National Urban Mobility Program

EDSA-Bus Case Study: Operations and Business Model

Final Report

Project Background

Transport is the highest energy-consuming sector in 40% of all countries worldwide and causes about a quarter of energy-related CO_2 emissions. To limit global warming to two degrees, an extensive transformation and decarbonisation of transport is necessary. The TRANSfer project's objective is to increase the efforts of developing countries and emerging economies for climate-friendly transport with international support. The project acts as **a mitigation action preparation facility** and thus specifically supports the implementation of the Nationally Determined Contributions (NDC) of the Paris Agreement. The TRANSfer project is implemented by GIZ and funded by the International Climate Initiative (IKI) of the German Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU) and operates on three levels:

1) **Support for the MobiliseYourCity partnership**: The goal of this multi-stakeholder partnership, which is currently being supported by France, Germany and the European Commission, is that 100 cities and 20 national governments commit themselves to ambitious climate action targets for urban transport and take appropriate measures.
2) **Preparation of mitigation measures:** The project supports five countries (including Peru, the Philippines, Thailand, Indonesia) in developing greenhouse gas mitigation measures in transport. Standardised support packages (toolkits) are developed and used for the preparation of selected mitigation measures.
3) **Knowledge products, training, dialogue:** TRANSfer is sharing and disseminating best practices through the development **of knowledge products, trainings and the organisation of the annual "Transport and Climate Change Week".**

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Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
of the Federal Republic of Germany

EXECUTIVE SUMMARY

Background

Travel in Metro Manila is characterized by heavy congestion leading to extended and unreliable journey times. Public transport is typically overcrowded and uncomfortable, and with the exception of limited rail line coverage, also subject to the same congestion as private cars due to a lack of priority infrastructure.

The EDSA corridor is a highly trafficked orbital route which carries large volumes of travelers. It has been identified as a key strategic mass transit corridor in all of the strategic transport studies undertaken. Transit capacity is principally catered for by the MRT3 light rail system and the numerous bus routes which use the corridor. In recent years, MRT3 performance has suffered due to underinvestment, maintenance issues and a lack of rolling stock. Current ridership sits well below the 500,000 carried at peak operations.

Rehabilitation of the MRT3 is due to commence imminently to restore operating performance and enhance system capacity. The works are planned to commence in January 2019 and last for almost 3 years. During this time, it is anticipated that capacity will be further hampered, with a reduction from 15 to 12 operating units. Given the overcrowding presently observed on the system, these travelers are likely to be forced from the MRT system.

The E-Bus Concept and Scope of Study

The EDSA Bus or E-Bus concept has been developed to meet the imminent challenge to corridor capacity caused by the MRT3 rehabilitation. The scheme features a segregated bus corridor operating along the MRT3 alignment, serving the MRT3 stations through a sharing of the station infrastructure. The conceptual design, developed by the Swedish consultants SWECO, features infrastructure proposals which are rapidly deliverable to enable the E-Bus system to support corridor capacity during the MRT3 rehabilitation, but also to provide a new form of mass transit which will benefit travelers on the corridor in the longer term.

This report presents a strategic review of the E-Bus concept which leads to the development of recommendations on the business model for operation of the E-Bus, covering the institutional arrangements and roles and responsibilities of the key stakeholders.

Review of Ridership and Commercial Viability

A review of existing travel demand observed along the EDSA corridor, and potential abstraction of ridership to the EDSA Bus service concludes that a ridership of 125,000 passengers per day in Phase 1 is very plausible. The catchment demand would increase markedly in Phase 1.5 when more stations are serviced, making the E-Bus a viable alternative travel mode for approaching 500,000 tips presently made along the corridor axis. The scale of demand actually captured by the system will be influenced by the level of service offered by the E-Bus, the adopted fare and the inherent capacity constraints of the system.

A financial viability assessment which draws on an operating cost analysis concludes that at MRT3 or A/C bus fares, revenues would be sufficient to cover daily vehicle operating costs and also vehicle financing, with sufficient surplus to be attractive to a private operator. At a premium fare, the additional surplus could be channelled to cover system management costs.

Recommendations

Following careful review and assessment of the pros and cons of alternative options, the following conclusions have been drawn:

Form of Contract

Two potential contractual options were identified as being appropriate to the contractual relationship with bus operators:

- appointing operators on the basis of them keeping the revenue and seeking no subsidy.
- gross cost contracts where operators are paid a fee per km, and the revenue stays within the system.

On balance the gross-cost option is considered to be a better match to wider long-term strategy because it will better-support overall network rationalisation and it gives government the ability to cross-subsidise between different parts of the network in future.

Contract duration and number of operators

Contracts of about five years are considered best for public purposes, striking a balance between the contract price and the ability to change contractors / services as the city develops.

Appointing a single operator facilitates good headway management but represents a large vehicle-financing commitment. It may be that detailed service planning will allow two or three separately-identifiable services to be defined, for example an express, and two overlapping two-stopping services. These could be issued as separate franchise opportunities, allowing the appointment of up to three operators.

Service specification and performance management

The service frequency must be specified in detail, effectively providing the timetable to be run as part of the contract documentation. Performance standards can also be set, including the minimum level of scheduled km to be delivered and the headway requirements.

Specification can be done as an extension of the process LTFRB uses for P2P services.

A system to ensure that operators deliver the specification and that appropriate action is taken where not will be needed. This will be a new activity and can be carried out by the system manager. It will be greatly facilitated if there is a reporting system based on GPS data from the vehicles.

System Manager – structure and responsibilities

Most cities locate the system manger function in the public sector as part of a city-level transport authority. As this is not available yet in Metro Manila, a hybrid public / private arrangement may be considered:

- A private-sector entity would run the stations, ticketing and fare collection, bus despatching and day-to-day liaison with the MMDA over traffic management and DPWH over road infrastructure and maintenance.
- A public sector entity would hold the contracts with the System Manager and the bus operators.

If gross cost contracts are used the public sector entity would be responsible for receiving the revenue from the System Manager, then paying the System Manager and the operators. It would own the task of anticipating and dealing with any projected shortfall so would therefore require government financial guarantee. In this case the public sector entity could not be located in the DOTr but would need to be a new body, or be located within the MMDA, LTFRB or some other suitable organisation.

Bus Operator responsibilities

The Bus Operators would own the vehicles and provide drivers, service controllers and depot engineers. To get services going in the short-run they should also own the depots, unless it is considered that this requirement would negatively affect competition for contracts.

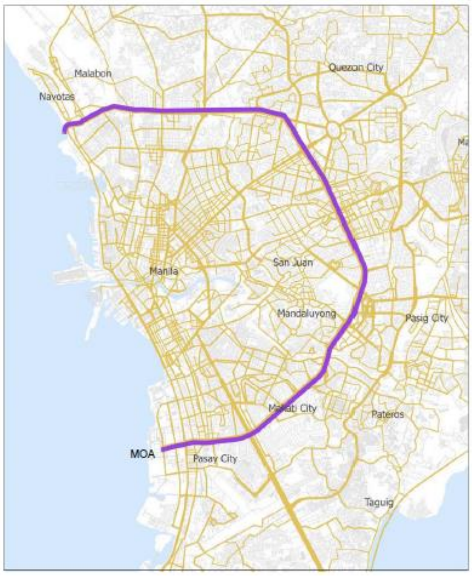
Contents

1 Overview / Context

1.1 Background to study

1.1.1 EDSA corridor and MRT services

Epifanio de los Santos Avenue, more commonly referred to as EDSA, is a major circumferential highway corridor which passes through 6 cities within Metro Manila (MM). It is the longest, and one of the most heavily congested roads in the capital. and represents an important strategic corridor within the wider transport network, carrying large volumes of traffic and people in public transport, private vehicles and taxis. Based on franchise data, almost 50 bus services use EDSA as part of the route alignment, with jeepney services, P2P buses and UV Express services also operating on the route.



EDSA Corridor (Credit: ITP)

Metro Manila Rail Map showing MRT3 (in yellow)

Further transit capacity is provided on the EDSA corridor alignment by the Metro Rail Transit 3 (MRT3) rail line which runs from North Avenue to Taft Avenue on 17km of mainly elevated track above EDSA.

The system was constructed by a private consortium - Metro Rail Transit Corporation (MRTC) - under a build, lease, transfer contract with the DOTr (formerly DOTC), with responsibility for maintaining the system availability, with the DOTC holding the franchise and running the operation and fare collection for the system.

The maintenance contract has changed hands multiple times in recent years, from Sumitomo Corporation to Busan Universal Rail Inc, and then to DOTC after operating performance and system maintenance was deemed unacceptable. DOTr has recently recommissioned Sumitomo to deliver the system maintenance functions, which will include a three-year programme of essential reparatory maintenance, supported by JICA financing.

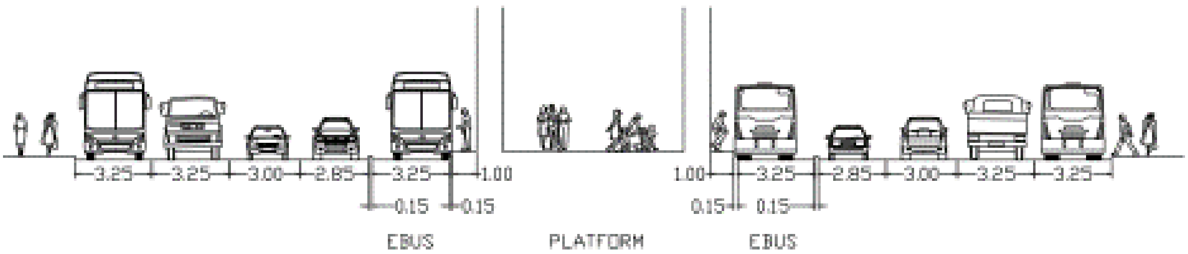
When operating at full service, MRT-3 carries upwards of 500,000 passengers per day, well in excess of the original design capacity. However, in recent years, the performance of the MRT system has deteriorated, mainly as a result of insufficient maintenance leaving fewer trains in service. The standard running of 20 trains had fallen to 15 in November 2017 and then down to less than 10 in early 2018. Performance has recently been partially restored, but the rehabilitation work required to restore system performance and to enhance capacity is expected to impact on service levels in future. Statements made by the DOTr indicate that there will be an anticipated reduction from 15 to 12 trains operating during the rehabilitation work, which is expected to commence at the beginning of 2019 and to last 32-34 months.

1.1.2 The E-Bus Concept and Objectives

The ‘Emergency Bus’ or ‘E-Bus’ scheme relates to proposals for high capacity segregated bus operations along EDSA following the alignment of the MRT3 rail line. The scheme has been promoted partly as a means of alleviating the impact of the rehabilitation works on the MRT service, with the parallel bus service providing additional capacity and options for travellers.

However, to view the E-bus solely as a rail-replacement service is to do the concept a disservice, as the role of additional bus-based mass-transit along EDSA will continue to provide a vital service to travellers even once the MRT system is restored to maximum capacity. With an estimated travel demand in the region of 2 million trips per day along EDSA (ITDP, 2015) and with the wide range of trip patterns and origin-destination pairs serviced by EDSA, the MRT3 will only ever form one element of the overall transport service offer along the corridor.

The intention is that the E-Bus will operate within the median along EDSA, taking the outside lane from existing traffic, and using newly constructed stations within the median in the location of the current MRT stations, and accessed via the overhead MRT station infrastructure.



