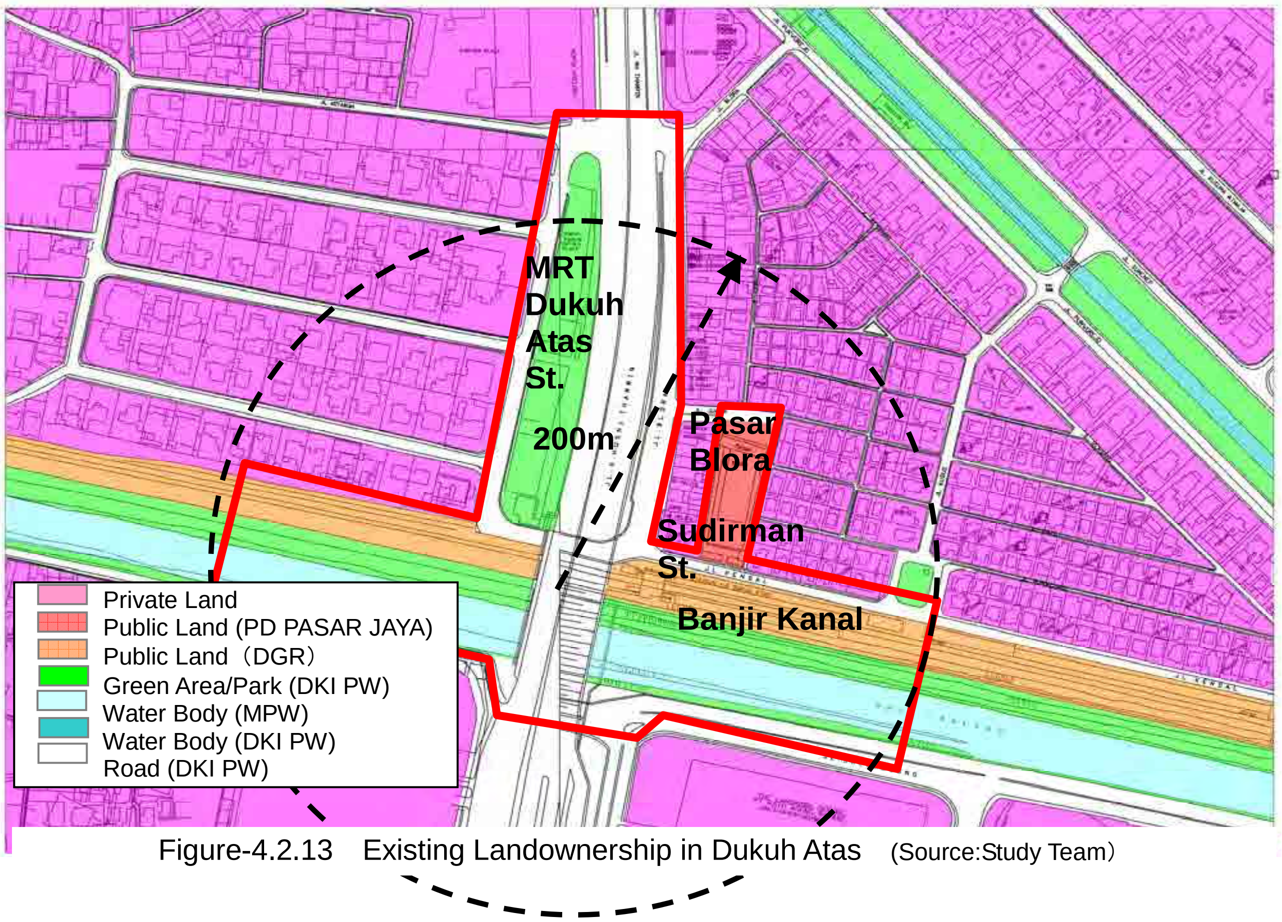


Figure-4.2.13 Existing Landownership in Dukuh Atas (Source:Study Team)

Rise of growth potential for development will occur by integrating the transport hub, which will lead to the interest of private developers wanting to develop the area. To thrust this interest of the private parties to get involved, it is important to form a network of pedestrians, not just for the transport facilities, but also for the whole Dukuh Atas area. The north south dividence by the Banjir Kanal, the east west dividence by the Thamrin/Sudirman Boulevard, the elevation dividence by the Sudirman Bridge, must be solved by an effective infrastructure to connect all 4 areas.

To solve this issue, the study proposes to build an artificial ground over the Banjir Kanal with multiple passages to connect pedestrian network between north and south to solve the bottle neck structure. Also the passage connecting MRT and the railway station on the north side, and passage connecting the artificial ground between east and west would form a large circulation network around the area.

Also for the station area, in contrast to the current UDGL study focusing on equal KLB(Floor area ratio) around the area, the study team proposes to concentrate the KLB(Floor area ratio) to the working distance of 200m around the station area, according to the TOD concept, to focus and speed up the station area development in the early stage.

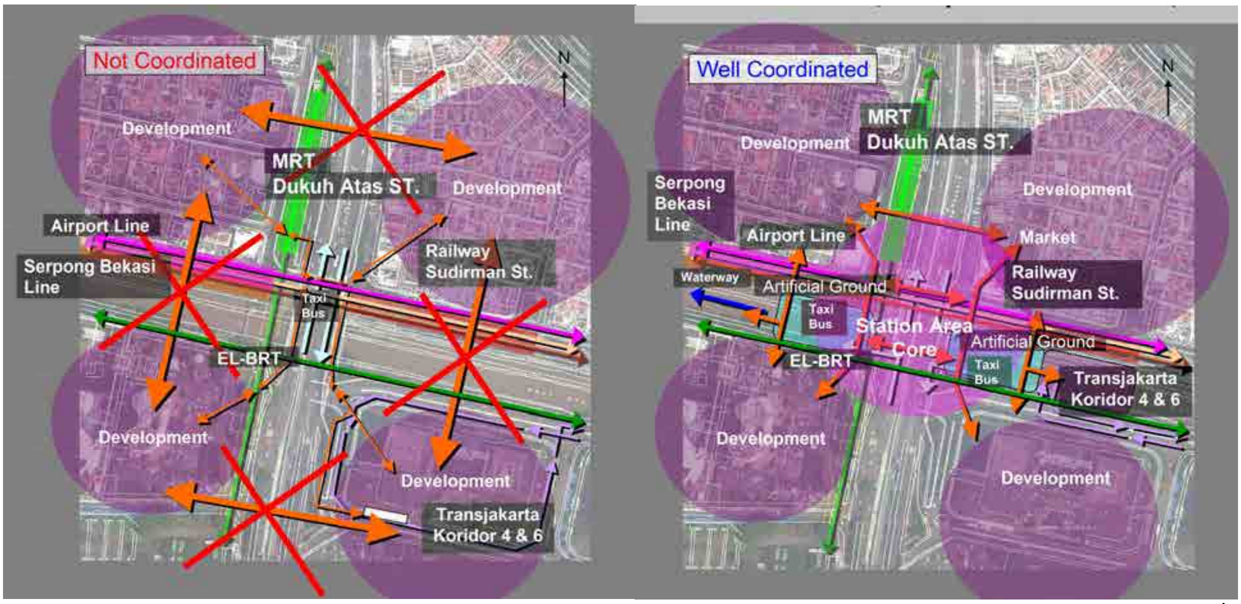


Fig-4.2.14 Artificial Ground over Banjir Kanal and coordinated flow line (source : Study Team)

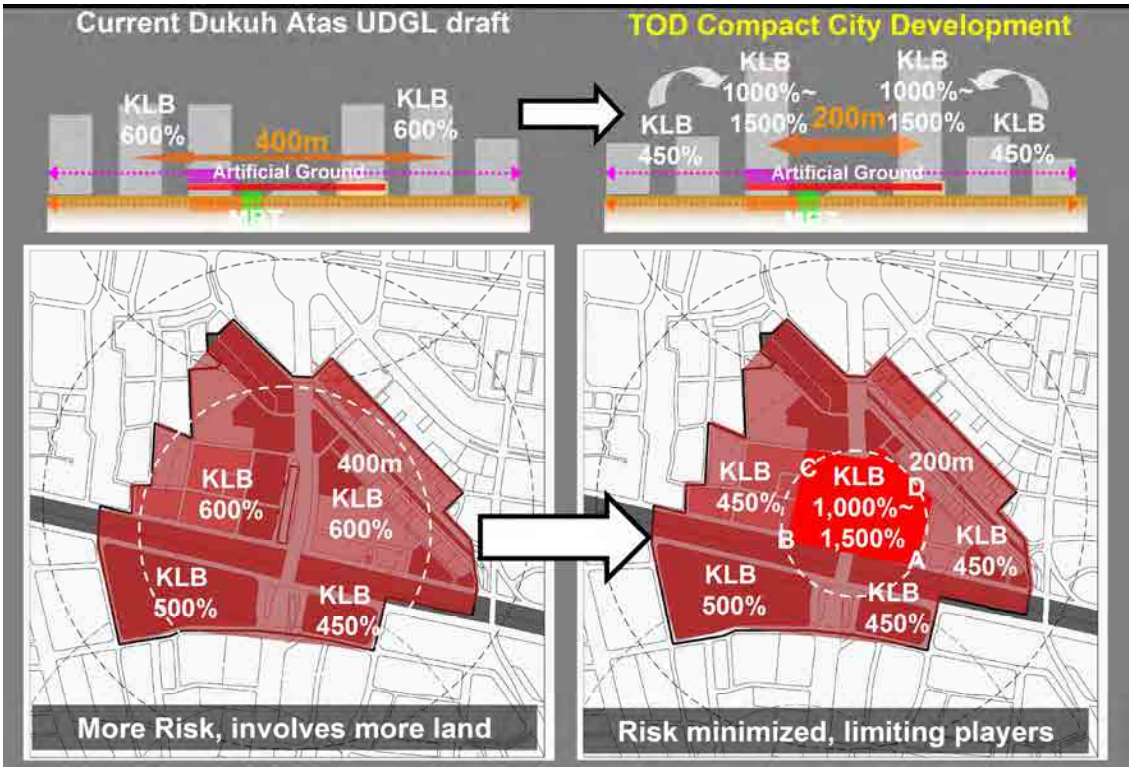


Fig-4.2.15 TOD concept of concentrated development around Station Area (source : Study Team)

4.2.3 Precondition

1) Phased Construction by Opening of Transport Facilities

Based on the preconditions presented in 4.1 "Demand Forecast," the plan is to construct the Dukuh Atas Station area in two Phases as noted below.

The major changes that will occur in the Dukuh Atas Station area are, firstly, the construction of facilities that will be needed when the MRT station opens for service in 2017. At this point, the land in the Dukuh Atas station area will not have been developed, and the construction of facilities for transferring between transport facilities is given top priority to improve the convenience of Dukuh Atas Station and attract riders. This will be Phase 1. At the Phase 1 stage, if transfer between the MRT, train (West Line) and Trans Jakarta Corridor 4 & 6 is seen as one route, the total will be 2700 p/h (=900p/h+500p/h+1300p/h) and this will be the most important route in Phase 1.

Phase 2 will begin when Serpong Bekasi Line Station in the Dukuh Atas Station area, the Airport Express Line, the Elevated BRT and the new transport facility begins service. At this point, there will be a dramatic increase in the number of people using the Dukuh Atas Station area, and the Serpong-Bekasi Line and MRT and the MRT and TransJakarta routes will become important. The facility construction should be completed by 2020, but for the ridership estimation, is set for 2030 to consider ridership growth.

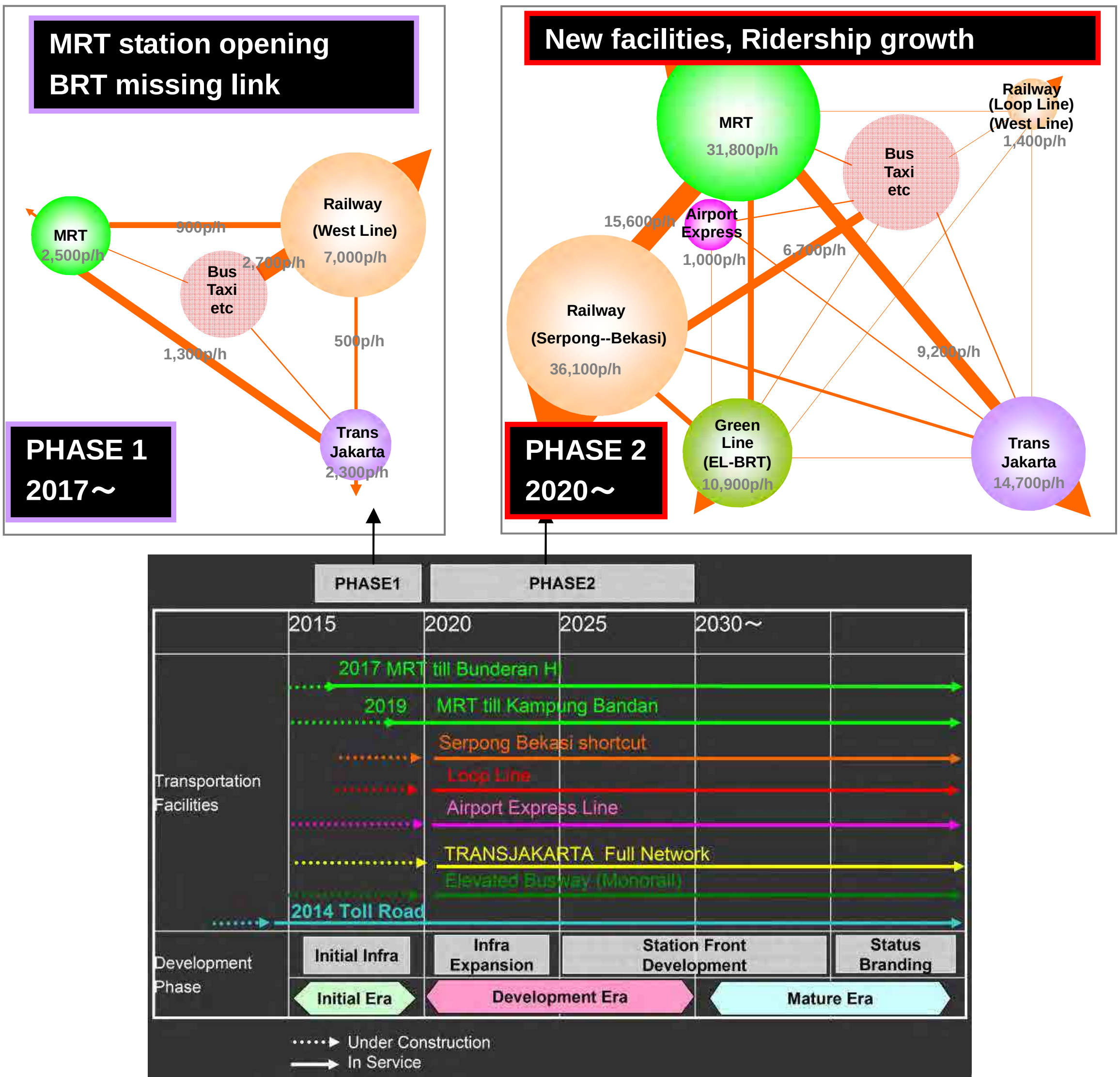


Figure-4.2.16 Present and Future Routes for Pedestrians Transferring to and from Various Means of Transport (Source: Study Team)

4.2.4 Basic Planning Policy

1) PHASE1. Development Policy

For the development of Dukuh Atas PHASE1, to coordinate with the opening of the MRT North –South line Dukuh Atas station, the first priority is to establish a safe and smooth access connection between the MRT North-South line and the BRT Koridor 4&6, to maintain the current access service level. The MRT North-South line Dukuh Atas station ticket gate planned on the B1 level of the station, therefore considering the vertical access easiness, crossing the Thamrin Boulevard with an underground walkway is most efficient.