Proposed EDSA Cross-Section for E-Bus (SWECO, 2018)

Given the imminent start of rehabilitation works, the rapid implementation of the E-Bus is of the essence. Infrastructure designs are being developed by SWECO, and according to the most recent plans, it is envisaged that the scheme will be implemented in phases, allowing the additional capacity offered by the new service to be delivered quickly, before expending the scheme to meet the longer-term strategic vision for the bus corridor.

1.2 Baseline for technical work

1.2.1 Agreed infrastructure design / specifications

The analysis presented in this report buildings on the parallel work being undertaken on the infrastructure designs and also the past work undertaken by DOTr (concept and station infrastructure designs) and the MMDA (highway designs). This section provides a brief overview of the key elements of the current scheme concept and designs which are taken as pre-determined.

Alignment

The E-Bus will run in segregated infrastructure along EDSA. However, under current proposals, the scheme will be implemented in phases, with the service plan developing and extending as supporting infrastructure and wider route rationalisation progresses.

The phases of implementation are summarised as follows:

Phase 1

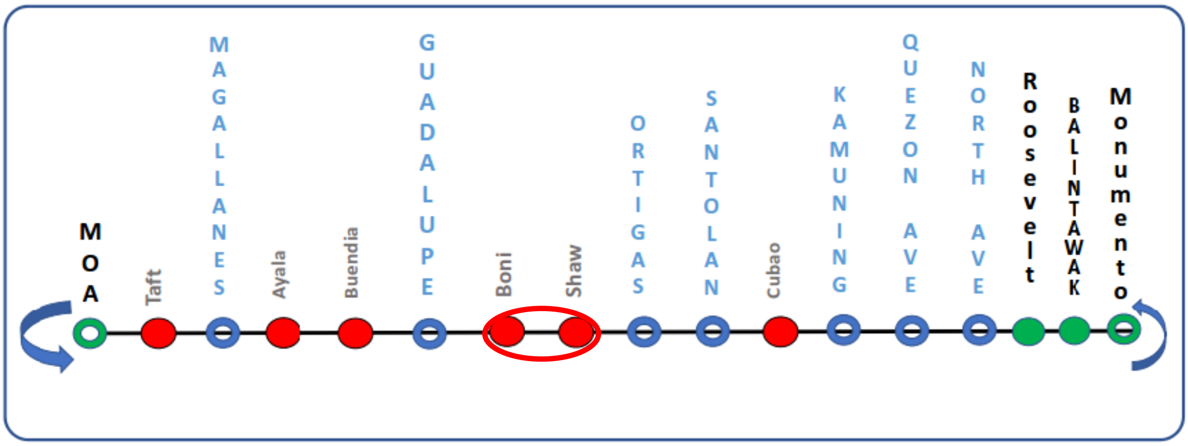
- 120 buses(bi-lateral doors) operating along EDSA
- Limited MRT station call between MOA and Roosevelt

Phase 1.5

- Increased bus numbers and more operators
- Inclusion of remaining stations between MOA and Roosevelt and extension to Monumento

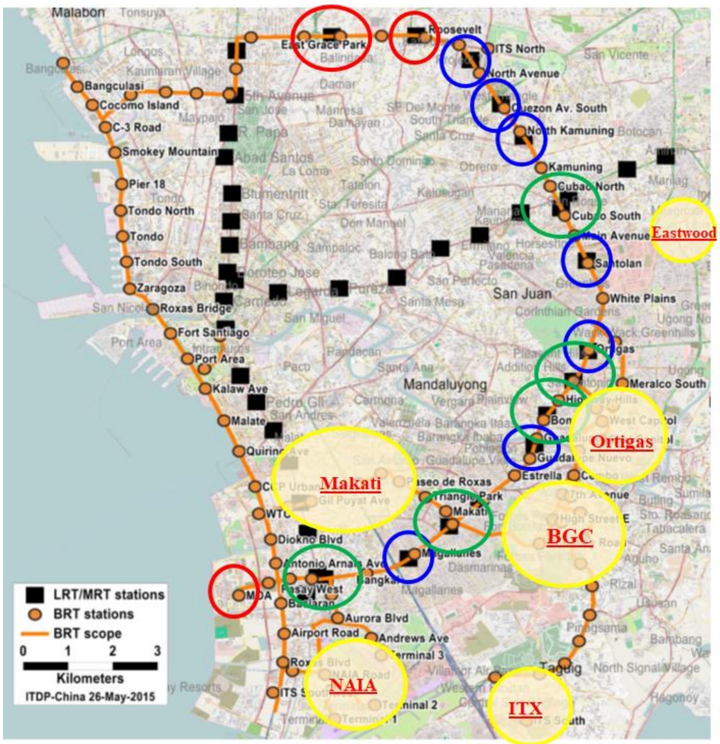
Phase 2

- Integration of buses from outside lanes and extension to destinations off-coriridor



E-Bus Route (Key: Green stations – terminals, blue stations – Phase 1, red stations - Phase 1.5.) NB: Boni and Shaw stations serviced by single combined E-Bus station

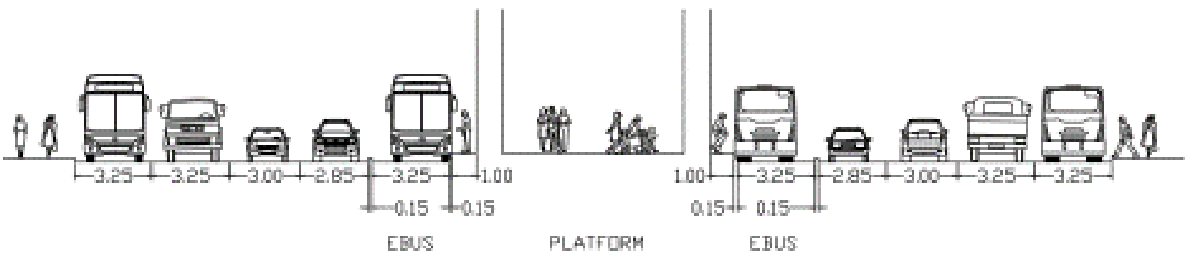
The proposed alignment and phasing of the E-bus system shown in the figure below.



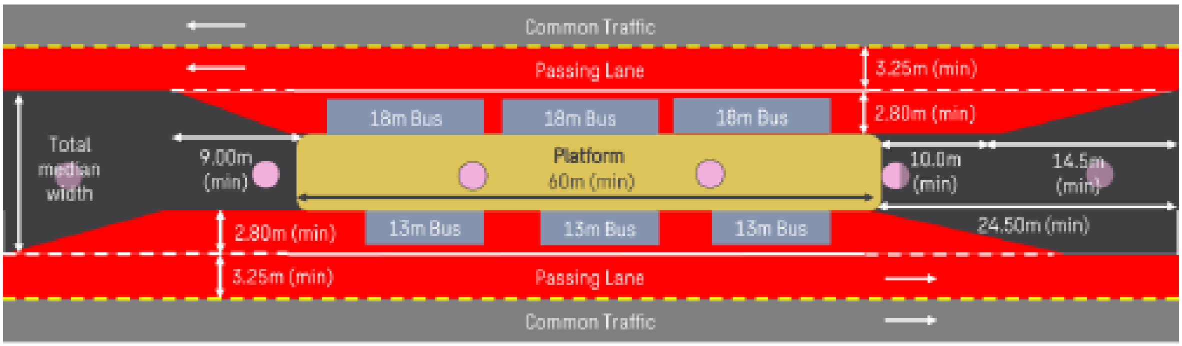
E-Bus Route (Key: Red stations – terminals, green stations – Phase 1, blue stations - Phase 1.5, activity areas Phase 2)

Infrastructure

The E-bus will use dedicated median bus lanes underneath the elevated MRT3 rail service, with median stations located at the existing MRT stations. Use of dedicated lanes adjacent to the median is intended to allow fast and reliable operation. It also potentially permits sharing of facilities with the MRT3 service, such as ticketing equipment, passenger circulation areas and access bridges from adjacent properties.



Proposed EDSA Cross-Section for E-Bus (SWECO, 2018)



E-bus stop layout (SWECO, 2018)

The station design features a median 3 bay platform providing level boarding. This design allows the boarding of up to three vehicles at the same time. Kassel kerbing is proposed to facilitate accurate vehicle docking at station and to avoid damage to vehicles.

Vehicles

Median runningways with median stations requires the buses to have doors on the left-hand side. In order to maintain the possibility of operating beyond the median infrastructure, it is proposed that the procured buses will also be equipped with conventionally-located doors to allow services to extend beyond the new EDSA lanes.

Example of 13m bus vehicle with bi-lateral doors (DOTr, 2018)

1.3 Report content / scope of technical support

The scope of the technical input required from this consultancy assignment has been determined based on indicated requirements given by the Project Management Office (PMO) and agreed with GIZ.

The infrastructure and service features described above are to be the baseline assumptions for the current work. The technical support provided will include the following outputs and activity areas.

1.3.1 Output Requirements of the Study

The new requirements are to review and provide commentary on:

- The service offer - including alignment, frequency, capacity.
- Fares and ticketing options.
- Vehicle financing.
- Organisational models - including the division of responsibilities between Bus Operators, Transport Organising Bodies and DOTr and contract arrangements.

1.3.2 Activities

The requirements of the study have been addressed by carrying out activities in the areas listed below:

- Current demand and services
  - The existing model for service provision
  - Details of services provided on the EDSA
  - Patronage by route, demand at the busiest points
- The new EDSA express service
  - Strategic objectives
  - The alignment, the infrastructure and the vehicles
  - Relationship to the MRT3 rail service
  - Defining service alignment frequency and capacity
  - Relationship with other services: demand transfers from bus and rail
  - Arrangements for passenger access, waiting and boarding
- Sustaining the new service
  - Estimated costs of obtaining and operating vehicles
  - Estimated cost of staff,
  - Funding of infrastructure: alignment, stops, stands, depots
  - Fares options and associated revenue
- Business models for the new EDSA express service
  - Alternative business model options which may be deliverable within the present institutional framework
  - Responsibilities, including ownership of vehicles, revenue, equipment etc
  - Contract options
- Capacity building
  - Extending the new EDSA service
  - Applying the business models to other bus services
  - Organisational development requirements

2 Baseline analysis

2.1 Existing public transport service provision

In this section, we review what is known about the existing travel patterns observed along the EDSA corridor, setting the context for an evaluation of the strategic vision for the E-bus and for the demand forecasting of potential ridership.

2.1.1 MRT Services

The MRT3 system is one of three rail systems in Metro Manila, and has historically carried the highest passenger volume, with daily ridership approaching 550,000 passengers at its peak, well in excess of the design capacity of 350,000 passengers per day.

The standard scheduled service for the MRT system is as follows:

Regular Weekdays Train Schedule					
Period	Time	No. of Trains	Headway	Start of Operation	End of Operation
Morning	4:30AM-6:30AM	15→19 Trains	7→4 Minutes	First Revenue Train departs North at 4:37 AM	Last Revenue Train departs Taft at 10:40 PM
AM Peak	6:30AM-9:00AM	20 Trains	4 Minutes		
Off Peak	9:00AM-5:00PM	15 Trains	5.5 Minutes		
PM Peak	5:00PM-7:30PM	20 Trains	4 Minutes		
Night	7:30PM-10:30PM	19→15 Trains	4→7 Minutes		

The service and maintenance issues discussed earlier have severely hampered system in recent times. The number of trains operating has fallen from the scheduled 20 to 15 or less. Ridership figures are not available for 2018 but given the recent service levels, it is likely that these will fall short of the most recently available figures which indicate average daily patronage of 463k passengers recorded between July 2016 and June 2017.