Also for the BRT Koridor 4&6 station, considering the rise of the transit volume from the MRT North-South line, and the also connection with the Sudirman railway station, the facility must be renewed and repositioned closer to each other to minimize the connection distance. For this relocation, considering the current operation route of the Koridor 4&6 and the connection with the Sudirman railway station, the east area over the Banjir Kanal is to be considered most efficient.

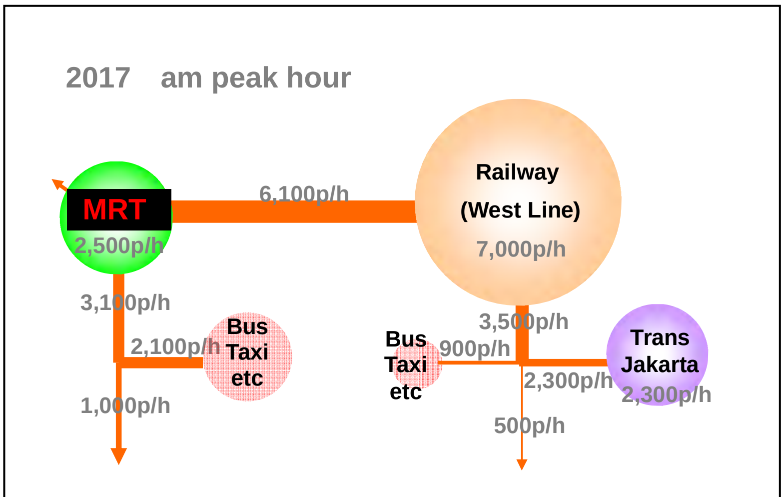


Fig-4.2.17 Peak time passenger volume（source : Study Team）

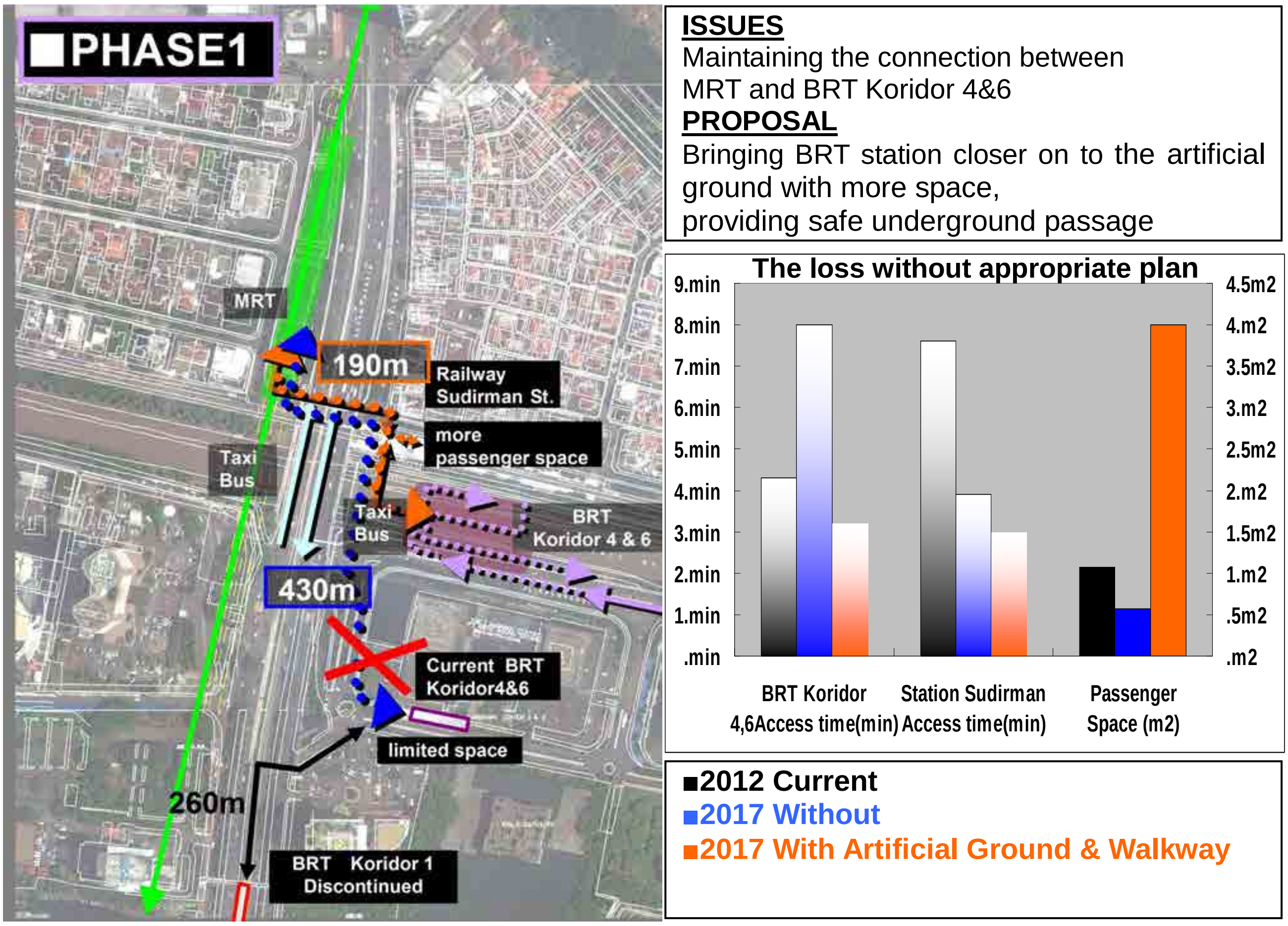


Fig-4.2.18 Phase1 Issues and Solutions（source： Study Team）

For PHASE2 of Dukuh Atas, as more and more new transport network is formed in the area creating a transportation hub, the potential of development would be growing in the area, leading to the urban development to the area by private parties. To accelerate this development, not just integrating the transport facilities but also to develop a pedestrian circulation network in the area is very important. To connect the areas separated in north and south by the Banjir Kanal, east and west by the Thamrin-Sudirman boulevard, an facility to connect the 4 separated areas is needed..

Several pedestrian routes linking north and south via the artificial ground will be constructed for the north-to-south pedestrian routes, for which the Dukuh Atas Bridge is currently a bottleneck. The four future development areas will be connected and integrated by means of the underground passageways that cross east to west on the northern side where the MRT and railway stations are located, and the pedestrian walkway that crosses the artificial ground in the east-west direction. This will create routes extending over a wide area that encourage people to stroll throughout the area.

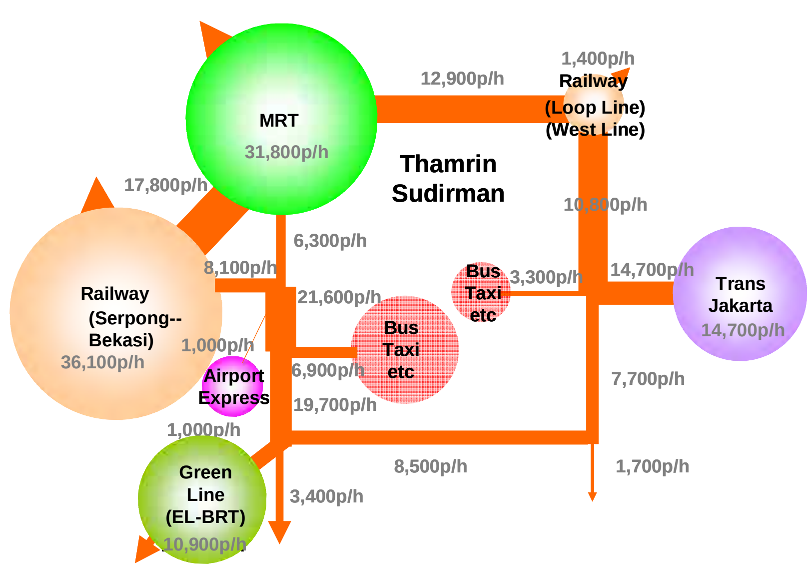
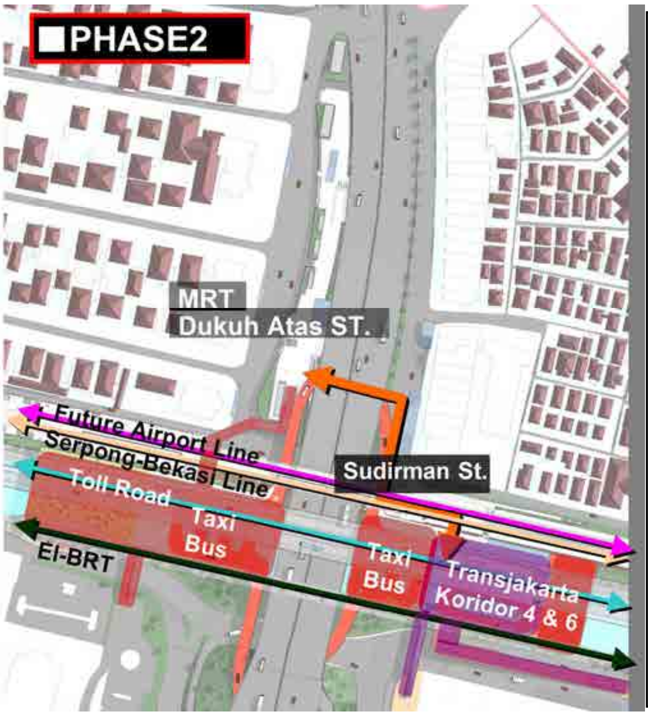


Fig-4.2.19 Peak time passenger volume（source：Study Team）



ISSUES

Dramatic ridership growth in Dukuh Atas with new transport network
- MRT
- BRT Koridor 4&6
- Loop Line
- Serpong-Bekasi Line
- Future Airport Line
- Elevated BRT (or Monorail)
- Feeder (Bus&Taxi)

PROPOSAL

Expanding the artificial ground terminal to provide terminal for growing feeder traffic(bus&taxi), transit connection space between new transport facilities, and improving passenger access from all areas of Dukuh Atas

Fig-4.2.20 Phase2 Issues and Solutions（source：Study Team）

4.3 Outline of Planning and Study of Facility

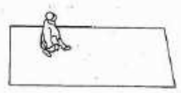
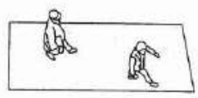
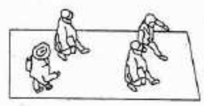
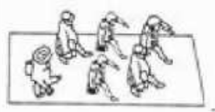
4.3.1 Pedestrian Network Planning

1) Necessary Width for Routes

(1) Assessment method

Based on 4.1 "Demand Forecast," the number of passengers moving between transport facilities during the morning peak use time was calculated. The width needed to satisfy Fruin's Level of Service (LOS) A~D was calculated to determine the width needed for passageways connecting to each transport facility.

Table-4.3.1 Fruin's Pedestrian Service Levels

Level of Service (LOS)	No. of pedestrians per unit of time	Pedestrian density
A	23- (persons/m/minute) There is sufficient space for pedestrians to overtake slower-walking people and freely choose the pace at which they would like to walk.	
B	33-23 (persons/m/minute) There is a small possibility of a collision in places where there is a counterflow or crossflow of pedestrians.	
C	49-33 (m^2/person) There are limitations on overtaking and freedom in selecting walking speed.	
D	66-49 (m^2/person) It is difficult to overtake other pedestrians and avoid collisions. The walking speed of most pedestrians is reduced.	
E	82-66 (m^2/person) None of the pedestrians are able to walk at their normal walking pace, and they must frequently change their pace.	
F	-82 (m^2/person) Pedestrian traffic is paralyzed beyond any possibility of control.	

Pedestrian Environment

Degree of Congestion: Low

Degree of Congestion: High

Source: Pedestrian's Planning and Design (J.J. Fruin)

3) Phase 1 (2017) Route Planning

The most important routes in the Phase 1 planning is the route leading from the MRT to the existing West Line train station and the new TransJakarta Terminal to be constructed on the artificial ground. At this stage, there will be 6,100 pedestrians per hour crossing the Dukuh Atas Bridge at peak times. In cross-sectional terms, a width of approximately 4.0 meters would be needed to satisfy Fruin's Level of Service B.

With regard to pedestrian routes from Sudirman Station on the West Line to the TransJakarta Terminal and further crossing to the south side, 3,500 pedestrians will be moving along this route at peak times. Accordingly, a width of approximately 2.0 meters would be needed to satisfy Fruin's Level of Service B.