Annual ridership figures for 2017 are not available, but a DOTr press release quoted an average daily ridership of 463,202 passengers from July 2016 to March 2017, up from 379,223 daily trips between July 2015 to June 2016. Origin-destination data provided by DOTr covering each month in 2016 indicates an annual ridership of 129.2m.

It is clear that the present volume of travellers carried on the MRT3 does not represent the scale of demand. This is evidenced by the significant queuing observed to board the rail service (often exceeding an hour to board a train and the scale of patronage by comparison with the original design capacity, even following the recent falls). Patronage has not kept pace with the growth trend in trips observed in the early years of the system operations, and the number of people carried is now below that carried as far back as 2008.

Figure 2.1: Annual MRT3 Ridership

Source: SYSTRA 2010

The table overleaf shows the boarding and alighting patterns derived from the 2016 annual ticket gate data.

Analysis of OD Patterns (2016)

	ORIGIN													
DESTINATION	NOR	QUE	GMA	CUB	SAN	ORT	SHA	BON	GUA	BUE	AYA	MAG	TAF	Total
NOR	37,229	358,954	271,018	1,352,997	329,689	926,593	1,907,621	1,039,932	1,382,990	805,287	2,148,681	1,203,579	1,803,150	13,567,720
QUE	157,923	19,824	65,720	662,989	149,561	536,713	1,099,311	653,968	1,159,776	529,154	1,455,500	1,133,700	1,773,628	9,397,767
GMA	134,422	41,261	14,052	164,776	34,640	115,313	301,734	172,011	410,354	206,634	404,613	446,348	993,586	3,439,744
CUB	2,192,425	815,990	313,156	56,698	201,536	549,224	1,448,072	1,147,319	1,896,979	899,565	2,252,323	1,755,834	3,835,356	17,364,477
SAN	765,017	243,707	124,323	118,889	12,014	28,609	113,724	91,284	290,288	67,971	186,050	259,821	667,946	2,969,643
ORT	2,997,024	1,081,863	466,769	695,839	53,581	17,420	42,386	133,993	299,098	130,147	295,124	561,887	2,043,417	8,818,548
SHA	4,167,977	1,408,598	702,262	1,217,074	111,612	29,466	30,898	187,246	696,362	276,187	806,729	1,080,735	3,761,007	14,476,153
BON	2,032,658	698,428	315,343	952,155	69,176	117,374	206,950	21,542	177,816	133,630	442,883	568,371	1,698,694	7,435,020
GUA	2,238,169	1,125,544	578,941	1,457,924	251,241	254,715	664,474	213,972	26,341	61,137	319,237	423,241	1,946,958	9,561,894
BUE	1,772,796	667,107	373,023	695,262	88,811	136,376	287,177	167,332	58,155	10,708	36,787	107,201	545,960	4,946,695
AYA	3,767,508	1,367,501	658,980	1,652,824	207,532	315,949	807,740	498,675	358,715	75,554	23,476	268,133	2,290,790	12,293,377
MAG	1,193,693	636,559	330,483	772,781	152,485	262,238	663,150	367,087	383,423	70,889	167,811	16,968	655,800	5,673,367
TAF	1,904,630	1,496,578	1,022,628	2,853,559	585,546	1,421,177	3,250,321	1,349,461	1,917,024	464,422	2,068,916	867,572	40,397	19,242,231
Total	23,361,471	9,961,914	5,236,698	12,653,767	2,247,424	4,711,167	10,823,558	6,043,822	9,057,321	3,731,285	10,608,130	8,693,390	22,056,689	**129,186,636**

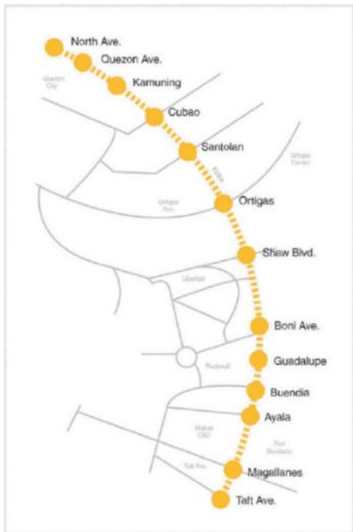
The table above shows MRT3 trip origin-destination data for the calendar year 2016.

The busiest stations in terms of footfall are as follows:

- Taft
- North Avenue
- Cubao
- Shaw Avenue
- Ayala

The following station pairs are the most frequented:

- North Avenue to Shaw Boulevard
- Taft to Cubao
- North Avenue to Ayala
- Taft to Shaw Avenue
- Shaw Avenue to Taft



MRT3 Stops

2.1.2 Existing Standard Bus and Jeepney services

As earlier stated, EDSA forms part of the route alignment for a large number of road-based public transport services, with franchised bus and jeepney services operating along the corridor.

Bus Services

The figure below, taken from the ITP RTRS2 work shows a spider diagram of all of the City bus routes servicing EDSA. (Note that these don't include the provincial services, but that these are being moved to outer terminals in any case).

Figure 2.2: Existing Bus Routes serving EDSA (ITP, 2015)

A detailed list of the city bus and jeepney services operating along EDSA based on the 2015 data is set out below.

City Bus Services Operating along EDSA

Route	Mode	Length (1-way)	Vehicle Units	Daily veh trips	Daily Pax
Alabang-Malanday (via EDSA, McArthur)	PUB	43.7	62	244	27,996
Angat-Leveriza (via Ayala)	PUB	58.5	0	49	5,738
Baclaran-Malanday (via EDSA, McArthur, Ayala)	PUB	35.2	79	293	27,308
Bagong Silang-Baclaran (via EDSA, Commonwealth)	PUB	39	77	140	11,922
Bagong Silang-NAIA (via EDSA, Commonwealth)	PUB	42.8	15	105	8,564
Balibago-SM Fairview (via EDSA)	PUB	60.5	0	65	7,611
Dasmarinas-Navotas (via EDSA)	PUB	58.6	46	237	16,193
FTI-SM Fairview (via EDSA, Commonwealth)	PUB	34.7	10	116	9,821
Grotto-Baclaran (via EDSA, Commonwealth)	PUB	42.2	104	698	83,074
Grotto-Baclaran (via EDSA, Commonwealth, Ayala)	PUB	43.6	39	184	19,181
Grotto-FTI (via EDSA, Commonwealth)	PUB	42.9	20	267	24,781
Grotto-NAIA (via EDSA, Commonwealth)	PUB	45.1	253	465	60,733
Grotto-NAIA (via EDSA, Commonwealth, Ayala)	PUB	47.3	20	73	10,683
Hertiage Homes-Baclaran (via EDSA, NLEX)	PUB	38.5	14	94	9,096
Malanday-Baclaran (via EDSA, McArthur)	PUB	33	66	165	20,665
Malanday-Muntinlupa (via EDSA, McArthur)	PUB	44.2	67	56	6,685
Malanday-NAIA (via EDSA, McArthur, Ayala)	PUB	39	114	564	74,945
Marilao-Muntinlupa (via EDSA, McArthur)	PUB	55.1	58	100	11,335
Montalban-Baclaran (via EDSA, Aurora, Ayala)	PUB	36.3	20	51	4,449
Montalban-Baclaran (via EDSA, Commonwealth)	PUB	36.6	20	70	6,396
NAIA-Malanday (via EDSA, McArthur)	PUB	36.8	98	477	44,623
Navotas-Alabang (via EDSA)	PUB	41.5	212	253	28,035
Navotas-Baclaran (via EDSA)	PUB	30.8	41	217	32,270
Navotas-Baclaran (via EDSA, Ayala)	PUB	33	213	242	41,752
Navotas-FTI (via EDSA)	PUB	32.4	137	458	78,844
Navotas-Pacita (via EDSA)	PUB	49.7	173	290	28,632
Norzagaray (Sapang Palay)-Baclaran (via EDSA)	PUB	54.4	89	322	33,246
Norzagaray (Sapang Palay)-NAIA (via EDSA)	PUB	58.2	15	281	32,359
Norzagary-Baclaran (via EDSA, Marilao)	PUB	58.5	36	10	1,235
Novaliches-Alabang (via EDSA, Mindano)	PUB	41.2	231	447	57,446
Novaliches-Alabang (via EDSA, NLEX)	PUB	46.3	33	169	22,456
Novaliches-Baclaran (via EDSA, Mindanao)	PUB	30.5	173	198	17,428
Novaliches-Baclaran (via EDSA, Mindanao, Ayala)	PUB	32.7	15	286	25,794
Pacita-Letre (via EDSA)	PUB	48	8	22	2,149
Pacita-Novaliches (via EDSA, Mindanao)	PUB	46.7	21	135	14,226
Pacita-Novaliches (via EDSA, NLEX)	PUB	54.4	130	250	28,846
SM Fairview-Alabang (via EDSA, Commonwealth)	PUB	43.8	353	505	54,973
SM Fairview-Baclaran (via EDSA, Commonwealth)	PUB	33.1	224	646	54,019
SM Fairview-Baclaran (via EDSA, Commonwealth)	PUB	35.3	120	389	34,159
SM Fairview-Buendia/Cartimar (via EDSA)	PUB	32	47	153	19,168
SM Fairview-NAIA (via EDSA, Commonwealth)	PUB	36.9	18	55	4,908
SM Fairview-Pacita (via EDSA, Commonwealth)	PUB	54.1	72	357	27,948
Sta Maria-Baclaran (via EDSA, McArthur)	PUB	45.5	16	16	1,664
Sta Maria-Baclaran (via EDSA, McArthur, Ayala)	PUB	47.5	16	102	12,747
Sta Maria-Baclaran (via EDSA, NLEX, Ayala)	PUB	55.9	99	37	4,741
Sta Maria-Santolan (via Quezon City)	PUB	43.9	40	367	26,419
Total	**PUB**		**3,652**	**10,427**	**1,143,529**

Source: ITP, RTRS 2016

Daily patronage carried by buses which run along the EDSA corridor axis stands at over 1 million passengers per day (excluding provincial services), or more than twice that of the MRT3 at the peak of its operational performance.

2.1.3 Jeepney Services

The EDSA corridor has been assigned as a major bus corridor, so jeepney services operating along this alignment have been limited. However there are a small number of routes in operation, which collectively carry a further 150,000 travellers per day.

Jeepney Services Operating along EDSA

Route	Mode	Length (1-way)	Vehicle Units	Daily veh trips	Daily Pax
Balintawak-Monumento	PUJ	3.1	390	5029	58,443
EDSA/Shaw-Guadalupe	PUJ	3	35	16	264
Kamias-Malabon	PUJ	16.7	1	5	172
Malabon-Monumento (via Letre)	PUJ	3.8	238	1796	38,929
Navotas-Monumento	PUJ	6.9	186	1296	29,025
Sangandaan-MCU	PUJ	2.2	91	715	10,682
SM MOA-Pasay Rotonda	PUJ	1.8	41	325	4,502
SM North-Aurora	PUJ	4.5	28	208	4,633
Total	**PUJ**		**1,010**	**9,390**	**146,650**

Source: ITP, RTRS 2016

2.1.4 Other Services

Aside from the franchised route-based bus and jeepney services operating along EDSA, other public transport modes include the Point-to-Point (P2P) buses, UV Express services and the ride hailing (Grab) and taxi services that provide a public transport type service for many travellers.