However, when constructing a passageway that crosses Thamrin Street east to west and a north-south route on the artificial ground to accommodate these routes, a sufficient width should be provided in Phase 2 out of consideration for the future (2030 when new transport facilities will be constructed).

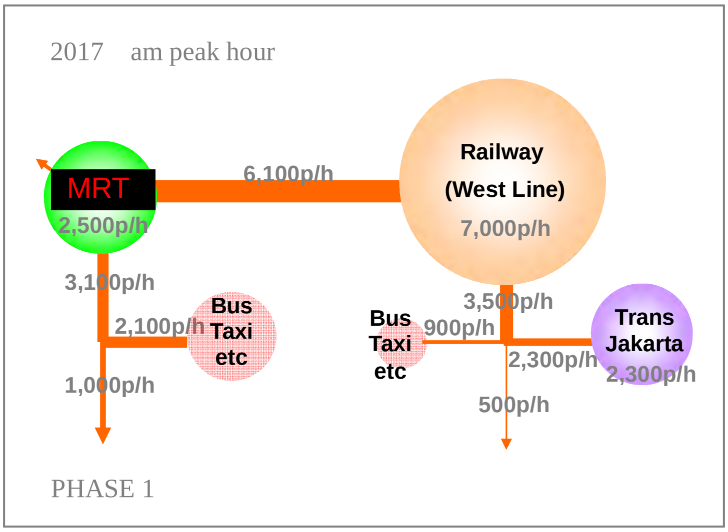
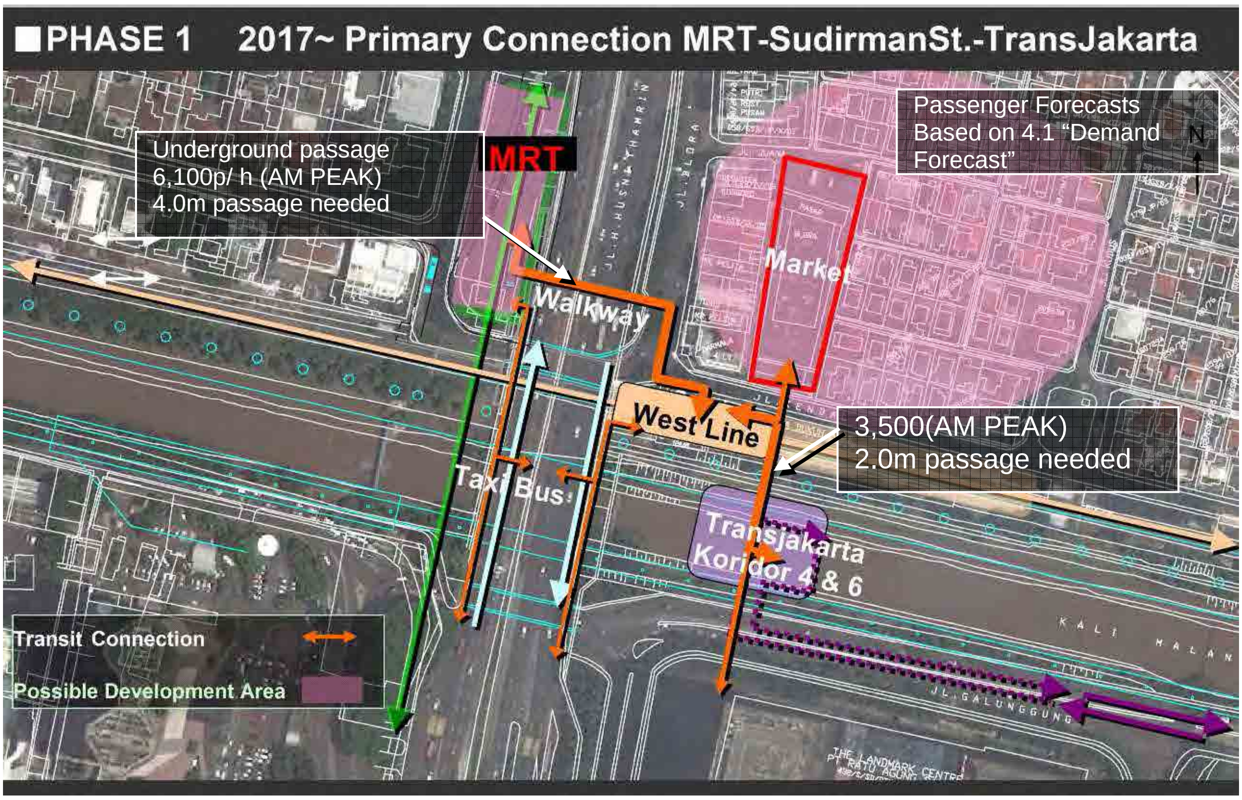


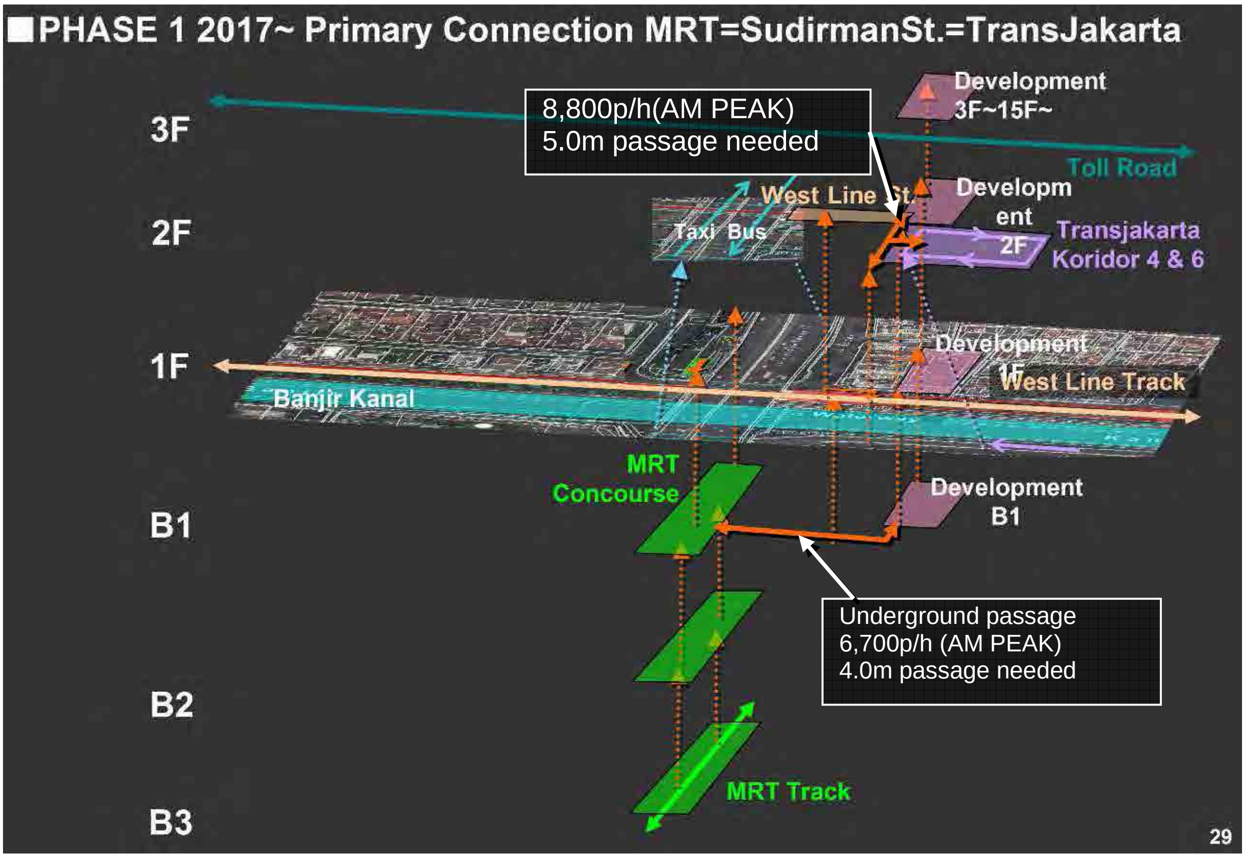
Figure-4.3.1 Passenger Volume of Phase1 2017

（Source：Study Team）



Source: Study Team

Figure-4.3.2 Pedestrian Network Needed in 2017 when MRT Begins Service



Source: Study Team

Figure-4.3.3 Multilevel Pedestrian Network Needed in 2017 when MRT Begins Service

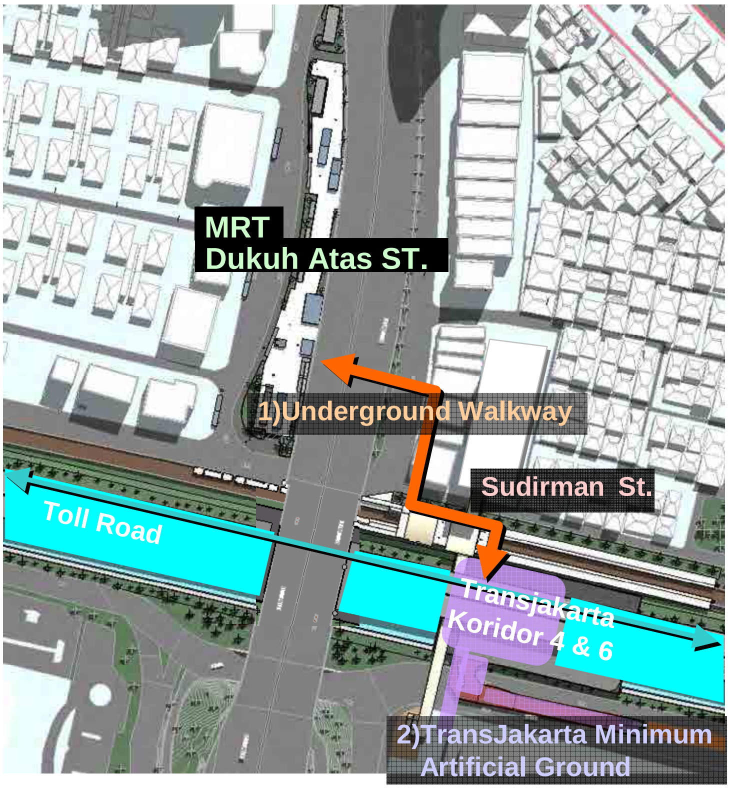


Figure-4.3.4 Facility Image for Phase1 (Source: Study Team)

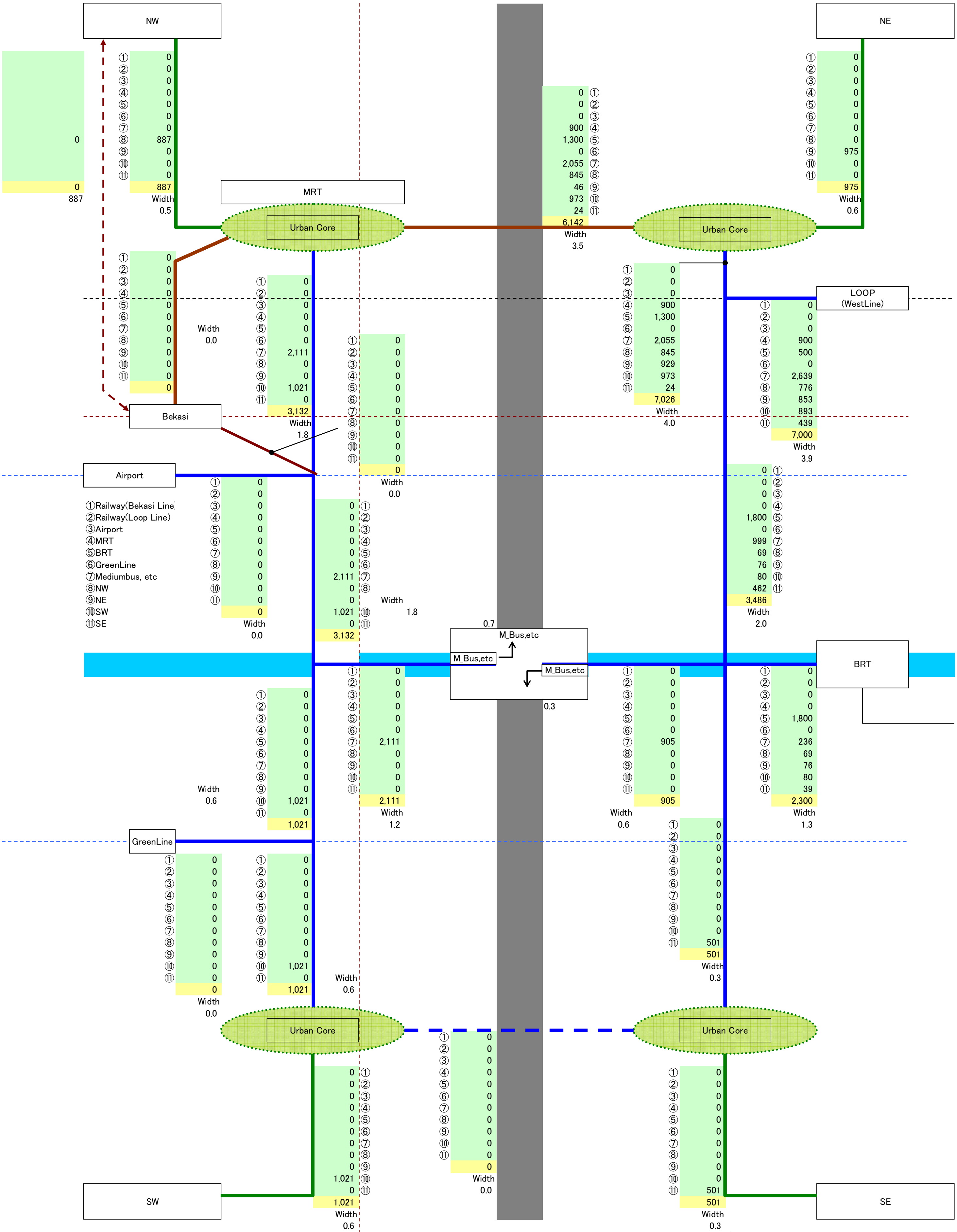


Figure -4.3.5 Year 2017 Morning Peak Time Passenger Volume （Source：Study Team）

The quantitative benefit of the PHASE1, constructing underground walkway and the artificial ground for the BRT Koridor 4&6 would be the upgrading the service level of the route, shortening the transit distances, and providing more passenger spaces.

In 2017, in case there is no connection provided between MRT and the current BRT Koridor 4&6 station, the transit time will decrease to 3.7min from the current situation, and also the passenger space in the BRT station will exceed 100% space limit, up to 175%, not meeting the demand of Japanese Traffic Design Standard of 1.0m2 per passenger, and would decrease the service level to half of the required standard.

Providing only the underground walkway will improve the transit time -1.3min, the passenger space in the BRT station would stay the same as above, exceeding the 100% space limit, up to 175%, not meeting the demand of 1.0m2 per passenger, and would decrease the service level to half of the required standard.

Providing the underground walkway and also relocating the BRT Koridor 4&6 to the artificial ground and bringing it closer would improve the transit time -4.8min, and for the passenger space, providing passenger space over 192m2 would meet the standard space of 1.0m2/passenger.

Table-4.3.2 Major Passenger Routes and the Service Level （Source：Study Team）

Peak Time Year 2017 MRT BRT Transit Volume 1,300p/h									
Without PHASE1 Construction					Underground Walkway & Artificial Ground				
	Distance (m)	Width (m)	p/min/m	Service Level		Distance (m)	Width (m)	p/min/m	Service Level
A Existing Conenction	260	2.0	11	A	DUndeground Walkway	50	10.0	10	A
B Existing Road Tunnel	50	0.9	113	F					
C Sudirman Bridge sidewalk	100	2.0	51	C					

Table-4.3.3 Pedestrian Route Distance and Time （Source：Study Team）

※ 2)Existing Road Tunnel section walking speed set to 0.5m/sec according to the service level of E, other section set on 1.0m/sec.					
	Walking Distance(m)	Access Time(min)		Walking Distance(m)	Access Time(min)
1)Current Status	260	4.3min (260sec)	2)Only Underground Walkway	400	6.7min (400sec)
2)MRT 2017 No action	430	8min (480sec)	4)with Underground Walkway & Artificial Ground	190	3.2min (190sec)

Table-4.3.4 Access Time Improvement by Built Facilities （Source：Study Team）

	Equation	Access Time Improvement
2)No Action	1)-2)	＋3.7min Worse
3)Only Underground Walkway	2)-3)	－1.3min Improvement
4)Underground Walkway & Artificial Ground	2)-4)	－4.8min Improvement

Table-4.3.5 Passenger Space Improvement by Built Facilities （Source：Study Team）

Peak Time Year 2017 MRT BRT Passenger Volume 1,300p/h Other Passenger Volume 1,000p/h Needed Passenger Space 1.0 ㎡／passenger (Under Japanese Terminal Planning Guidance)			
	Current BRT （Station Space 110 ㎡）	MRT constructed Without Artificial Ground （Station Space 110 ㎡）	MRT constructed With Artificial
Maximum Passengers/ car	80 passengers (1 Bus)	1,500 passengers (6 Train Cars)	1,500 passengers (6 Trains)
Peak Time 5min Operation	3 Busses	1 Train	1 Train
Peak Time 5min Carriage Value	0.16 (240 passengers)	1 (1,500 passengers)	1 (1,500 passengers)
Peak Time 5min Transit Volume	18 passengers （1,300p/h×5/60×0.16）	108 passengers （1,300p/h×5/60）	108 passengers （1,300p/h×5/60）
Peak Time 5min Other Volume	84 passengers （1,000p/h×5/60）	84 passengers （1,000p/h×5/60）	84 passengers （1,000p/h×5/60）
Needed Passenger Space	102 ㎡ （18 ㎡＋84 ㎡）	192 ㎡ （108 ㎡＋84 ㎡）	192 ㎡ （108 ㎡＋84 ㎡）
Occupation Space per Passenger	OK 1.07 ㎡／passenger Occupation Space 93% 102 ㎡＜110 ㎡	Not Satisfied 0.57 ㎡／passenger Occupation Space 175% 192 ㎡＞110 ㎡	Over 192 ㎡ needed on Artificial Ground

(2) Phase 2 (2030) Route Planning

Phase 2 in the year 2030 is the year in which the transport facilities currently being planned in the area around Dukuh Atas Station will have been completed and the construction of facilities to accommodate them will be needed. In the event that transport facilities are placed in accordance with existing plans, the route with the greatest demand at this point will be the route between the MRT in the west and the Serpong-Bekasi lines. The Airport Express Train and EL-BRT (Green Line) are located in the west, and there will also be great demand for movement from these lines to the MRT. In cross-sectional terms, a space of approximately 23.0 meters will be needed to secure a route that fulfills Fruin's Level of Service B. Within that amount, a width of approximately 15.2 meters will be needed just to accommodate the route between the MRT and Serpong-Bekasi lines.

In the west, many new transport facilities will be deployed. Connections with taxi and other road transport will be particularly important in the case of lines such as the Airport Express Line. For this reason, construction of a more robust artificial ground space will be needed to secure pedestrian routes.

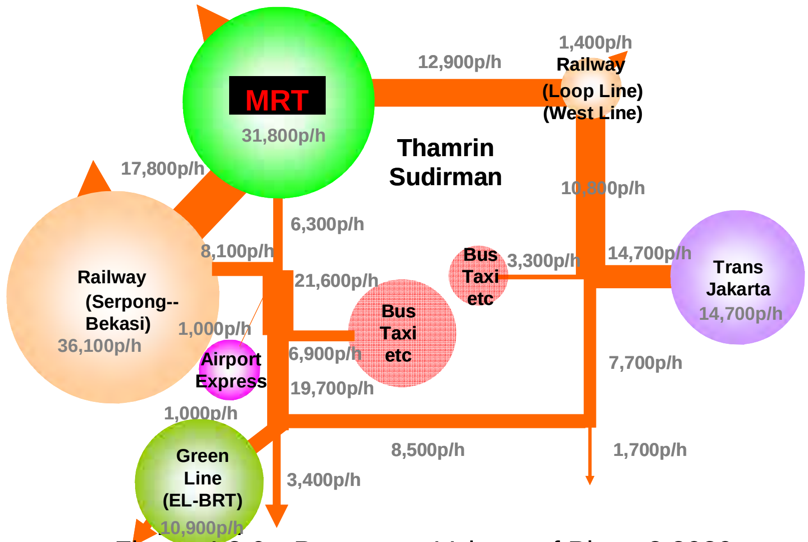


Figure-4.3.6 Passenger Volume of Phase2 2030
（Source：Study Team）

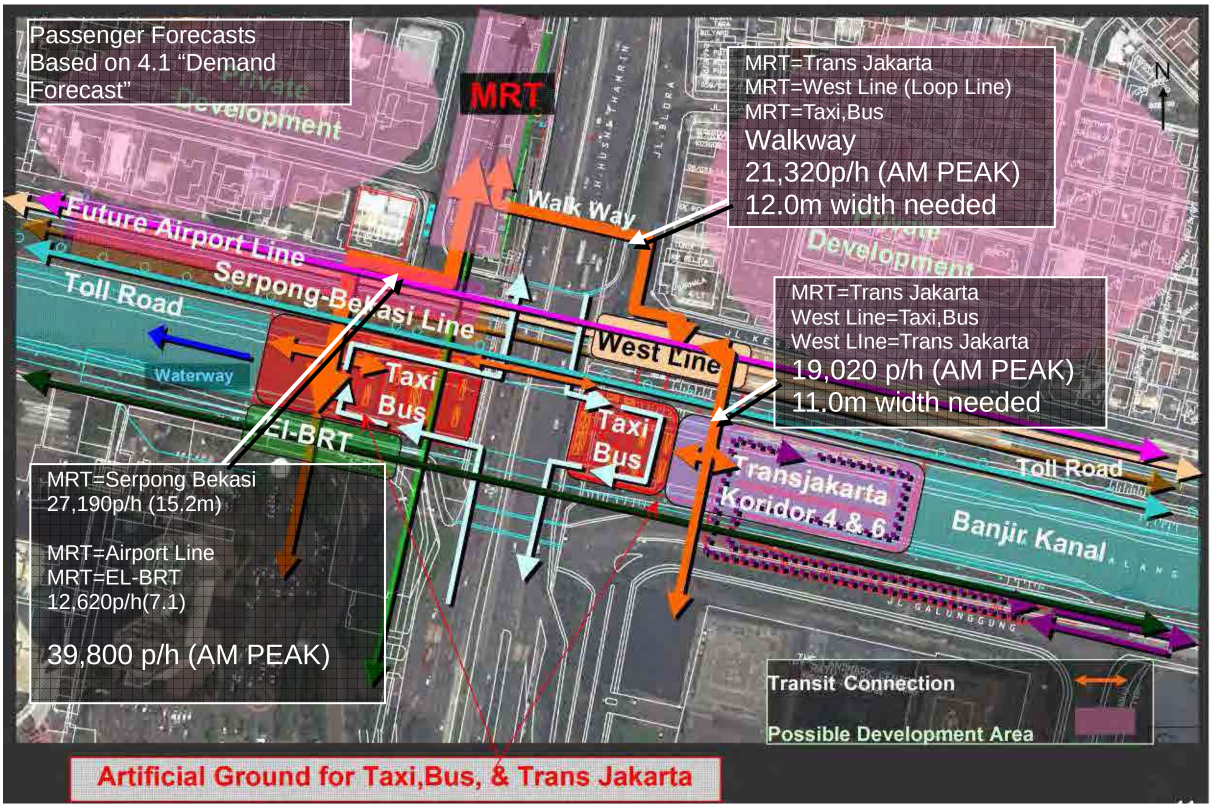
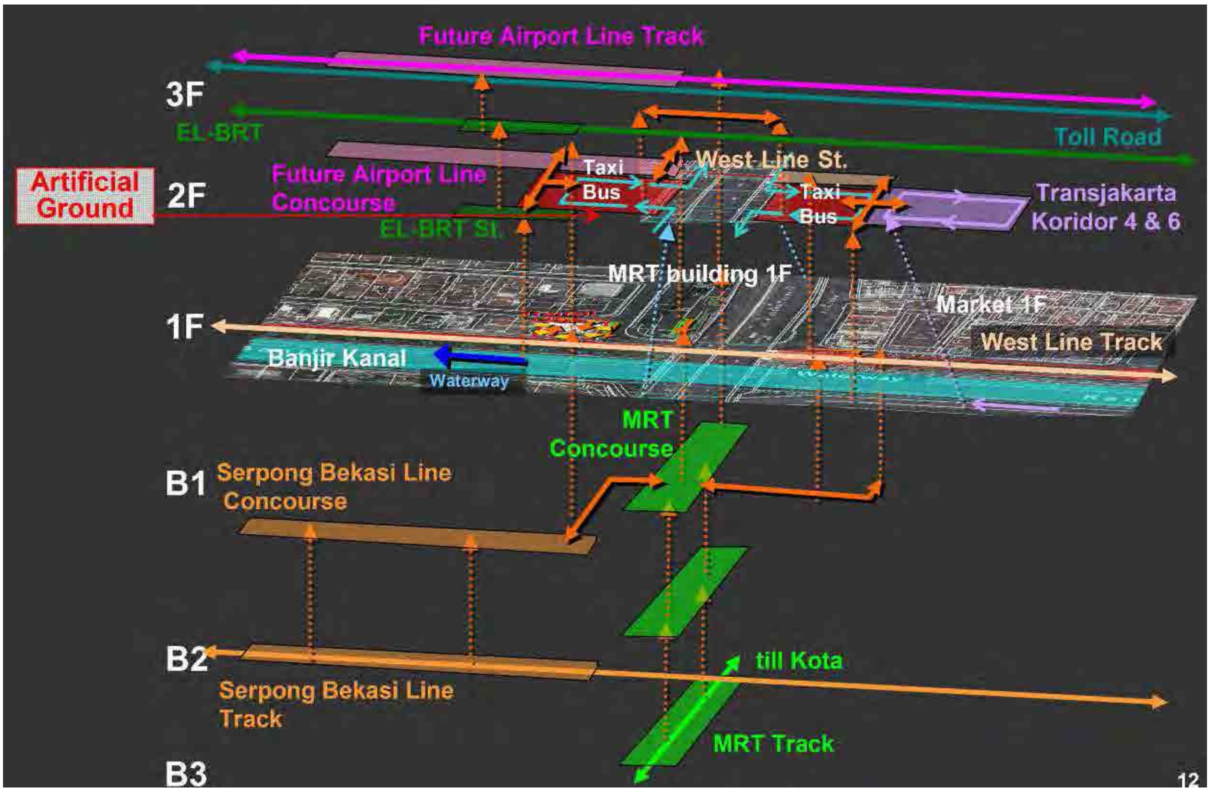


Figure-4.3.7 Anticipated Pedestrian Network in 2030（Source：Study Team）



Source: Study Team

Figure-4.3.8　Anticipated Multilevel Pedestrian Network in 2030

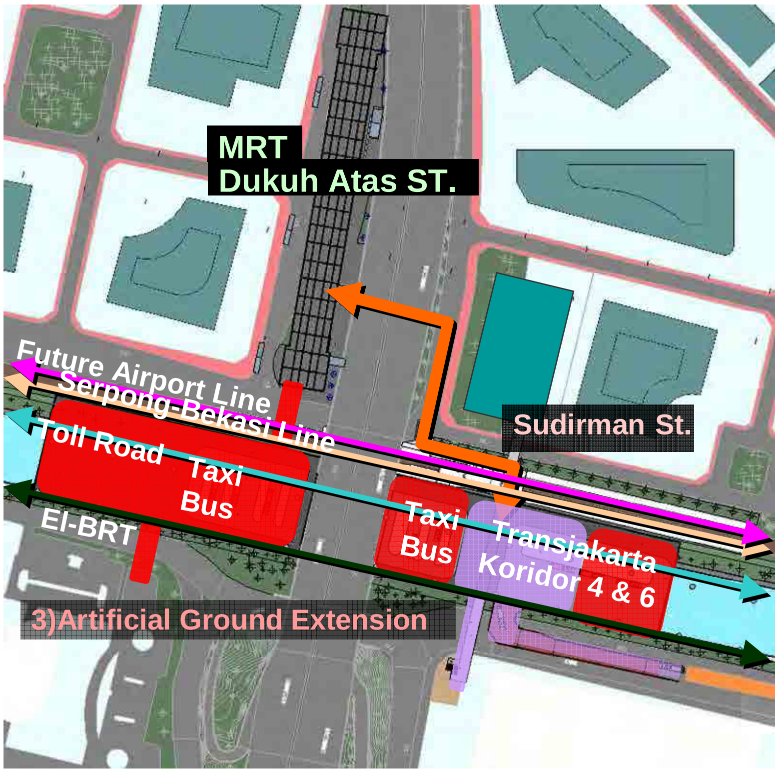


Figure-4.3.9　Facility Image for Phase2　　(Source: Study Team)