2.2 Characteristics of Bus Operations

2.2.1 Institutional Structure

The main entities involved in providing the Manila bus network or supporting processes are: the central government Departments of Transportation (DOTr) and of Public Works and Highways (DPWH); the Land Transportation Franchising and Regulatory Board (LTFRB), an agency of the DOTr; the Metro Manila Development Authority (MMDA), providing certain Metro-wide services; and the bus operators. Responsibilities are summarised below.

Central government - DOTr and DPWH are accountable for delivering the transport policies and programme set out in the Philippine Development Plan and other national strategies. The DOTr's main actions in the bus area are carried out through its agencies, particularly the LTFRB.

The Land Transport Franchising and Regulatory Board - The LTFRB prescribes and regulates bus routes, issues Certificates of Public Convenience to operators and sets fares. As the agency responsible for franchise issue, the LTFRB has an important role in the practical implementation of the Public Utility Vehicle Modernisation Programme, an initiative to modernise public transport including upgrading the quality of the bus fleet and transferring responsibility for network planning to local government units. Consolidation of operator entities is being encouraged, to enable improved access to investment funds. The Board's main routine activity is in licensing bus routes. There has been a moratorium on new franchises affecting EDSA, though the new Omnibus Franchising Guidelines allow for new issues if in compliance with PUVMP. Existing provincial bus routes are in the process of being amended to terminate at off-EDSA terminals. Comprehensive restructuring of the EDSA bus service network awaits further technical study.

The Metro Manila Development Authority - The Authority was created in 1995 to carry out functions which need to operate at metro level:

- Development and land-use planning, including project programming, monitoring and implementation
- Transport and traffic management
- Waste disposal, sewerage and flood control; public health management; and emergency planning
- Promoting the safe and convenient movement of persons and goods, provision for mass transport, regulation of road users and administration of traffic enforcement

It has the power to set up offices to manage any metro-wide project within its remit. The Chairman is appointed by the President. Policy direction is set by the Metro Manila Council, composed of the 17 mayors of the constituent cities and the municipality. DOTr, DPWH, other government departments and the police have non-voting representation at council meetings.

In the bus domain, MMDA's main role is its management of the traffic signalling system and enforcement on the major highways. This is a general function and it is understood there is no explicit targeting of bus speeds.

Bus Operators – Analysis of the LTFRB franchise data suggests that there are approximately 100 city bus operators running services using EDSA, with a total fleet of around 3,000 buses operating on 50 routes. The average registered company size is relatively small with the typical operator owning about 50 units. In some cases two or more operating companies are in common ownership.

2.2.2 Bus service delivery responsibilities

The responsibilities of the various bodies in relation to bus service delivery are set out below:

Network definition and licensing. The pattern of bus services in Metro Manila has been defined through operator proposals over many years, subject to checks and licensing by the LTFRB. A portion of service operates without a licence, though this illegal operation is regularly targeted by enforcement agencies. The main features of network development have been the moratorium on new licences for services along the EDSA and the requirement for services from outside the Metro area to terminate at bus stations rather than continue along the EDSA. Overall network rationalisation is the subject of ongoing studies.

Network change. The LTFRB has the powers to reorganise service patterns in line with the outcomes of the studies but it is not expected that they will be concluded in the near future. There is no recent experience of implementing a comprehensive recast of the network and the processes and timescales for doing it would need some consideration.

Bus priority and traffic. There is some bus priority on EDSA, but its effectiveness is reduced due to the very high volumes of buses and by violations. The traffic system is operated by various public and private road owners, though the MMDA has an overview, and direct control of the main highway. There is active management of the traffic system on EDSA, but no selective detection or other features explicitly designed to support bus reliability. As part of the "numbering" system, individual buses are required to be off-the road one day a week. City authorities or landowners impose additional restrictions in their areas, such as banning certain areas or streets to buses.

Fares and ticketing. Fares are proposed by operators and regulated by the LTFRB. Elements of the fare system are set in legislation, for example the premium for air-conditioning. Revenue is collected and retained by operators. There is no multi-operator nor multi-modal ticket.

Vehicles. Vehicles are supplied by operators and certified by the LTFRB. Historically the public sector has intervened in vehicle acquisition and standards. Access to finance has been seen as one of the main factors hindering modernisation.

Industry structure. Operating companies registered with the LTFRB vary in size but smaller entities predominate. Government is pursuing operator consolidation as one element of the Public Utility Vehicle Modernisation programme.

Staff. Bus staff are generally salaried but there is an element of commission, related to the number of passengers carried. This has some impact on operations, for example it can lead to waiting at stops for longer than is needed to load and unload.

Information and marketing. This the responsibility of operators. There is no network-level information available.

Funding. Operators cover their costs from fares. General information on profitability is not available, but it is thought to be healthy.

2.2.3 Existing operating characteristics

The main bus services along EDSA use high-floor vehicles with capacity for around 60-70 passengers. Seating is arranged in transverse rows of five and there is a narrow aisle leading to a single door at the front suitable for one passenger at a time. Tickets are sold by a conductor riding on the bus. No timetables are available. There are no route numbers. Route is indicated by stickers on the bus showing both terminal points and one or two intermediate points or roads.

Figure 2.3: Typical city bus

The P2P services which are licensed to run on EDSA are authorised for a total of 120 buses (source SWECO, 2018) so are themselves adding significantly to flows on the corridor. They provide a timetabled service running from one (or a small number) of suburban stops into the city centre. In many cases vehicles are similar to other buses on EDSA. However, some operators in Metro Manila are using citybuses with two wide doors, low floors and more space internally for standing. Fares can be around three times as high as on standard buses.

Figure 2.4: P2P bus

UV Express services are operated by vans with a capacity of around 25. As with P2P they run directly from suburban points to the central area. Unlike P2P there is no timetable. Boarding is via sliding doors at the side or lifting doors at the back. Fares are also a premium level compared with standard buses.

Figure 2.5: UV Express vehicle

Some bus services are organised directly by landowners, notably in the Bonifacio area where the vehicles are high floor but otherwise specified as modern city buses with dual doors and good internal circulating space.

Figure 2.6: BGC Transport vehicle

2.2.4 Commentary on existing arrangements

Previous studies have found that that there is an over-supply of vehicle flows with respect to highway capacity combined with under-supply of passenger capacity at peak times. The experience of using buses is low in quality, with crowding, slow journeys and poor information. Network development has not been responsive to the rapid growth of the city and a significant number of residential areas have little or no bus services, relying instead on jeepney or UV Express. These services can be high-frequency but are very crowded, uncertain in their operation (there are no timetables) and they can contribute to highway congestion.

Steps have been taken to enhance the service offer, Jeepney modernisation has commenced. This will transform the ride experience however the vehicles are still too small for main-trunk service. The P2P services which have been introduced in the last three or so years offer more predictable journey times (a timetable is available). PUB modernisation will require bus operators to consolidate. A network rationalisation study is planned. Longer-distance "provincial" buses are being required to terminate at new peripheral facilities located around 6-10 km from the central area and transfer their passengers to a service authorised for city operation.

Nonetheless, significant further work is needed to bring the bus service offer up to the standards required to meet current aspirations and to be able to support a rapidly-growing population and workforce in Metro Manila and surrounding areas. The classic resolution has three essential features: (a) use of bigger buses with low-floors and wide doors to reduce bus stop dwell times and to reduce highway impacts; (b) efficient ticketing regimes, also to reduce stop dwell-times; (c) a network approach to planning instead of one based on operators' route-level perspective, allowing loadings per bus to be increased, perhaps at the cost of requiring some passengers to transfer to complete their journey.

This combination would allow the total bus capacity to work more effectively, both for passengers and in relation to highway space. The E-Bus starts to introduce some of these features. However, the current Manila operating model would not permit this to happen to the necessary extent. Of the three features, current policies and delivery mechanisms are closest to requirements in respect of vehicles. Powers to control network planning exist in principle, but the institutional structures are not in place. Ticketing is an area which is traditionally entirely in the operators' domain

Successful delivery of E-Bus requires consideration of wider changes to the Metro Manila bus operating model. Some may not be possible in the short-term, but the short-term policy should be consistent with the desirable longer-term direction.

2.3 Strategic vision for EDSA corridor

2.3.1 JICA Dream-plan vision

The JICA Dream Plan[1](2014) updated and collated previous studies on the transport network in Metro Manila, providing vision for a transport network and land use plan for Mega Manila.

The Dream Plan recognised the importance of the EDSA alignment in carrying strategic trips, recommending that a new (underground) rail system be built along part of the EDSA axis.

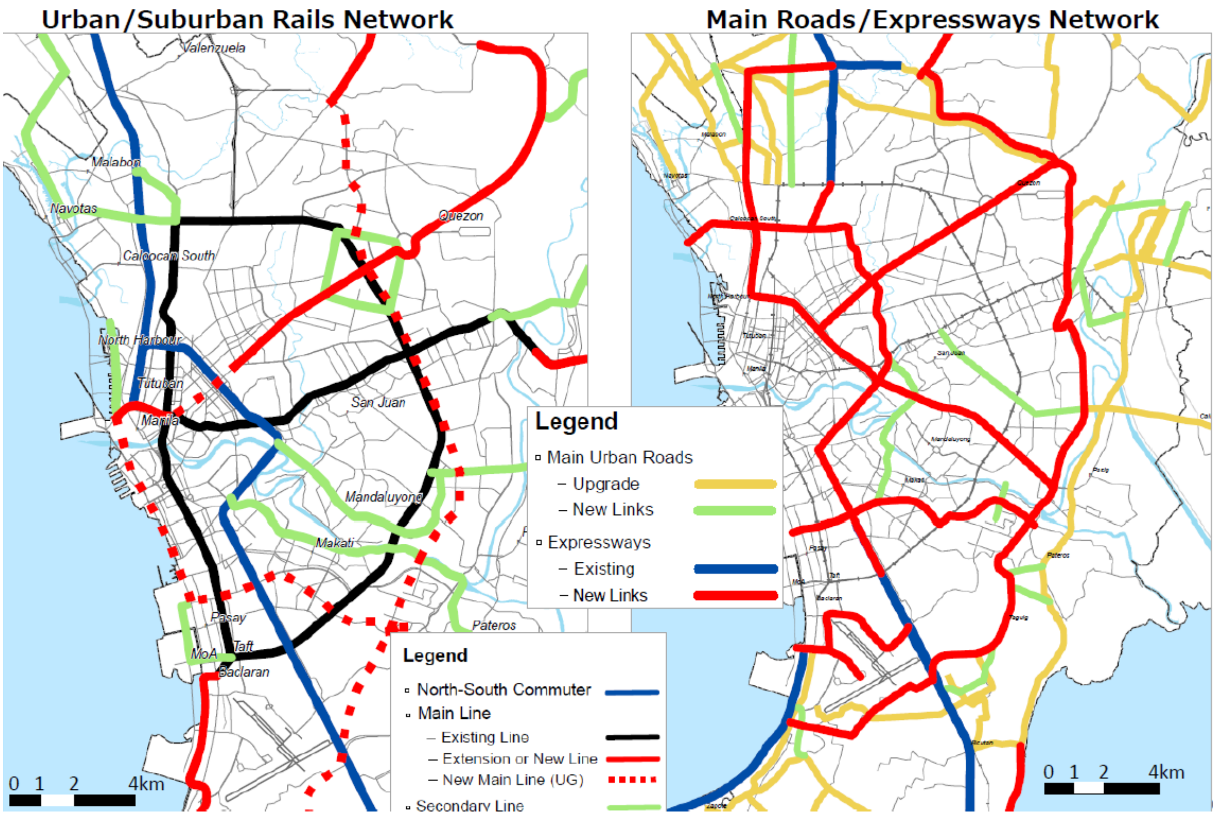


Figure 2.7: JICA 'Dream Plan' vision for public transport and highway network

[1] Officially named the MMUTIS Update and Capacity Enhancement Project (MUCEP)

The proposed Metro Manila Subway system forms part of the Duterte Administration 'Build, Build, Build' agenda, and having been approved by NEDA in 2017, work is due to commence on the subway before the end of 2018. The latest alignment has deviated slightly from the EDSA corridor: The subway is anticipated to begin partial operation by 2025.

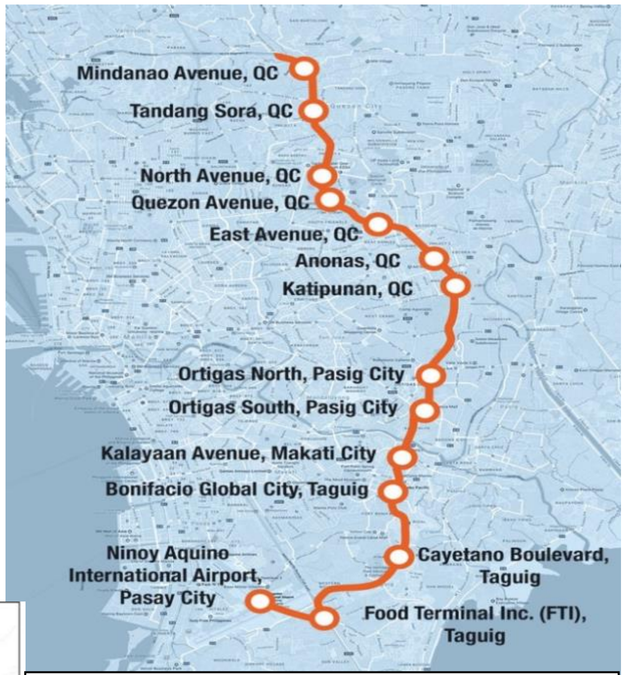


Figure 2.8: Manila Subway - Proposed Alignment

2.3.2 RTRS vision

The Road Transit Rationalisation Study (RTRS) undertaken in 2014 provided a strategic vision for road based public transport in Manila. This study identified 15 strategic public transport corridors, one of which being EDSA.

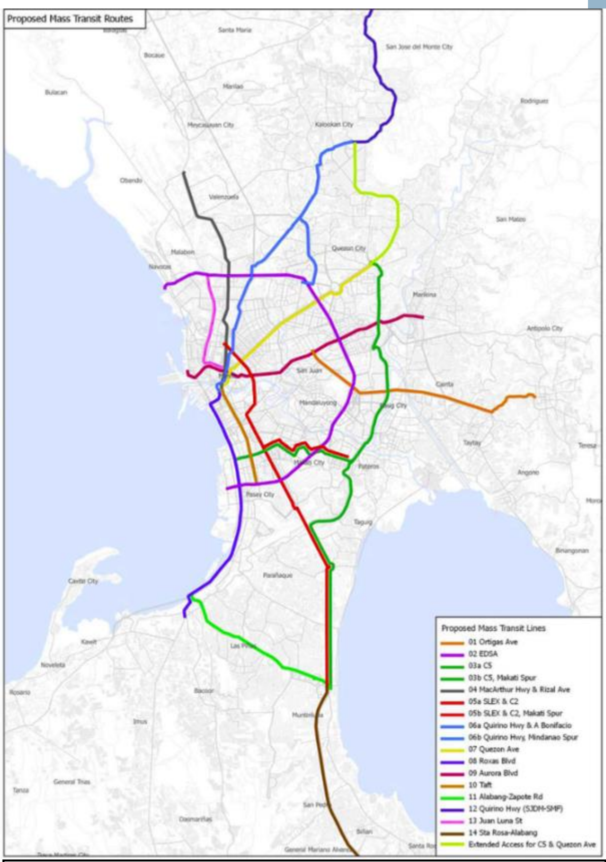


Figure 2.9: RTRS vision- strategic public

The study recommended that these corridors should serve as the 'back-bone' of the strategic public transport network, offering high capacity mass-transit, complemented by a supporting network of secondary and feeder services.

Further detail of the reorganisation of the existing road based public transport services was developed in a second stage of the rationalisation planning – RTRS2.

This set out how existing services should be reorganised in preparation for the implementation of the mass transit systems on each of the strategic corridors, in recognition that the delivery of such high capacity corridors, whether BRT or rail based, would take some time.

A detailed report on the EDSA corridor was prepared, providing valuable information on travel patterns on the corridor and on strategic vision for the EDSA corridor.

The EDSA report recommended that the existing 54 city bus routes be rationalised down to 18 routes running on amended alignments, and supported by an additional 5 feeder routes. The proposed rationalised route structure is shown in the figure below.

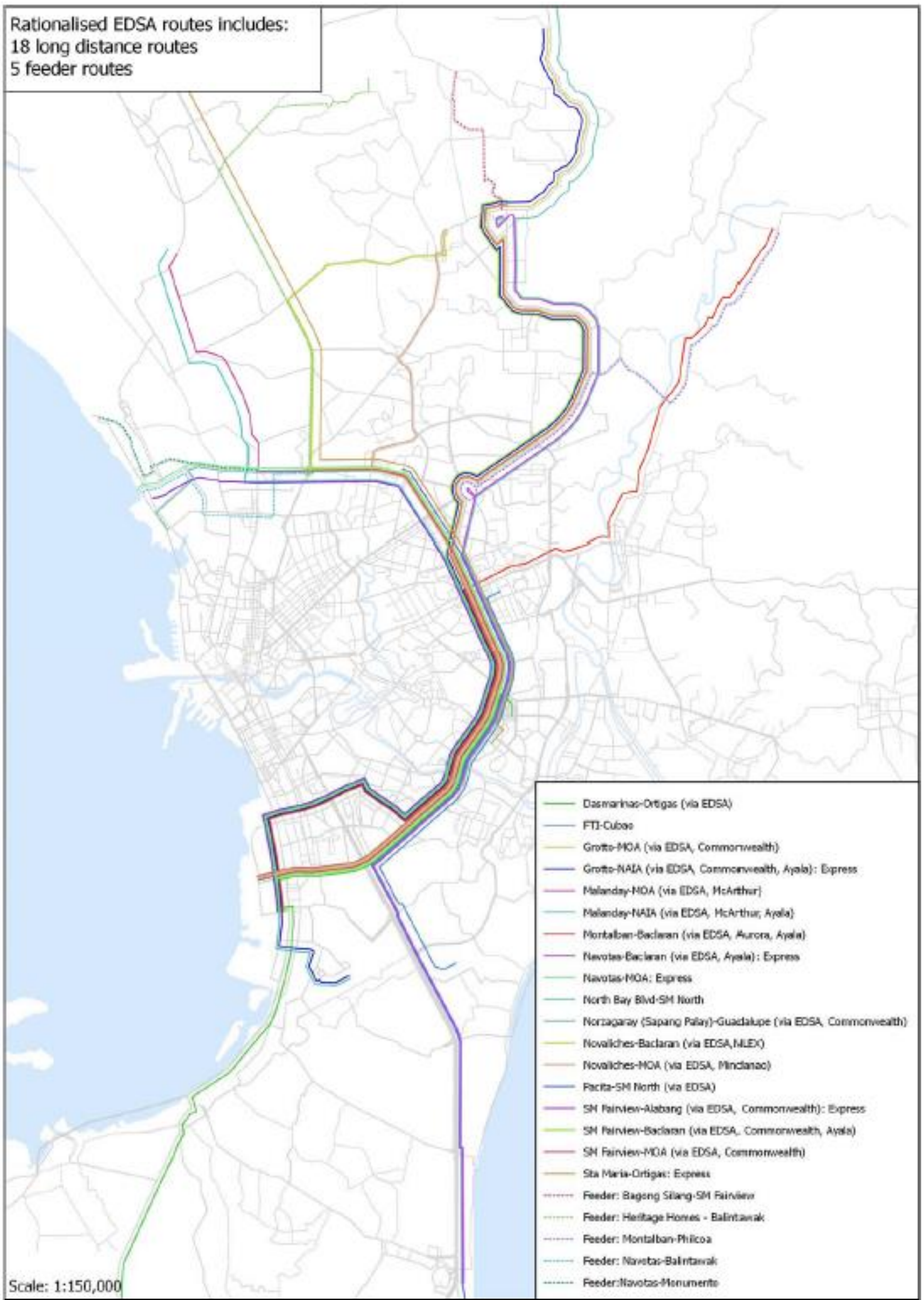


Figure 2.10: Proposed Rationalised Bus Routes service EDSA (ITP, 2015)

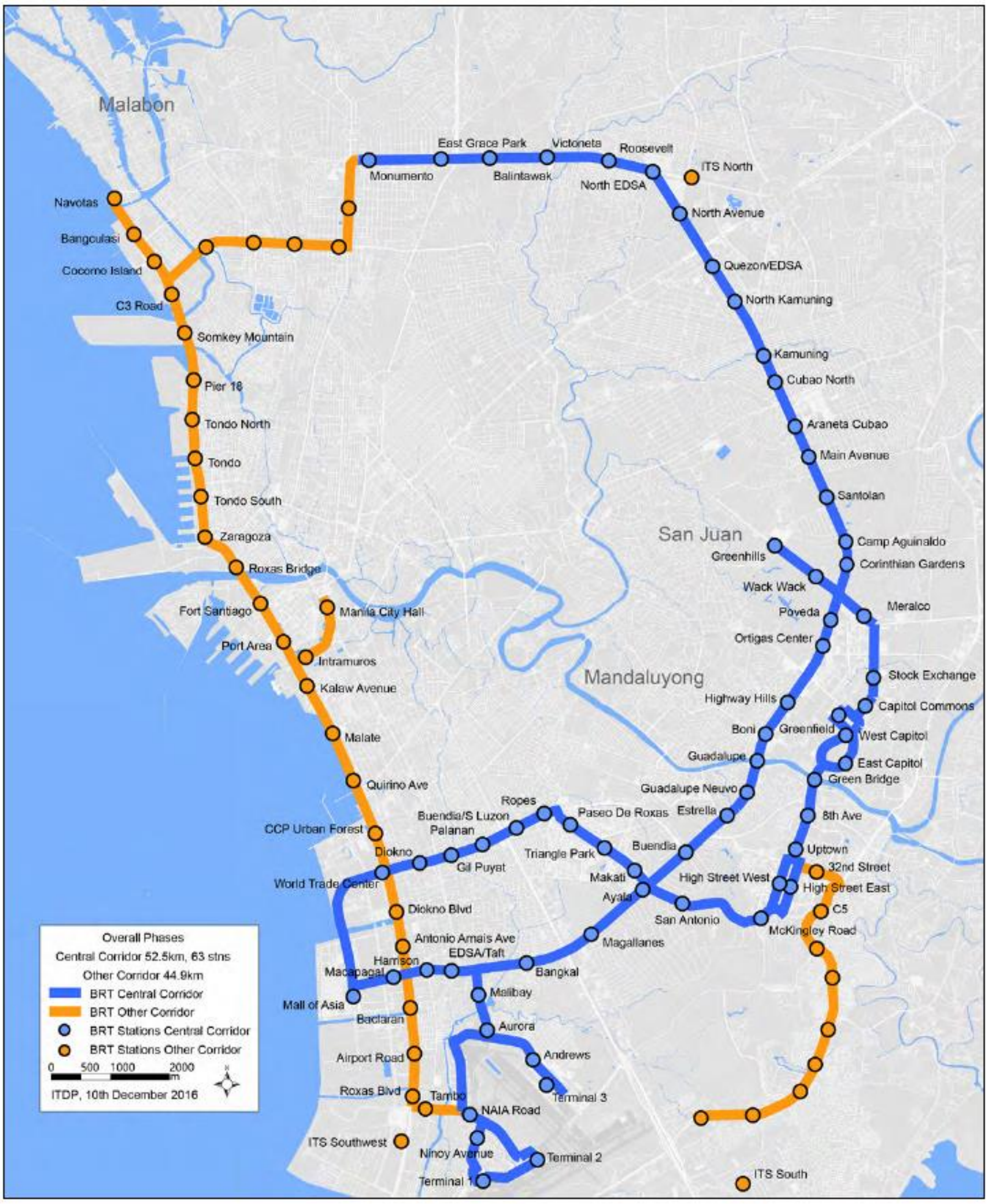
Modelling of the revised operations within the CUBE transport model developed as part of the RTRS study forecast that the changes would lead to an increase in passenger trips carried on services using the EDSA corridor alignment, reaching 1.76 million, whilst requiring a reduced number of buses, at 3,275 units. Average bus loadings, observed to be low on existing service, were forecast to increase from 316 passengers per day to 536.