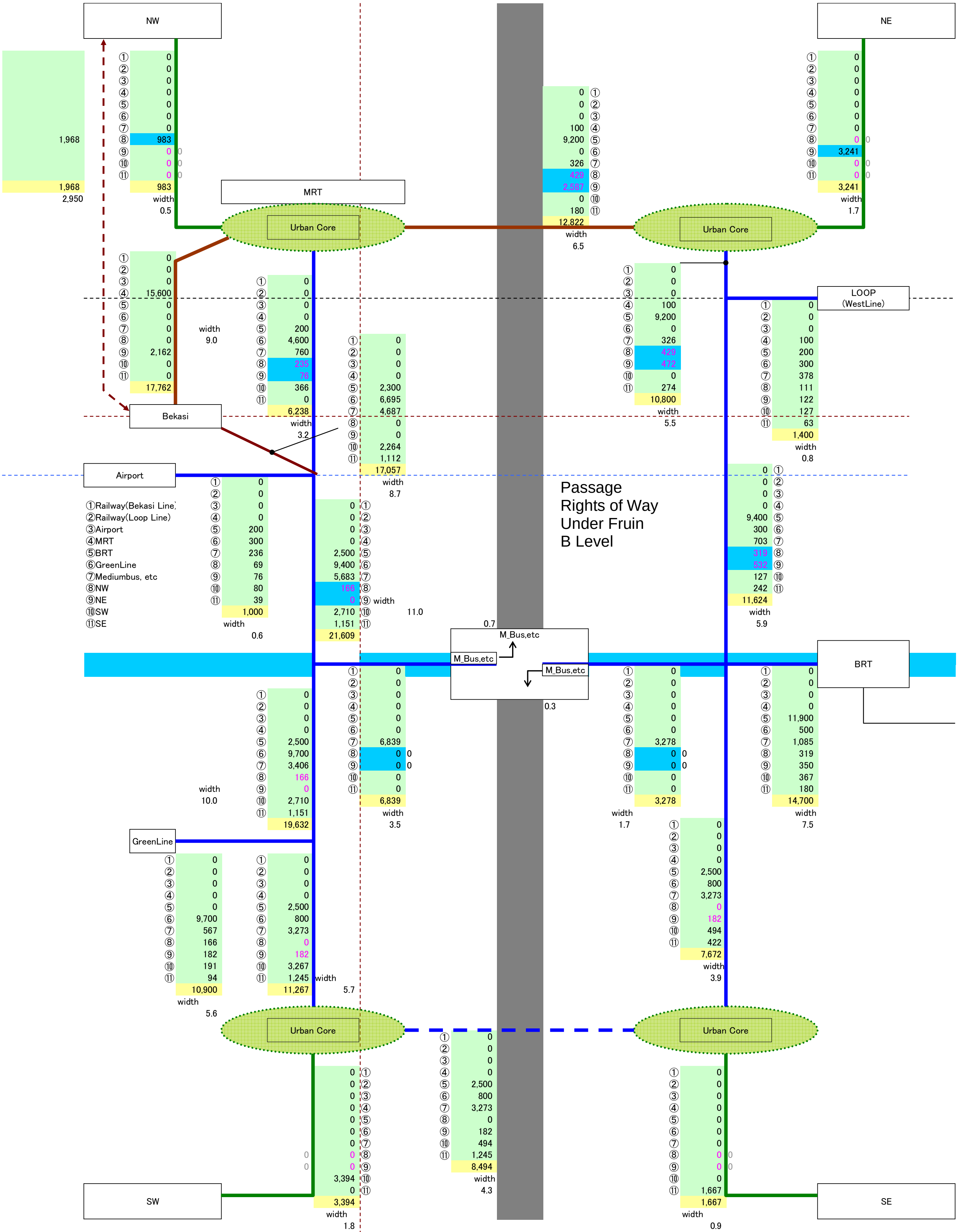


Figure -4.3.10 Year 2030 Morning Peak time Passenger Volume（Figure：Study Team）

The benefit of artificial ground expansion in year 2030 is to able to provide the passenger space for Mini-bus, Taxi and other feeder traffic in Dukuh Atas Area by having over 587m2 on the west side, and over 252m2 on the east side., from growing passenger volume from year 2017, when passenger space was still able to meet the needs.

Also for expanding the artificial ground on the west side provides an improved access time between the north and south of the area. By not expanding the artificial ground on the west side, in year 2030, the growth of passenger traffic volume limits the walking speed of passengers, and the access time between the north and south area turns +2.6min worse, but by expanding the artificial ground and improving the spatial service level, the access time can be shortened -4.1min.

Table-4.3.6 Major Passenger Routes and the Service Level （Source：Study Team）

	Peak Time Year 2030 (1)Maximum West side volume between north&south 3,400 p/h (2)West artificial ground between MRT 6,300 p/h (3)West artificial ground terminal 6,900 p/h (4)West Artificial ground maximum volume 21,600 p/h									
	No Expansion					Artificial Ground Expansion				
		Distance (m)	Width (m)	p/min/m	Service Level		Distance (m)	Width (m)	p/min/m	Service Level
(2)	A MRT to Sudirman Bridge connection slope	60	2.0	53	D	D West connection passage	50	6.0	18	A
(4)	B Sudirman Bridge Sidewalk	100	2.0	180	F	E Artificial Ground	50	10.0	32	C
(1)	C Regular Sidewalk	100	2.0	29	B	F South connection deck	100	3.0	19	A

Table-4.3.7 Pedestrian Route Distance and Time （Source：Study Team）

2)Existing Road Tunnel section walking speed set to 0.5m/sec according to the service level of E, other section set on 1.0m/sec.					
	Walking Distance(m)	Access Time(min)		Walking Distance(m)	Access Time(min)
1)Year 2017	430	7.2min (430sec)	3)Artificial ground expansion	290	4.8min (290sec)
2)Year 2030	430	8.9min (530sec)			

Table-4.3.8 Access Time Improvement by Built Facilities （Source：Study Team）

	Equation	Access Time Improvement
2)Year 2030 No Action	2)-1)	+1.7min worse
3)Artificial Ground Expansion	3)-2)	-4.1min improvement

Table-4.3.9 Passenger Space Improvement by Built Facilities （Source：Study Team）

Peak Time Year 2030 West（via North）Minibus・Taxi passenger 6,900p/h（Morning Peak）
East（via South）Minibus・Taxi passenger 3,300p/h（Morning Peak）

Peak Time Year 2017 West（via North）Minibus・Taxi passenger 2,100 p/h（Morning Peak）
East（via South）Minibus・Taxi passenger 900 p/h（Morning Peak）

Needed Passenger Space 1.0 ㎡／passenger (Under Japanese Terminal Planning Guidance)

	Current Year 2017 Peak （Bus stop space 180 ㎡）	Without artificial ground extension Year 2030 Peak （Bus stop Space 180 ㎡）	With artificial ground Year 2030 Peak
Peak 5min Passenger Volume	West 175 passenger （2,100p/h×5/60） East 75passenger （900p/h×5/60）	West 575 passenger （6,900p/h×5/60） East 275 passenger （3,300p/h×5/60）	West 575 passenger （6,900p/h×5/60） East 275 passenger （3,300p/h×5/60）
Needed Passenger Space	West 175 ㎡ East 75 ㎡	West 575 ㎡ East 275 ㎡	West 575 ㎡ East 275 ㎡
Occupation Space per Passenger	West OK 1.02 ㎡／p Occupation Space 98% 175 ㎡＜180 ㎡ East OK 2.40 ㎡／p Occupation Area 42% 75 ㎡＜180 ㎡	West Not Satisfied 0.32 ㎡／p Occupation Space 320% 575 ㎡＞180 ㎡ East Not Satisfied 0.66 ㎡／p Occupation Area 153% 275 ㎡＞180 ㎡	West over 575 ㎡ East over 275 ㎡ Needed on Artificial Ground

(4)PHASE2+ Year 2030~ Station area maximum development traffic volume estimation

In the Dukuh Atas station area, when the planned transport facilities completed and the function as a transport hub becoming stronger, which would lead to station area development in the area. At this stage, for the study estimation of the balance of residence, office, and commercial, the future image of Dukuh Atas can be estimated as close to "Shinbashi,Roppongi, and Hamamatsucho" area in the data of Year 2008 5th Tokyo Metropolitan Area Person Trip Study (Traffic Survey) . From this survey, using peak time volume of transport modes and transport mode balance between building types, estimation of KLB 1,500% development is estimated by using the Japanese manual of "Large Development Area traffic volume planning manual(by Ministry of Land,, Infrastructure, and Tourism) . Year 2030 estimation is used to estimate the rights of way of facilities, for the development. The maximum development only considers traffic volume, and in the future, walking route direction portion, expanding traffic facilities should consider and discussed in the future about private portion.

Table-4.3.10 Major Traffic Modality Peak Time Percentage

(Source : Year 2008 5th Tokyo Metropolitan Area Person Trip Study and JUTPI)

Area	AM/PM	Railway・Subway	Bus・Tram	Private car	Motorbike	Bicycle	Walk
:0031(Shinbashi,Roppongi, Hamatsucho)	AM	17.9%	9.9%	7.7%	9.5%	10.2%	18.3%
:0233(Nishi-shinjyuku,Okubo)		17.2%	9.3%	8.2%	10.1%	8.9%	14.5%
:0241(Shibuya)		10.3%	8.4%	7.8%	7.5%	9.1%	13.2%
:1013(Minatomirai)		13.3%	9.8%	9.2%	12.1%	10.1%	12.0%
:0031(Shinbashi,Roppongi, Hamatsucho)	PM	10.2%	10.0%	7.6%	8.1%	10.8%	10.5%
:0233(Nishi-shinjyuku,Okubo)		9.9%	8.7%	7.3%	7.9%	8.7%	10.7%
:0241(Shibuya)		9.7%	8.9%	8.8%	9.7%	7.9%	10.7%
:1013(Minatomirai)		9.2%	11.0%	10.0%	12.5%	11.4%	13.0%
Dukuh Atas (JUTPI 2030)	AM	12.3%	12.1%	12.4%			

Table-4.3.11 Traffic Modality by facility and volume (trip end))

(Source : Year 2008 5th Tokyo Metropolitan Area Person Trip Study and JUTPI)

Area	AM/PM	Railway・Subway	Bus・Tram	Private car	Motorbike	Bicycle	Walk
:0031(Shinbashi,Roppongi, Hamatsucho)	AM	17.9%	9.9%	7.7%	9.5%	10.2%	18.3%
:0233(Nishi-shinjyuku,Okubo)		17.2%	9.3%	8.2%	10.1%	8.9%	14.5%
:0241(Shibuya)		10.3%	8.4%	7.8%	7.5%	9.1%	13.2%
:1013(Minatomirai)		13.3%	9.8%	9.2%	12.1%	10.1%	12.0%
:0031(Shinbashi,Roppongi, Hamatsucho)	PM	10.2%	10.0%	7.6%	8.1%	10.8%	10.5%
:0233(Nishi-shinjyuku,Okubo)		9.9%	8.7%	7.3%	7.9%	8.7%	10.7%
:0241(Shibuya)		9.7%	8.9%	8.8%	9.7%	7.9%	10.7%
:1013(Minatomirai)		9.2%	11.0%	10.0%	12.5%	11.4%	13.0%
Dukuh Atas (JUTPI 2030)	AM	12.3%	12.1%	12.4%			

(a) Future Land Development Area Under Estimation

The current land area, building usage, and floor volume are shown in the Figure and table below. These outputs are sureveyed under 1:2500 scale land survey map.

Under the outputs of the survey, for the area east of Thamrin/Sudirman the land area is apx.40ha, west area is apx 2.3ha, all together the development area is apx6.3ha. The future building use is shown on table-4.3.11.