2.3.3 EDSA BRT Corridor Conceptual Study

In line with the recognition of the strategic importance of EDSA and the need for mass transit along the corridor, plans were developed for a bus rapid transit system to be implemented along EDSA. The ITDP EDSA Central Corridor BRT Conceptual Study (2016) develops this vision.

In reviewing the existing level of bus service provision along the EDSA corridor, ITDP highlighted the great unpredictability in bus service frequency and in journey times, and developed proposals for a segregated corridor located in the median, bearing similarities with the layout proposed for the E-Bus.

Artists Impression of EDSA BRT (ITDP, 2016)



Proposed BRT corridor infrastructure (ITDP, 2016)

The service plan proposed by ITDP consisted of 22 different services (closely following existing service provision) with a fleet requirement of 1,273 buses, including 477 articulated and 796 standard buses. Estimated patronage was seen to reach 2 million trips per day.

In summary, a variety of previous studies have identified a strategic case for enhanced bus service quality on EDSA. Detailed work has included bus demand forecasting and rationalisation of the service plan. There are no specific estimates of impacts on other traffic, but all the studies are consistent with the general strategic need to shift more motorised movement in Metro Manila onto public transport.

3 Review of proposal

3.1 Introduction

This section describes the proposal as developed to date, in the context of its strategic aims to:

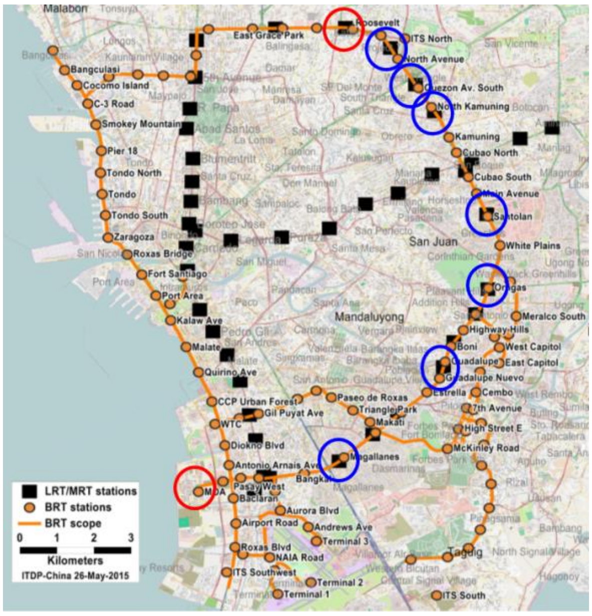
- Supplement the capacity provided on MRT3 during its renovation
- Permanently expand public transport capacity on EDSA
- Help develop the practical application of new business models for bus services.

3.2 Proposed scheme characteristics

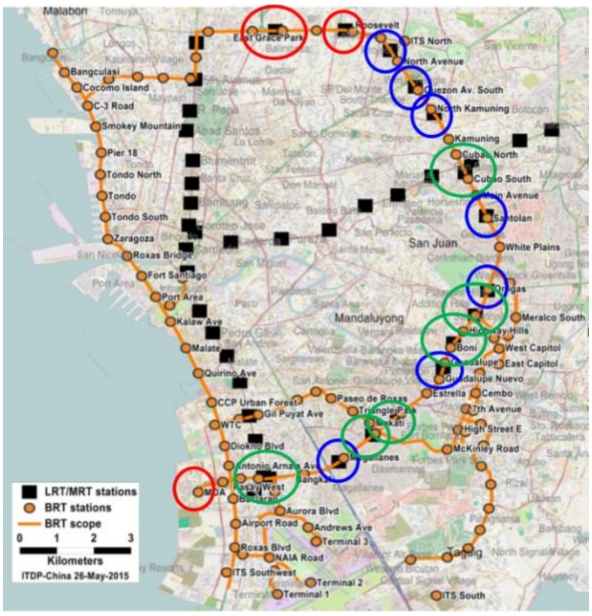
3.2.1 Alignment and phasing

Based on current proposals, the E-Bus is to be implemented in three phases. Phase 1 will operate a limited stop service between MOA and Roosevelt, before being extended to Monumento in Phase 1.5, serving the remaining intermediate MRT3 stations. The longer-term vision in Phase 2 will see extension of services to destinations off the EDSA corridor, with tributary services operating to the major activity centres.

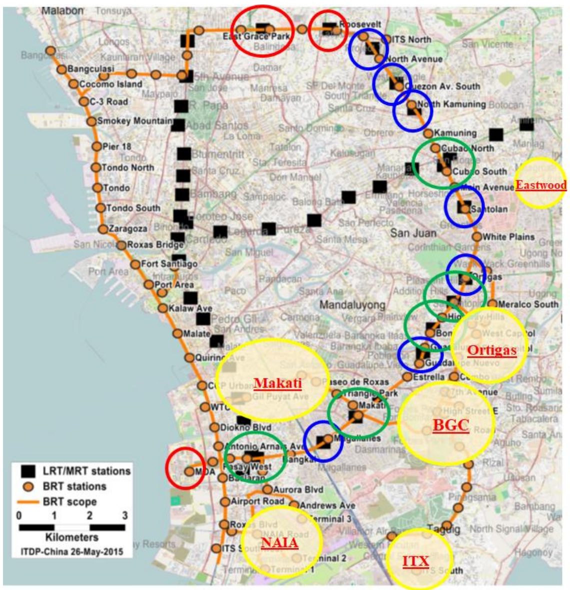
The alignment and stopping patterns of each of the phases is shown below.



Phase 1: 2 terminals + 7 stations



Phase 1.5: Extend route, add intermediate stations



Phase 2: Tributary services to off-corridor destinations

In the short term, the decision to operate only along the MRT3 alignment is consistent with the role of the E-Bus in supporting the rail line during its rehabilitation. The decisions relating to the stops to be served are driven by the technical constraints to rapid delivery.

The extension of the service in Phase 1.5 to Monumento, and the inclusion of the additional intermediate stops will allow the E-bus to serve as a travel choice for all existing MRT3 catchment.

The expansion of the services, and the introduction of tributaries to destinations off the EDSA corridor is fully consistent with the strategic transport vision for the capital, as presented in both the RTRS study and the EDSA BRT proposals. The route options for service expansion should be guided by these past reports which include high level service planning of tributary services. The potential new services will however be influenced by:

- **Runningway infrastructure constraints**. Median operation provides for reduced friction operations for buses along the segregated trunk corridor, but presents challenges for vehicles leaving the corridor. There is a need for junctions or merge/diverges allowing bus vehicles to leave the corridor to access the tributary destinations.
- **Station infrastructure capacity**. The introduction of multiple services in a high-volume system can greatly complicate the passenger management arrangements the station. Whilst the trunk corridor only serves a single destination in each direction, all travellers are queuing to board the same service. Once there are a number of different destinations served (or indeed express services introduced), there is a need to separate the passenger boarding points for the different services. The present infrastructure designs with three boarding bays limits the potential to operate a complex service plan with multiple services and revised station infrastructure would be required to accommodate direct / tributary services.
- **Integration of the kerb-side services**. Phase 2 intends for the inclusion of existing services operating along EDSA. Use of the segregated runningway (within capacity limits) and amalgamation of the existing services into the new operating structure offers the potential to enhance operational efficiency and be of benefit both to public transport passengers and other road users on EDSA. However, as noted above, station layout would need to be modified to accommodate the requirements of serving multiple service destinations.

3.2.2 System Design

The design characteristics of the system have been set out in Section 1.2. It is not within the scope of this study to undertake a detailed review of the scheme designs which have been developed, but rather to take those designs as the basis for our analysis, and the implications in terms of operational performance and the delivery chain.

We make the strong caveat therefore that although the designs have been considered for the purposes of this report, we have not undertaken any assessment of the engineering aspects of the designs or of the operational safety of the system.

We would highlight the importance of undertaking a full safety audit of the proposals once the final details of the design have been finalised, in particular with relation to the movement of passengers though the system. Passenger safety within the MRT3 stations, on the stairways and on the E-Bus platforms must be carefully assessed, given the high anticipated demand, and the scope for irregular and potentially excessive demand movements wishing to gain access to the E-Bus platforms.

3.3 Relationship to other services

3.3.1 Relationship to MRT 3

The relationship between service provision levels on the MRT and the anticipated demand (and hence required capacity) on the E-bus is fundamental.

Based on the latest information, service levels on the MRT are expected to be impacted during the rehabilitation, although not to be suspended completely. A reduction of the usual 15 to 12 trains is the stated expectation, and the implications on MRT capacity of these reduction needs to be clearly established.

Factors which are key to the relationship between MRT-3 and the E-bus include the following:

- Level of service on MRT-3
- Stations in operation on MRT-3 (in case of temporary shutting of individual MRT-3 stations during the rehabilitation work.
- Phasing of the E-bus (including stations and services operating)
- The form of access provided to the MRT-3 station infrastructure by E-bus passengers – i.e. whether segregated from MRT-3 travellers by ticket gates or other cordoning
- The fare level on the E-bus and differential between E-bus and MRT-3 fares.
- The quality of service provided by the E-bus, including journey time, reliability and comfort

3.3.2 Relationship with other services: demand transfers from bus, rail

The E-bus may be anticipated to abstract existing travellers not only from the MRT-3 but, if service characteristics are attractive, also from other public transport modes. The E-bus will essentially represent a parallel and competing service to many existing EDSA bus services and represent an alternative option for many of the trips presently carried.