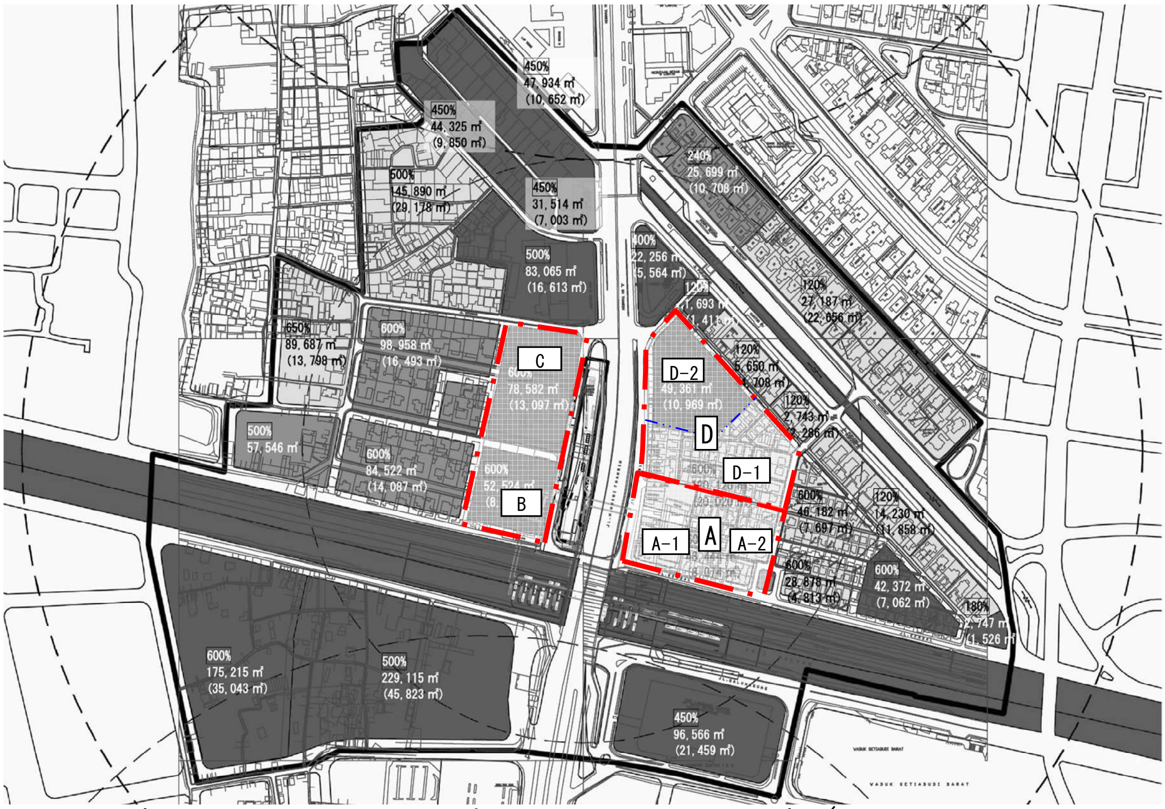


Figure-4.3.10 Future Development Area Survey Code（Source: Study Team）

Table-4.3.12 Proposed Future Land Use for the Area (Source: Study Team)

	Usage	Floor Volume		Land Use Percentage				
		Existing Plan	Future Plan	Residence	Commercial	Office	Hotel	計
A	Residence・Commercial	600%	1500%	**10.0%**	**20.0%**	*60.0%*	**10.0%**	100.0%
D	Residence・Commercial	600%	1500%	10.0%	20.0%	*60.0%*	10.0%	100.0%
D	Office・Commercial	450%	1500%	10.0%	20.0%	*60.0%*	10.0%	100.0%
B	Office・Commercial	600%	1500%	**10.0%**	**20.0%**	*60.0%*	**10.0%**	100.0%
C	Office・Commercial	600%	1500%	10.0%	20.0%	*60.0%*	10.0%	100.0%

(b) Maximum Development Traffic Volume Estimation

Table-4.3.13 Traffic Volume Estimation According to Land Use (Source: Study Team)

Name	Use	Total Floor Area		Basic Unit	OD Traffic Volume	Caluculation of OD traffic Volume																				
						Modal Share							OD Traffic Volume							Check	OD Traffic Volume					APX.
				Person/ha・day	(Person/day)	Railway	Bus	Private car	Motor bike	Bicycle	Walk	Total	Railway	Bus	Private car	Motor bike	Walk	Bicycle	Total		Railway	Bus	Private car	Motor bike	Bicycle	Walk
A	Housing	2.33	ha	700	1,631	41.8%	4.9%	13.9%	1.3%	6.7%	31.5%	100.0%	681	79	226	21	109	514	1,630	-1	600	100	200	30	100	500
	Commercial	4.66	ha	20,600	95,994	44.4%	4.2%	8.1%	0.2%	5.8%	37.4%	100.0%	42,591	4,028	7,743	175	5,601	35,855	95,993	-1	42,500	4,000	7,700	100	5,600	35,800
	Office	13.98	ha	3,900	54,521	80.6%	0.9%	6.9%	0.4%	1.4%	9.7%	100.0%	43,933	496	3,787	242	767	5,297	54,522	1	43,900	400	3,700	200	700	5,200
	Hotel	2.33	ha	1,300	3,029	62.6%	0.8%	23.5%	0.0%	0.7%	12.5%	100.0%	1,895	23	711	0	22	378	3,029	0	1,800	30	700	0	30	300
	Total	23.3	ha		155,175								89,100	4,626	12,467	438	6,499	42,044	155,174	-1	88,800	4,530	12,300	330	6,430	41,800
D-1	Housing	1.92	ha	700	1,346	41.8%	4.9%	13.9%	1.3%	6.7%	31.5%	100.0%	562	65	187	17	90	425	1,346	0	500	100	100	20	100	400
	Commercial	3.85	ha	20,600	79,246	44.4%	4.2%	8.1%	0.2%	5.8%	37.4%	100.0%	35,160	3,325	6,392	144	4,624	29,600	79,245	-1	35,100	3,300	6,300	100	4,600	29,600
	Office	11.54	ha	3,900	45,009	80.6%	0.9%	6.9%	0.4%	1.4%	9.7%	100.0%	36,268	409	3,126	200	633	4,373	45,009	0	36,200	400	3,100	200	600	4,300
	Hotel	1.92	ha	1,300	2,500	62.6%	0.8%	23.5%	0.0%	0.7%	12.5%	100.0%	1,564	19	587	0	18	312	2,500	0	1,500	20	500	0	20	300
	Total	19.2	ha		128,101								73,554	3,818	10,292	361	5,365	34,710	128,100	-1	73,300	3,820	10,000	320	5,320	34,600
D-2	Housing	1.65	ha	700	1,153	41.8%	4.9%	13.9%	1.3%	6.7%	31.5%	100.0%	482	56	160	15	77	364	1,154	1	400	100	100	20	100	300
	Commercial	3.29	ha	20,600	67,850	44.4%	4.2%	8.1%	0.2%	5.8%	37.4%	100.0%	30,104	2,847	5,473	124	3,959	25,343	67,850	0	30,100	2,800	5,400	100	3,900	25,300
	Office	9.88	ha	3,900	38,536	80.6%	0.9%	6.9%	0.4%	1.4%	9.7%	100.0%	31,052	350	2,676	171	542	3,744	38,535	-1	31,000	300	2,600	100	500	3,700
	Hotel	1.65	ha	1,300	2,141	62.6%	0.8%	23.5%	0.0%	0.7%	12.5%	100.0%	1,339	16	503	0	15	267	2,140	-1	1,300	20	500	0	20	200
	Total	16.5	ha		109,680								62,977	3,269	8,812	310	4,593	29,718	109,679	-1	62,800	3,220	8,600	220	4,520	29,500
A-D		59.0			392,956								225,631	11,713	31,571	1,109	16,457	106,472	392,953	-3	224,900	11,570	30,900	870	16,270	105,900

Name	Use	Total Floor Area		Basic Unit	OD Traffic Volume	Caluculation of OD traffic Volume																				
						Modal Share							OD Traffic Volume							Check	OD Traffic Volume					APX.
				Person/ha・day	(Person/day)	Railway	Bus	Private car	Motor bike	Bicycle	Walk	Total	Railway	Bus	Private car	Motor bike	Walk	Bicycle	Total		Railway	Bus	Private car	Motor bike	Bicycle	Walk
B	Housing	1.38	ha	700	968	41.8%	4.9%	13.9%	1.3%	6.7%	31.5%	100.0%	404	47	134	12	64	305	966	-2	400	50	100	20	100	300
	Commercial	2.76	ha	20,600	56,949	44.4%	4.2%	8.1%	0.2%	5.8%	37.4%	100.0%	25,267	2,390	4,594	104	3,323	21,271	56,949	0	25,200	2,300	4,500	100	3,300	21,200
	Office	8.29	ha	3,900	32,345	80.6%	0.9%	6.9%	0.4%	1.4%	9.7%	100.0%	26,064	294	2,246	143	455	3,143	32,345	0	26,000	200	2,200	100	400	3,100
	Hotel	1.38	ha	1,300	1,797	62.6%	0.8%	23.5%	0.0%	0.7%	12.5%	100.0%	1,124	14	422	0	13	224	1,797	0	1,100	20	400	0	20	200
	Total	13.8	ha		92,059								52,859	2,745	7,396	259	3,855	24,943	92,057	-2	52,700	2,570	7,200	220	3,820	24,800
C	Housing	1.99	ha	700	1,390	41.8%	4.9%	13.9%	1.3%	6.7%	31.5%	100.0%	581	67	193	18	93	438	1,390	0	500	100	100	20	100	400
	Commercial	3.97	ha	20,600	81,836	44.4%	4.2%	8.1%	0.2%	5.8%	37.4%	100.0%	36,309	3,434	6,601	149	4,775	30,567	81,835	-1	36,300	3,400	6,600	100	4,700	30,500
	Office	11.92	ha	3,900	46,479	80.6%	0.9%	6.9%	0.4%	1.4%	9.7%	100.0%	37,453	422	3,228	206	654	4,516	46,479	0	37,400	400	3,200	200	600	4,500
	Hotel	1.99	ha	1,300	2,582	62.6%	0.8%	23.5%	0.0%	0.7%	12.5%	100.0%	1,615	20	606	0	19	322	2,582	0	1,600	20	600	0	20	300
	Total	19.9	ha		132,287								75,958	3,943	10,628	373	5,541	35,843	132,286	-1	75,800	3,920	10,500	320	5,420	35,700
B,C		33.7			224,346								128,817	6,688	18,024	632	9,396	60,786	224,343	-3	#####	6,490	17,700	540	9,240	60,500

Table-4.3.14 Peak Time Traffic Volume According to Land Use (Source: Study Team)

Name	Use	Total Floor Area		Peak Ratio(%) AM Private car	AM People in-out	AM Raiway	PM Private car	PM People in-out	PM Railway	Person・Railway OD Traffic Volume in Peak Time: Railway AM	Railway PM	Bus,Motorbike,Bicycle AM	Bus,Motorbike,Bicycle PM	Bus AM	Bus PM	MotorBike AM	MotorBike PM	Bicycle AM	Bicycle PM	Walk AM	Walk PM	Caluculation of Automobile Traffic: Share ratio Automobile2008	DailyTraffic(/day) Automobile2008	Volume Conversion Factor	DailyTraffic(/day) Automobile2008	APX. DailyTraffic(/day) Automobile2008		Automobile Peak Ratio: AM Peak Ratio(%)	PM Peak Ratio(%)	Automobile OD Traffic Volume in Peak Time: AM Peak Traffic Volume (/h)	PM Peak Traffic Volume (/h)	【Reference】Required Number of Parking: DailyTraffic(/day) person	Value Conversion Factor	DailyTraffic(/day) number	AM Peak Traffic Volume (/h)	PM Peak Traffic Volume (/h)	Required Number Time Ratio=1.50
A	Housing	2.33	ha	7.0	10.0	17.9	6.0	7.0	10.2	108	61	23	16	10	7	3	2	10	7	50	35	13.9%	200	1.66	120	100	—	7.0	6.0	7	6	226	1.66	136	10	8	136
	Commercial	4.66	ha	7.0	1.0	16.1	10.0	12.0	10.2	6,842	4,339	97	1,164	40	480	1	12	56	672	358	4,296	8.1%	7,700	1.70	4,529	4,500	—	7.0	10.0	315	450	7,743	1.70	4,555	319	456	
	Office	13.98	ha	12.0	10.0	17.8	10.0	11.0	10.2	7,814	4,482	130	143	40	44	20	22	70	77	520	572	6.9%	3,700	1.52	2,434	2,400	—	12.0	10.0	288	240	3,787	1.52	2,491	299	249	1,116
	Hotel	2.33	ha	11.0	10.0	17.3	11.0	11.0	10.2	311	184	6	6	3	3	0	0	3	3	30	33	23.5%	700	2.00	350	300	—	11.0	11.0	33	33	711	2.00	356	39	39	746
	Total	23.3	ha							15,075	9,066	256	1,329	93	534	24	36	139	759	958	4,936		12,300		7,433	7,300				643	729	12,467		7,538	667	752	1,252
D-1	Housing	1.92	ha	7.0	10.0	17.9	6.0	7.0	10.2	90	51	52	36	10	7	2	1	40	28	40	28	13.9%	100	1.66	60	100	—	7.0	6.0	7	6	187	1.66	113	8	7	113
	Commercial	3.85	ha	7.0	1.0	16.1	10.0	12.0	10.2	5,650	3,584	330	3,960	33	396	1	12	296	3,552	296	3,552	8.1%	6,300	1.70	3,706	3,700	—	7.0	10.0	259	370	6,392	1.70	3,760	263	376	
	Office	11.54	ha	12.0	10.0	17.8	10.0	11.0	10.2	6,443	3,696	490	539	40	44	20	22	430	473	430	473	6.9%	3,100	1.52	2,039	2,000	—	12.0	10.0	240	200	3,126	1.52	2,057	247	206	921
	Hotel	1.92	ha	11.0	10.0	17.3	11.0	11.0	10.2	259	153	32	35	2	2	0	0	30	33	30	33	23.5%	500	2.00	250	200	—	11.0	11.0	22	22	587	2.00	294	32	32	616
	Total	19.2	ha							12,442	7,484	904	4,570	85	449	23	35	796	4,086	796	4,086		10,000		6,055	6,000				528	598	10,292		6,224	550	621	1,034
D-2	Housing	1.65	ha	7.0	10.0	17.9	6.0	7.0	10.2	72	41	42	29	10	7	2	1	30	21	30	21	13.9%	100	1.66	60	100	—	7.0	6.0	7	6	160	1.66	96	7	6	96
	Commercial	3.29	ha	7.0	1.0	16.1	10.0	12.0	10.2	4,845	3,073	282	3,384	28	336	1	12	253	3,036	253	3,036	8.1%	5,400	1.70	3,176	3,100	—	7.0	10.0	217	310	5,473	1.70	3,219	225	322	
	Office	9.88	ha	12.0	10.0	17.8	10.0	11.0	10.2	5,518	3,165	410	451	30	33	10	11	370	407	370	407	6.9%	2,600	1.52	1,711	1,700	—	12.0	10.0	204	170	2,676	1.52	1,761	211	176	789
	Hotel	1.65	ha	11.0	10.0	17.3	11.0	11.0	10.2	224	133	22	24	2	2	0	0	20	22	20	22	23.5%	500	2.00	250	200	—	11.0	11.0	22	22	503	2.00	252	28	28	527
	Total	16.5	ha							10,659	6,412	756	3,888	70	378	13	24	673	3,486	673	3,486		8,600		5,197	5,100				450	508	8,812		5,328	471	532	885
A-D		59.0								38,176	22,962	1,916	9,787	248	1,361	60	95	1,608	8,331	2,427	12,508		30,900		18,685	18,400				1,621	1,835	31,571		19,090	1,688	1,905	3,171