Again, the nature of the interaction between the E-bus and the existing services will be dependent upon a number of factors, including:

- Phasing of the E-bus (including stations and services operating)
- The fare level on the E-bus and differential between E-bus and MRT-3 fares.
- Level of service offered by the E-bus, including journey time, reliability and comfort
- Response of the existing bus operations to the new competition

3.4 Summary and next steps

3.4.1 Compatibility with strategy

E-Bus is not specifically listed in the Dream Plan but is generally consistent with the wider strategic aims for a high-quality public transport service, provided that it is implemented in a way that is consistent with further development of bus and rail infrastructure set out in the Plan. However, the Dream Plan does not address the delivery challenges associated with bus service improvement in Manila

Next steps:

- E-Bus gives a chance to add delivery experience. The business model for E-Bus can be used to develop clearer lines of accountability for bus improvements, acknowledged to be an issue at present.

3.4.2 Response to passenger priorities

Passengers prioritise a safe, reliable journey. Reliability is linked closely with variation in travel times. E-Bus clearly addresses the "on-board" component of travel time via provision of busways. If the traffic management designs can be agreed, then buses should run considerably faster.

Next steps:

- Waiting and boarding times can also be high at present and further development work is needed in these areas, specifying stops which are easy to use, with good information, simple ticketing, adequate circulating and waiting areas, crowd management and simple boarding procedures.
- Additionally, the business model could also be used to target reliability, via contractual incentives.

3.4.3 Innovation, flexibility and transferability

E-bus is clearly innovative in its busway design.

Next steps:

- The project is an opportunity to demonstrate how innovative business models could support delivery of government policy for transforming bus services, for example by introducing competition for the market rather than on the road. This may potentially be transferable to the wider network.
- At the same time E-bus needs to provide a robustly reliable service to passengers so it is important that design flexibility is retained to avoid innovation becoming a cause of delay to the introduction of the service.

3.4.4 Financial sustainability

E-bus project sponsorship has transferred within DOTr, from the rail to the road division, meaning rail funding cannot be used. Hence the funding structure needs to be identified.

Next steps:

- There is local experience of business organising their own bus services and their experience may be useful as they have a strong interest in successful public transport.
- A detailed understanding of the cost and income structure of the proposal is required.

4 Development of scheme

4.1 Demand forecasting and revenue estimation

Determining the likely scale of demand for EBUS services forms an important part of service planning and assessment of commercial viability. Forecasting prospective ridership for a completely new service has inherent uncertainties. Traveller response to the new services may be influenced be a wide range of variables, which each themselves may be unpredictable.

We identify the following factors as being strongly influential to prospective ridership:

- Service levels prevailing on the MRT-3 and kerbside buses
- Fare level of the E-Bus relative to MRT-3 and to other bus services
- Service levels provided by the E-bus – journey times and comfort relative to the alternatives
- The inherent capacity constraints of the system

A high-level demand analysis has been developed as part of this study, drawing on the baseline demand data presented earlier

Indicative passenger projections are made for the E-Bus service roll-out, and these ridership estimates underpin the revenue forecasts feeding in to the financial modelling. The process and detailed assumptions relating to the passenger and revenue model are set out below.

4.2 Comparison of Journey Attributes

Traveller response to the E-Bus services, as outlined above, will be influenced by the service offer provided by the new system relative to that of the existing travel options. We consider below the main components to the traveller journey below.

4.2.1 Journey times

In-vehicle travel time is typically one of the most important factors driving traveller mode choice. With segregated runningway separating the E-bus services from the habitual congestion observed on EDSA, journey times on the new service are expected to be lower than the existing kerbside bus services, approaching that of the MRT3 travel times.

Estimates of travel times for the typical 9km journey made on MRT3, and the end-to-end MRT3 journey are provided in the table below. The travel times for kerbside bus have been based on an operating speed of 15kph (source ITP, 2016) and 25kph for the E-Bus. MRT3 journey times are taken from the operating timetable and reflect well-running operation.

Table 4.1: Comparison of journey times for EDSA services

	Journey Time (mins)		
Journey	**MRT3**	**Kerbside Bus**	**E-Bus**
Quezon Avenue to Guadalupe – 9km	17	37	22
North Avenue to Taft – 16.5km	30	66	40

Based on the anticipated operating speeds, the E-Bus will deliver journey times around 40% faster than the kerbside buses. For the average MRT3 journey length of 9km that translates to a journey time saving of 15 minutes. The E-Bus journey times will not be competitive with MRT3 journey times (assuming MRT3 is operating to published journey times), although the time differential is smaller than between the kerbside bus and the E-Bus. For the average journey length, the E-Bus would be just 5 minutes slower than a journey by MRT3.

Journey time reliability is also important to passengers, and in situations of high variability, travellers may place even greater weight on having a dependable journey time than on the journey time itself. Data on journey time variability for kerbside buses or the MRT3 is not available, but with segregated infrastructure, the E-Bus may be expected to deliver more reliable journey times than the kerbside buses.

4.2.2 Fare levels

The cost of travel is important to travellers, particularly where different modes exhibit differing fare levels. The prevailing fares charged by the existing services on EDSA are as follows:

MRT3

Commuters who ride the MRT-3 are charged PHP13 for the first two stations, PHP16 for 3–4 stations, PHP20 for 5–7 stations, PHP24 for 8–10 stations and PHP28 for 11 stations or the entire line. The fares are broadly based on the PHP11.00 base plus PHP1 per km fare calculation which is applied to all rail lines (DOTC, 2014)

A fare table with indicative travel times is shown below:

Travel Time Guide / Fare Guide												
Travel Time												
Taft	3:02	5:32	7:18	10:24	12:14	14:24	16:59	20:24	22:54	25:54	27:45	30:00
	Magallanes	2:30	4:16	7:22	9:12	11:22	13:57	17:22	18:52	22:52	24:43	26:58
North Ave		Ayala	1:46	4:52	6:42	8:52	11:27	14:52	17:22	20:22	22:13	24:28
P13.00	Quezon Ave		Buendia	3:06	4:56	7:06	9:41	13:06	15:36	18:36	20:27	22:42
P13.00	P13.00	Kamuning		Guadalupe	1:50	4:00	6:35	10:00	12:30	15:30	17:21	19:36
P16.00	P13.00	P13.00	Cubao		Boni	2:10	4:45	8:10	10:40	13:40	15:31	17:46
P16.00	P16.00	P13.00	P13.00	Santolan		Shaw	2:35	6:00	8:30	11:30	13:21	15:36
P20.00	P16.00	P16.00	P13.00	P13.00	Ortigas		Ortigas	3:25	5:55	8:55	10:46	13:01
P20.00	P20.00	P16.00	P16.00	P13.00	P13.00	Shaw		Santolan	2:30	5:30	7:21	9:36
P20.00	P20.00	P20.00	P16.00	P16.00	P13.00	P13.00	Boni		Cubao	3:00	4:51	7:06
P24.00	P20.00	P20.00	P20.00	P16.00	P16.00	P13.00	P13.00	Guadalupe		Kamuning	1:51	4:06
P24.00	P24.00	P20.00	P20.00	P20.00	P16.00	P16.00	P13.00	P13.00	Buendia		Quezon Ave	2:15
P24.00	P24.00	P24.00	P20.00	P20.00	P20.00	P16.00	P16.00	P13.00	P13.00	Ayala		North Ave
P28.00	P24.00	P24.00	P24.00	P20.00	P20.00	P20.00	P16.00	P16.00	P13.00	P13.00	Magallanes	
P28.00	P28.00	P24.00	P24.00	P24.00	P20.00	P20.00	P20.00	P16.00	P16.00	P13.00	P13.00	Taft
Fare Table												

Source: DOTr

Bus Fares

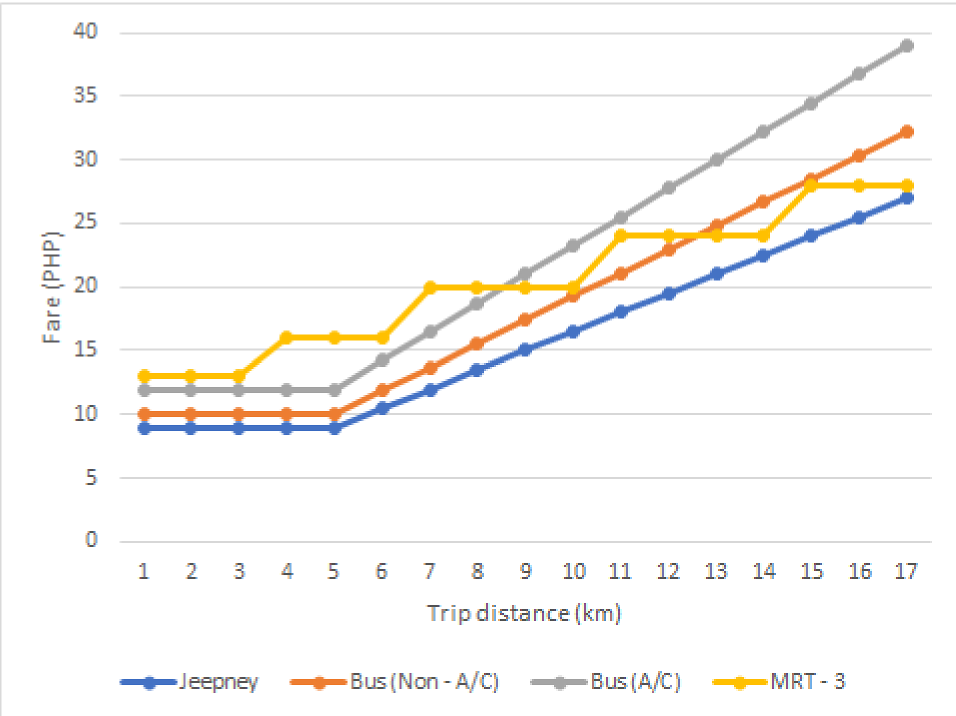
Bus (and jeepney) fares are regulated and set by the LTFRB. They presently consist of a fixed element or 'minimum fare' for the first portion of the journey followed by an additional per-km fare component thereafter. Fare level changes are typically driven by changes in the price of diesel which represents an important and unstable cost driver for service delivery for operators (although other cost elements such as spare parts and toll fees also sometime cited). As such, the justification for fare increases (and equally for fare reductions – sometimes tabled by the industry itself) are often made on the basis of the recorded change in diesel prices at the pump.

The current bus fares, unchanged since 2014, are as follows:

Standard Bus: Base fare PHP10 for first 5 kms and PHP1.85 for each proceeding km

Air-Conditioned Bus: Air con buses must charge 20% more than standard buses (LTFRB, 2005). The current fare tables set a base fare of PHP12 for first 5km + PHP2.25 per km thereafter.