Name	Use	Total Floor Area		Peak Ratio(%) AM Private car	AM People in-out	AM Raiway	PM Private car	PM People in-out	PM Railway	Person・Railway OD Traffic Volume in Peak Time: Railway AM	Railway PM	Bus,Motorbike,Bicycle AM	Bus,Motorbike,Bicycle PM	Bus AM	Bus PM	MotorBike AM	MotorBike PM	Bicycle AM	Bicycle PM	Walk AM	Walk PM	Caluculation of Automobile Traffic: Share ratio Automobile2008	DailyTraffic(/day) Automobile2008	Volume Conversion Factor	DailyTraffic(/day) Automobile2008	APX. DailyTraffic(/day) Automobile2008		Automobile Peak Ratio: AM Peak Ratio(%)	PM Peak Ratio(%)	Automobile OD Traffic Volume in Peak Time: AM Peak Traffic Volume (/h)	PM Peak Traffic Volume (/h)	【Reference】Required Number of Parking: DailyTraffic(/day) person	Value Conversion Factor	DailyTraffic(/day) number	AM Peak Traffic Volume (/h)	PM Peak Traffic Volume (/h)	Required Number Time Ratio=1.50
B	Housing	1.38	ha	7.0	10.0	17.9	6.0	7.0	10.2	72	41	37	26	5	4	2	1	30	21	30	21	13.9%	100	1.66	60	100	—	7.0	6.0	7	6	134	1.66	81	6	5	81
	Commercial	2.76	ha	7.0	1.0	16.1	10.0	12.0	10.2	4,057	2,573	236	2,832	23	276	1	12	212	2,544	212	2,544	8.1%	4,500	1.70	2,647	2,600	—	7.0	10.0	182	260	4,594	1.70	2,702	189	270	
	Office	8.29	ha	12.0	10.0	17.8	10.0	11.0	10.2	4,628	2,654	340	374	20	22	10	11	310	341	310	341	6.9%	2,200	1.52	1,447	1,400	—	12.0	10.0	168	140	2,246	1.52	1,478	177	148	662
	Hotel	1.38	ha	11.0	10.0	17.3	11.0	11.0	10.2	190	112	22	24	2	2	0	0	20	22	20	22	23.5%	400	2.00	200	200	—	11.0	11.0	22	22	422	2.00	211	23	23	443
	Total	13.8	ha							8,947	5,380	635	3,256	50	304	13	24	572	2,928	572	2,928		7,200		4,354	4,300				379	428	7,396		4,472	395	446	743
C	Housing	1.99	ha	7.0	10.0	17.9	6.0	7.0	10.2	90	51	52	36	10	7	2	1	40	28	40	28	13.9%	100	1.66	60	100	—	7.0	6.0	7	6	193	1.66	116	8	7	116
	Commercial	3.97	ha	7.0	1.0	16.1	10.0	12.0	10.2	5,843	3,706	340	4,080	34	408	1	12	305	3,660	305	3,660	8.1%	6,600	1.70	3,882	3,800	—	7.0	10.0	266	380	6,601	1.70	3,883	272	388	
	Office	11.92	ha	12.0	10.0	17.8	10.0	11.0	10.2	6,657	3,818	510	561	40	44	20	22	450	495	450	495	6.9%	3,200	1.52	2,105	2,100	—	12.0	10.0	252	210	3,228	1.52	2,124	255	212	950
	Hotel	1.99	ha	11.0	10.0	17.3	11.0	11.0	10.2	276	163	32	35	2	2	0	0	30	33	30	33	23.5%	600	2.00	300	300	—	11.0	11.0	33	33	606	2.00	303	33	33	636
	Total	19.9	ha							12,866	7,738	934	4,712	86	461	23	35	825	4,216	825	4,216		10,500		6,347	6,300				558	629	10,628		6,426	568	640	1,066
B,C		33.7								21,813	13,118	1,569	7,968	136	765	36	59	1,397	7,144	1,397	7,144		17,700		10,701	10,600				937	1,057	18,024		10,898	963	1,086	1,809

Table-4.3.15

(c)Future Passenger Route Traffic Volume

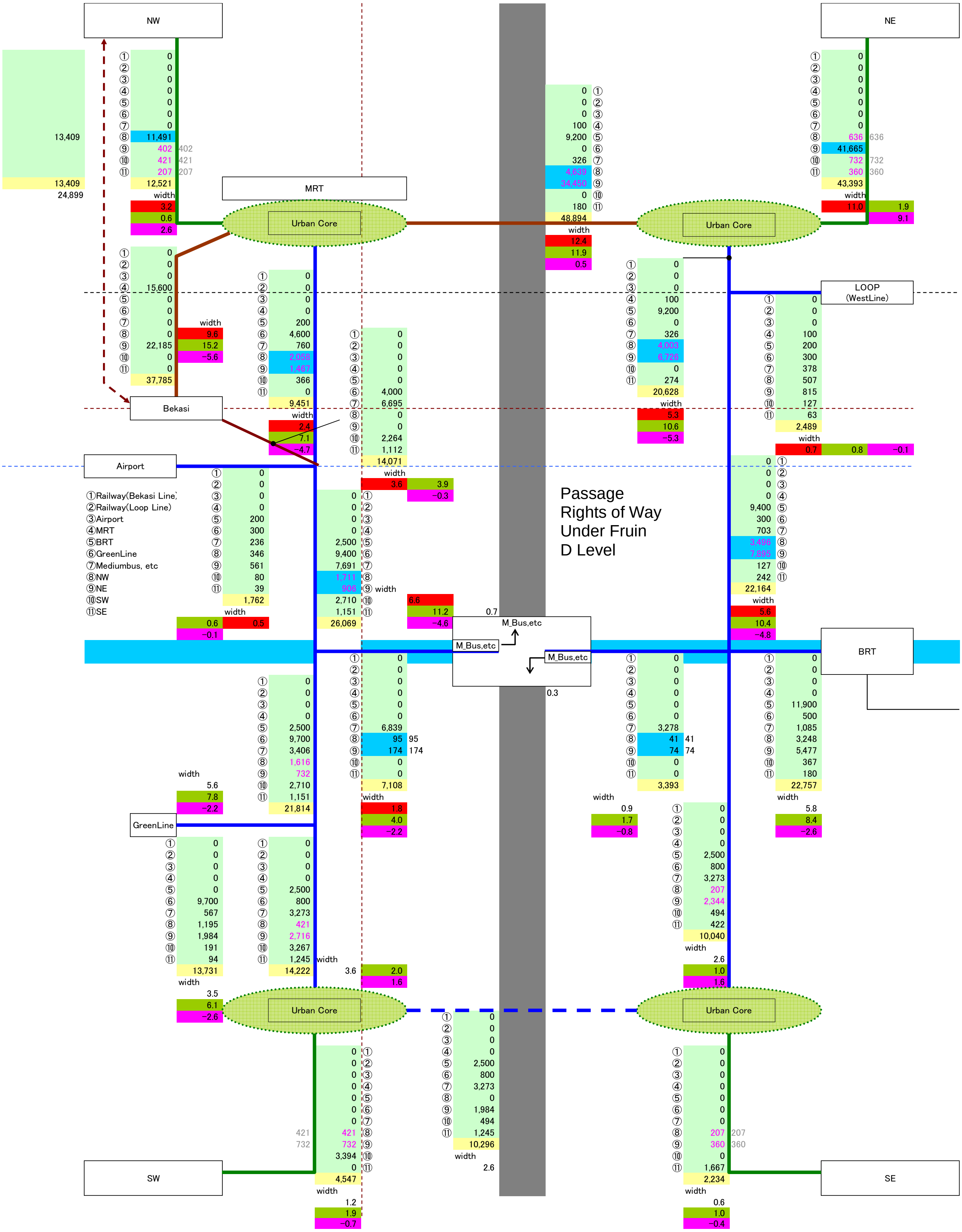


Figure-4.3.11 Year 2030+Maximum Development Morning Peaktime Passenger Volume

(Figure：Study Team)

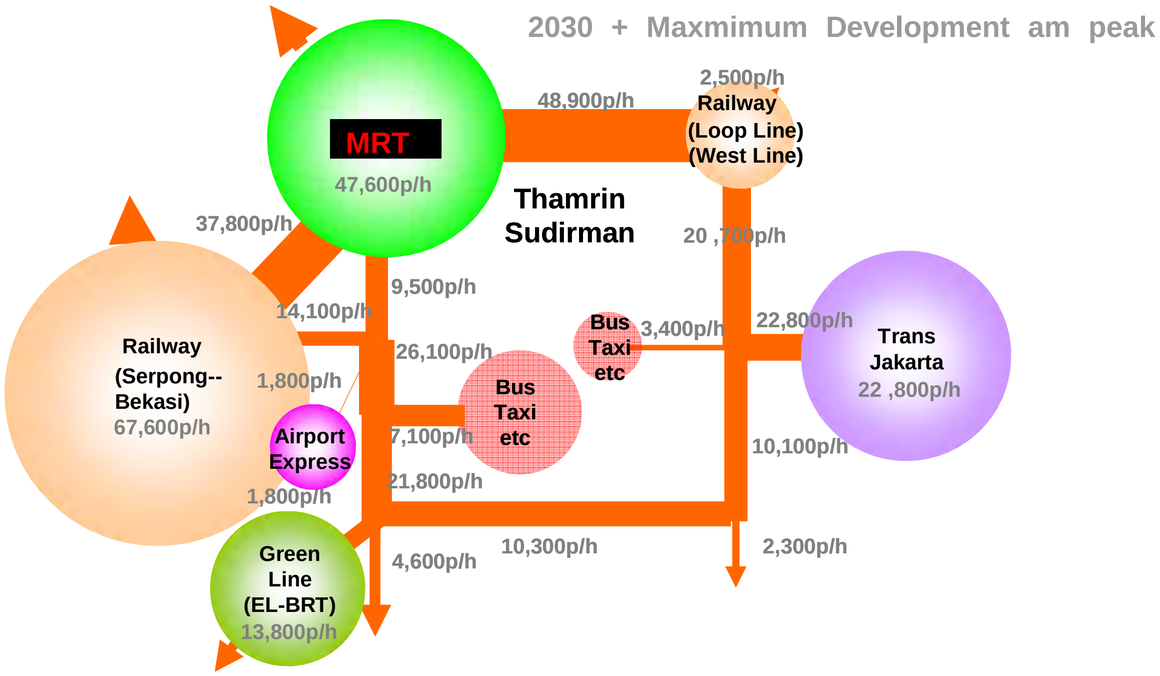


Figure-4.3.12 Year 2030+ Maximum Development Passenger Network (Source : Study Team)

The benefit of artificial ground expansion in year 2030 with maximum station area development traffic volume considered are to able to provide the passenger space for Mini-bus, Taxi and other feeder traffic in Dukuh Atas Area by having over 592m2 on the west side, and over 283m2 on the east side., from growing passenger volume from year 2017, when passenger space was still able to meet the needs.

Also for expanding the artificial ground on the west side provides an improved access time between the north and south of the area. By not expanding the artificial ground on the west side, in year 2030 with maximum station area development traffic volume considered, the passenger traffic volume limits the walking speed of passengers, and the access time between the north and south area turns +2.6min worse, but by expanding the artificial ground and improving the spatial service level, the access time can be shortened -4.1min.

Table-4.3.15 Major Passenger Routes and the Service Level （Source：Study Team）

	Peak Time Year 2030 (1)Maximum West side volume between north&south 4,600 p/h (2)West artificial ground between MRT 9,500 p/h (3)West artificial ground terminal 7,100 p/h (4)West Artificial ground maximum volume 26,100 p/h									
	No Expansion					Artificial Ground Expansion				
		Distance (m)	Width (m)	p/min/m	Service Level		Distance (m)	Width (m)	p/min/m	Service Level
(2)	A MRT to Sudirman Bridge connection slope	60	2.0	79	E	D West connection passage	50	6.0	27	B
(4)	B Sudirman Bridge Sidewalk	100	2.0	218	F	E Artificial Ground	50	10.0	44	C
(1)	C Regular Sidewalk	100	2.0	38	C	F South connection deck	100	3.0	26	B

Table-4.3.16 Pedestrian Route Distance and Time （Source：Study Team）

2)Existing Road Tunnel section walking speed set to 0.5m/sec according to the service level of E, other section set on 1.0m/sec.					
	Walking Distance(m)	Access Time(min)		Walking Distance(m)	Access Time(min)
1)Year 2017	430	7.2min (430sec)	3)Artificial ground expansion	290	4.8min (290sec)
2)Year 2030	430	8.9min (530sec)			

Table-4.3.17 Access Time Improvement by Built Facilities （Source：Study Team）

	Equation	Access Time Improvement
2)Year 2030 No Action	2)-1)	+2.6min worse
3)Artificial Ground Expansion	3)-2)	-4.1min improvement

Table-4.3.18 Passenger Space Improvement by Built Facilities （Source：Study Team）

Peak Time Year 2030 West（via North）Minibus・Taxi passenger 7,100p/h（Morning Peak） East（via South）Minibus・Taxi passenger 3,400p/h（Morning Peak） Peak Time Year 2017 West（via North）Minibus・Taxi passenger 2,100 p/h（Morning Peak） East（via South）Minibus・Taxi passenger 900 p/h（Morning Peak） Needed Passenger Space 1.0 ㎡／passenger (Under Japanese Terminal Planning Guidance)			
	Current Year 2017 Peak （Bus stop space 180 ㎡）	Without artificial ground extension Year 2030 Peak （Bus stop Space 180 ㎡）	With artificial ground Year 2030 Peak
Peak 5min Passenger Volume	West 175 passenger （2,100p/h×5/60） East 75passenger （900p/h×5/60）	West 592 passenger （7,100p/h×5/60） East 283 passenger （3,400p/h×5/60）	West 592 passenger （7,100p/h×5/60） East 283 passenger （3,400p/h×5/60）
Needed Passenger Space	West 175 ㎡ East 75 ㎡	West 592 ㎡ East 283 ㎡	West 592 ㎡ East 283 ㎡
Occupation Space per Passenger	West OK 1.02 ㎡／p Occupation Space 98% 175 ㎡＜180 ㎡ East OK 2.40 ㎡／p Occupation Area 42% 75 ㎡＜180 ㎡	West Not Satisfied 0.30 ㎡／p Occupation Space 320% 592 ㎡＞180 ㎡ East Not Satisfied 0.63 ㎡／p Occupation Area 158% 283 ㎡＞180 ㎡	West over 592 ㎡ East over 283 ㎡ Needed on Artificial Ground

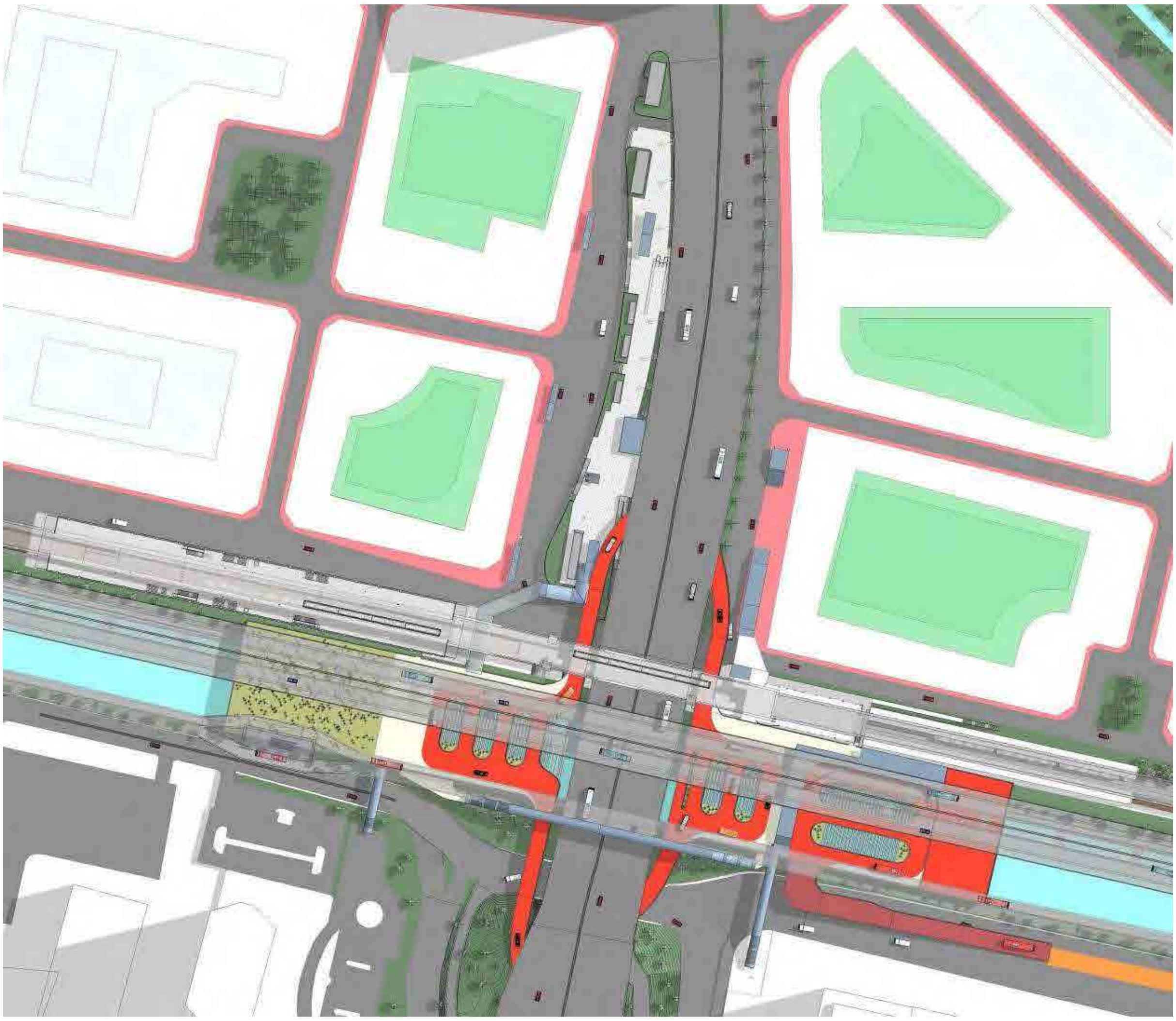


Figure-4.3.13 Anticipated Dukuh Atas Station Area in 2030

4.3.2 Planning of Railway Facilities

Current planning is focused primarily on ground-level railways and underground electric railways, and facilities inside the station are being planned only for Dukuh Atas subway station.

In order to promote regional development of a network that takes into consideration the construction of transport nodes and coordination with development in the surrounding area, the Jabodetabek Airport Line and a shortcut station for the Serpong Line are being planned. A brief introduction to the planned facilities will be presented and considered mainly in terms of pedestrian routes.

1) Planning of MRT Dukuh Atas Station

(1) Placement of connecting underground passageways

The layout of the various facilities inside the subway station has already been designed. The detailed design will developed as soon as a decision is made on the construction company.

For MRT J passengers transferring to the West Line, there is only a narrow walkway beneath Thamrin Street, and this walkway is unable to accommodate all of the passengers. Accordingly, it would be desirable to adopt a method in which an underground passageway leading from the subway station is constructed beneath Thamrin Street and connected to Sudirman Station on the West Line. Based on the pedestrian demand forecast, an effective width of 8-10 meters is anticipated, and the passageway will connect to the first basement floor (B1F) of the subway station.

As has been noted earlier, a commercial area leading to the circular pavilion outside the ticket gate is planned for the B1F floor of the subway station, so an entrance/exit for the underground passageway will be placed there. In accordance with the government's request that transport on the busy Thamrin Street not be affected during the construction period, the use of a non-cut-and-cover method, which has been used successfully in many projects in Japan, is being studied. Road crossings will be placed perpendicular to the road in order to ensure that they cover as short a distance as possible.

Connection between the subway station and the future Serpong Line shortcut underground station will be established on the B1F floor as well. The passageway will connect to a point near the underground entrance to the MRT J station on the south side.

(2) Structures constructed above subway station

Facilities located above the subway station include the stairs leading to the existing subway station, an elevator and a cooling tower. Other locations have been backfilled with earth, and a park is planned for construction on the site.

This underground station will be connected with the Airport Line from an elevated station, as the Airport Line is being planned as an elevated bridge over the existing above-ground railway. The height of the connecting passageway will be nine meters, and it will cross Tanjung Karang Street and lead to the park site.

2) Planning for Existing Sudirman Station

Currently, the West Line runs on the north side of the canal as the Jabodetabek commuter line. Sudirman Station is located on the east side of Thamrin Street. As has already been noted, the station was rebuilt in 2008, and constructing a new station building again is not being considered.

From the MRT North-South Line underground station, a passageway crosses under Thamrin Street and emerges above ground at Blora Street leading to the 2nd floor concourse of the existing station.

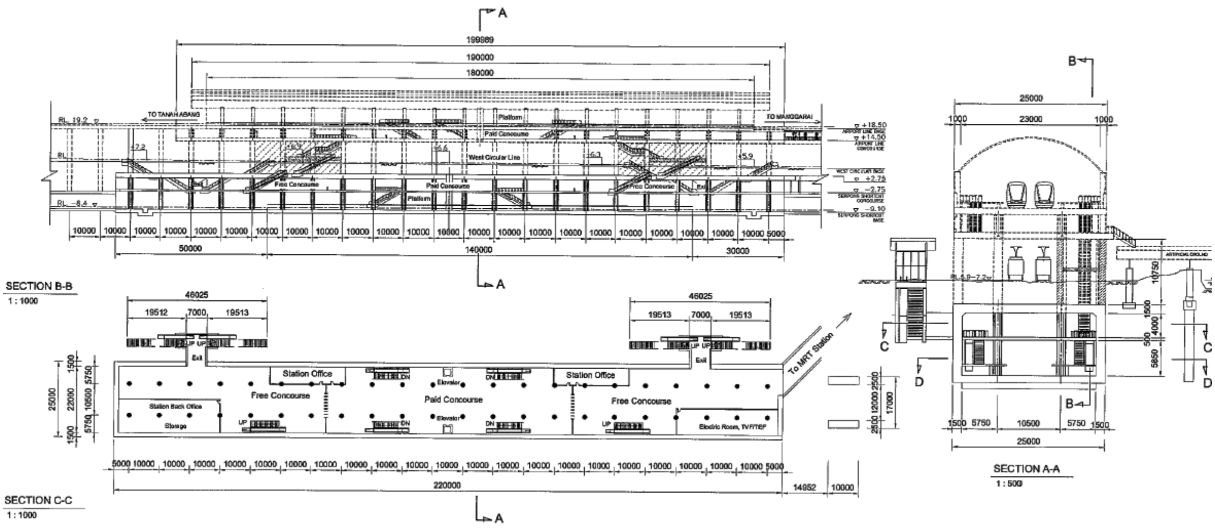
In addition, as there is not much space on the second floor of the existing station, a 4-m wide passageway will be arranged around the station, passing around the station buildings and connecting to the artificial ground on the south side.

3) Planning for Serpong Line Station and Airport Line Station

Study was based on the assumption that all lines of the Serpong Line would be constructed from the very beginning of the project. It was also assumed that the Airport Line would be an elevated structure, and that the station would be placed directly above the station for the Serpong Line due to site availability and out of consideration for ease of convenience in transferring between lines.

For both stations, the railway administrators will decide the details of the facilities inside the stations. For this reason, here the general makeup of the station facilities will be assumed, and the discussion will focus on the planning of the passenger routes between the two stations.

Due to the linear shape of the tracks, Dukuh Atas Station on the Serpong Line will have an earth covering of 4-5 meters. The station will have a length of L=220 m and a width of B=25 m and will have separate platforms. The West Line will be placed at ground level, with the Airport Line running directly overhead on an elevated track.



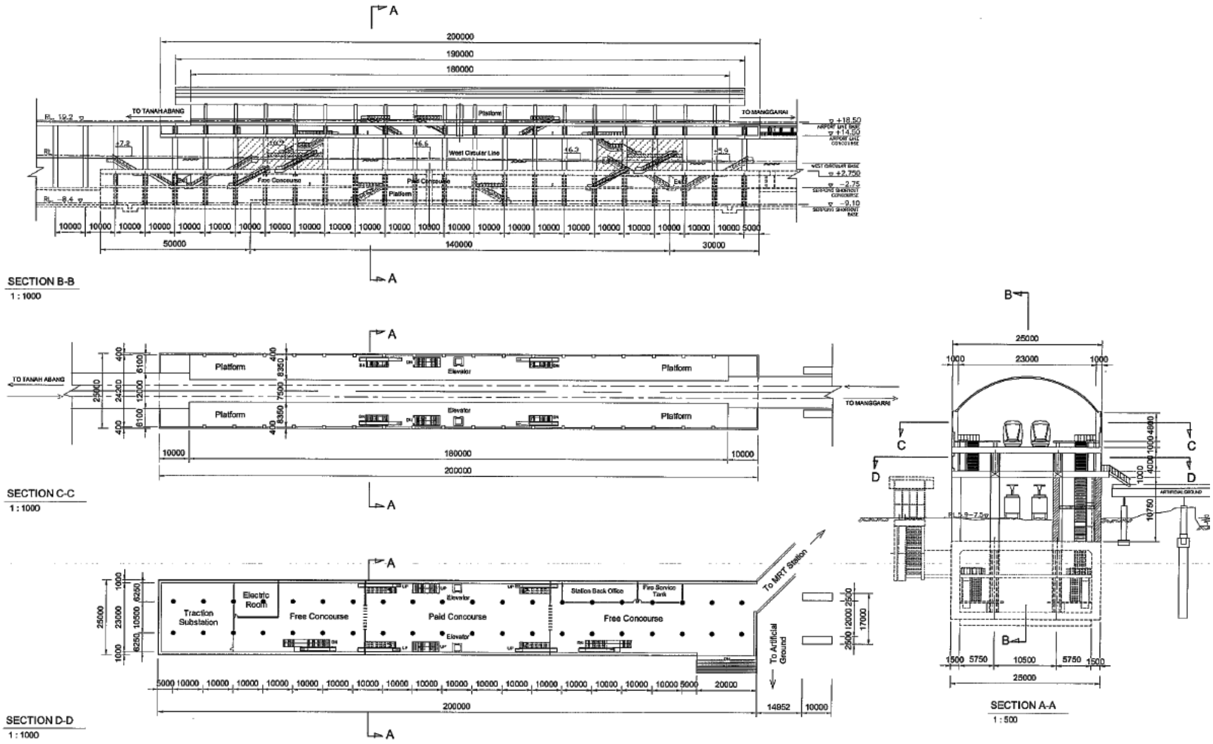
Source: Study Team

Figure- 4.3.14 Conceptual Diagram of Dukuh Atas Station, Serpong-Bekasi Line

The Airport Line station will consist of two levels, an upper track floor and a lower concourse floor. The length and width of the station will be L=200 m and B=25 m. The platforms on the upper floor will be separate platforms with a length of L=180 m (able to accommodate eight cars); as noted earlier, the lower floor will be a concourse floor with a connecting passageway that leads to the Serpong Line station below.

The station will be connected to exits that lead to the ground floor level. It will also be connected to the artificial ground over the canal.

For the Airport Line station, construction of a City Air Terminal (CAT) facility would be desirable. Under the existing plan, there is not much space for a concourse within the station, and so construction of a passenger waiting room, baggage receiving facility and so on the artificial ground is being considered.



Source: Study Team

Figure-4.3.15 Conceptual Diagram of Dukuh Atas Station, Airport Line