A comparison of the fares charged by different modes based on distance is shown below:

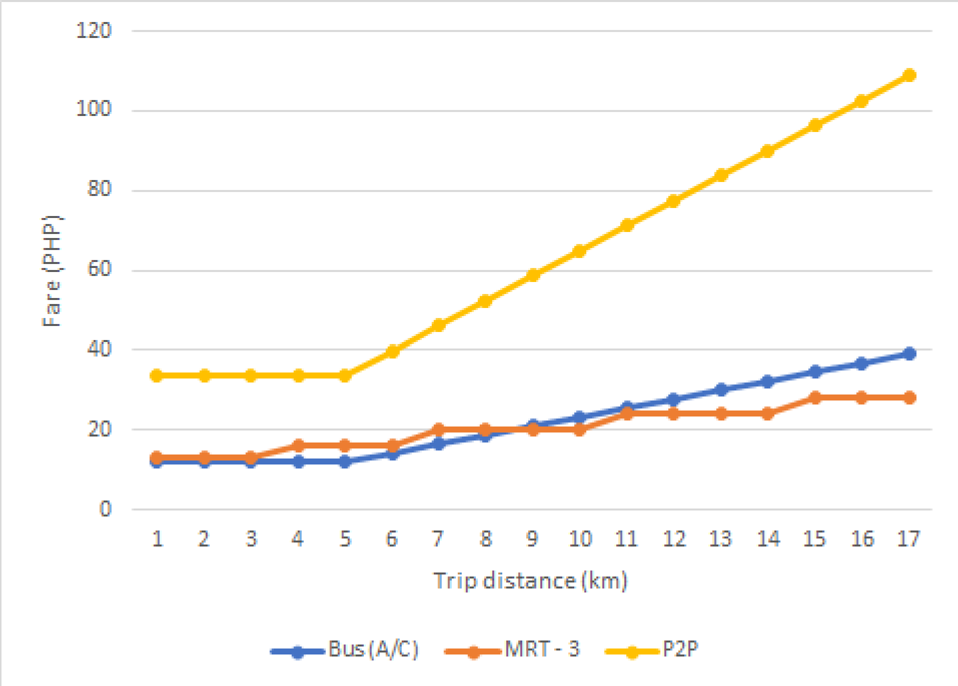


Source: GIZ consultant team

The fare for the typical journey distance of around 9km recorded along EDSA (based on MRT-3 trip data) are PHP17 on a standard bus compared to PHP20 for the equivalent journey on MRT3.

P2P Fares

Point to Point (P2P) services are permitted to charge a premium, reflecting higher levels of service offered by the direct services. An authorised maximum fare is set by LTFRB, although the P2P operator can choose to charge a lower fare to increase patronage. Analysis of the published P2P fare levels suggests that the implicit fare formula broadly equates to PHP6.4 per km. P2P services typically operate on routes longer than the E-Bus alignment, and of course fares are for end-to-end with no intermediate fare prices. However, if the implied fare formula was to be adopted for the E-Bus, with the same 5km base fare, the fare profile would be as follows:



Source: GIZ consultant team

Based on the average journey length, and the end-to-end MRT3 journey, the differing fare levels are as follows:

Table 4.2: Comparison of fares for EDSA services

	Fare (PHP)				
Journey	**MRT3**	**Jeepney**	**Kerbside Bus**		**P2P**
			Non A/C	**A/C**	
Quezon Avenue to Guadalupe – 9km	20	15	17	21	58
North Avenue to Taft – 16.5km	28	27	32	39	109

For the average journey, MRT3 fares are similar to those of the air-conditioned kerbside buses, whilst P2P fares are almost three times as high. For end-to-end journeys, MRT3 becomes cheaper than the bus. The fare setting considerations for the E-Bus are explored in further detail below.

4.3 Catchment Demand

The first step to estimating potential demand is to identify the size of the potential catchment demand from which travellers may be abstracted to the new service. The source of catchment demand is likely to be threefold:

- MRT3 ridership
- EDSA bus passengers
- Abstraction from other corridors and modes (e.g. from taxi)

We consider the scale of the potential demand from each of these sources below:

4.3.1 MRT3 modal shift

The E-bus runs along the identical axis of the MRT3 line, with some shared stops. However, the E-bus will not serve each of the MRT3 stops, even in later phases. The MRT3 stops to be served in each of the phases are indicated below:

MRT3 Stop	Phase 1	Phase 1.5 onwards
North Avenue	Yes	Yes
Quezon Avenue	Yes	Yes
Kamuning	Yes	Yes
Cubao		Yes
Santolan	Yes	Yes
Ortigas	Yes	Yes
Shaw Bvd		
Boni-Shaw		Yes
Guadalupe	Yes	Yes
Buendia		Yes
Ayala		Yes
Magallanes Ave	Yes	Yes
Taft		Yes

Source: Phasing outlined in SWECO Draft Final Report, 2018

As such, the service may not serve as a direct replacement for all travellers of the MRT3. Indeed, analysis of the service coverage in Phase 1 set against the recorded traveller origin-destinations demonstrates that the service will only provide a direct alternative to the MRT3 for under 20% of the existing travellers. In Phase 1.5, this would more than double to over 40% of travellers for whom the E-bus could provide a direct station to station replacement.

The scale of potential catchment and the likely proportion of travellers which may be abstracted from the current[2] MRT3 ridership during the rehabilitation works is presented in the table below. These estimates adopt the following assumptions:

- An annualization factor of 330 to convert annual demand to average weekday ridership
- An assumed 15% diversion rate based on the most recent information relating to the rehabilitation impact on MRT3 capacity and service levels, suggesting a reduction from 15 to 12 train units operating during the works (i.e. 20% reduction) of which ¾ is assumed to be abstracted to the E-Bus.

	E-Bus Phase 1	E-Bus Phase 1.5
MRT3 ridership (annual)	129,187,000	
MRT3 Ridership (daily)	391,000	
E-Bus total stop-stop catchment	72,400	166,500
Potential diversion (@15%)	10,900	25,000

The estimated passenger diversion is likely to be conservative as it does not consider passengers using other MRT3 stations, but for whom the longer -bus route may form an attractive alternative journey option despite not serving exactly the same MRT3 station trip pair. If rehabilitation requires the closure of certain stations served by the E-bus, or sees MRT3 capacity and service levels fall to below that currently envisaged, the number of travellers opting to divert to the E-Bus may exceed the above estimates.

4.3.2 EDSA Bus Passengers Abstraction

In Chapter 2, we reviewed the existing bus service provision along EDSA, identifying over 50 routes which carried a daily ridership of approaching 1.2m million. Based on the current designs for E-bus segregated infrastructure and the proposals to move existing services into mixed traffic, the relative service standards offered by the E-bus compared to existing bus routes are likely to lead to a modal shift from current services to the new service. The scale of this shift depends on the following:

- The service attributes of the E-bus relative to existing services – journey time, comfort etc.
- The relative fare differential between services (if any)
- Passenger origin-destinations
- Capacity of the E-bus system

Within the scope of this study, it is not possible to undertake a comprehensive passenger demand modelling exercise, although the origin-destination data collected as part of the RTRS studies would permit further detailed analysis. Based on the overall demand recorded travelling along the corridor, we can take high level estimates of likely abstraction. Actual modal shift will be strongly dependent on variables which remain uncertain presently including response of existing operators to the new service and actual performance levels of the E-Bus (as opposed to design ideals).

[2] Based on most recently available ridership origin-destination data from 2016

Source: ITP EDSA Corridor Report, July 2015

Route by route demand of almost 1.2 million passengers per day sits much higher than that of the MRT3 demand, though the route-length of the bus services is also much longer than that of MRT-3, and potential catchment for the E-bus from existing bus services is also likely to be greater than that abstracted from MRT3 provided the service offer is attractive compared to the existing bus services. The scale of potential catchment depends an actual traveller origin-destinations. Survey data collected from bus travellers on EDSA services was collected as part of the RTRS surveys. The major OD patterns are shown in the table overleaf. Analysis of these trip patterns indicates that:

- 50% of recorded trip pairs are for destinations with both origin and destination along EDSA
- 10% of trip ODs are directly within Phase 1 E-Bus catchment
- This rises to 40% of EDSA bus trips in Phase 1.5

A direct catchment demand of upwards of 100,000 trips is estimated in Phase 1, based on existing trip ODs, rising to almost half a million in Phase 1.5. This excludes trips which orginate or terminate off the E-Bus corridor, although there is the possibility of attracting these trips to the E-Bus with suitable interchange and service offer.

Even is service levels of E-Bus far exceed those of the existing bus services, there will be a proportion of travellers who will be better serviced by the existing routes due to alignment. Without the scope to undertake detailed catchment analysis, we consider the scale of demand flows along the main sections of the corridor which overlap with the E-Bus route, and take high level assumptions as to the range of likely abstraction.

The figure presented above shows passenger link loadings in the peak hour of travellers on bus services running along the EDSA corridor axis. It can be seen that peak hour demand exceeds 10,000 passengers per hour per direction on the busiest sections. A fair proportion of this demand heads north to Philcoa rather than continuing along the E-Bus alignment to Monumento. Link flows on the section between SM and Monumento fall to below 5,000 pphpd. The relative scale of flows suggest that around 2/3 of the southbound flow in the AM peak hour heads in from Philcoa (8,000 of 12,000). Assuming these travellers would be better served by direct services in that direction, the E-Bus 'prime' catchment may be in the order of 1/3 of the observed corridor demand. On the basis of this very broad approximation of catchment, perhaps as many as 400,000 travellers per day may have travel patterns which could potentially be served by the E-Bus. If just a quarter of these trips were abstracted from the less attractive existing bus services, demand of upwards of 100,000 passengers per day may be feasible.

4.3.3 Abstraction from other modes and corridors

Once of the challenges in undertaking any demand analysis is the dynamic nature of travel in Manila. Faced with heavy and unpredictable congestion, and unreliable public transport services, our analysis has identified fluid travel choices and routes taken, even for regular trips. Introducing a new route which aims to offer higher levels of service may not only abstract travellers from directly competing PUV routes, but influence travel decisions of those on other corridors, or even those travelling on different modes such as taxi. This suggests a potential upside possibility to the ridership estimated based on direct abstraction which we present above. The scale of this abstraction will again be heavily influenced by the actual level of service quality delivered by the E-Bus system, and also the inherent capacity constraints of that system. Having identified a potential demand for the service which is likely to be upwards of 125,000 passengers per day when direct abstraction from both MRT3 and existing EDSA bus routes is taken into account, we consider below the extent to which the system could cope with this demand.

Table 4.3: Major ODs of travellers on EDSA Bus Services (2015)

			On EDSA														Off EDSA													
			Navotas	Monumento/MCU	SM North	East Ave area	Kamuning/Kamias	Cubao	Ortigas	Guadalupe	Makati S	Makati N	Buendia	EDSA/SSH	Baclaran	MOA	Sta Maria	Grotto	SM Fairveiw & Lagro	Novaliches	Fairview Dahlia	Litex	COA/Ever Gotesco	Tandang Sora	Philcoa/UP	Signal	Bicutan	Alabang	Muntilupa	Pacita
On EDSA	Navotas	**30,932**	-																											
	Monumento/MCU	**11,359**	2,587	-																										
	SM North	**21,939**	8,424	257	-																									
	East Ave area	**35,614**	4,085	514	542	228																								
	Kamuning/Kamias	**24,338**	698	-	1,993	1,768	-																							
	Cubao	**75,960**	2,913	485	3,892	6,177	5,065	469																						
	Ortigas	**78,298**	8,016	1,770	1,021	2,302	6,699	14,244	2,054																					
	Guadalupe	**22,855**	-	1,000	698	-	-	3,096	4,556	-																				
	Makati S	**16,393**	871	-	-	2,685	208	1,592	1,101	1,603	-																			
	Makati N	**23,762**	871	-	-	171	2,305	4,103	3,161	1,210	86	-																		
	Buendia	**4,453**	-	-	-	-	-	1,422	183	-	-	2,777	-																	
	EDSA/SSH	**16,256**	-	485	-	694	694	943	2,268	1,954	685	305	-	-																
	Baclaran	**29,875**	-	-	-	1,903	462	4,610	2,412	3,789	1,669	751	-	4,754	-															
	MOA	**6,810**	871	-	-	-	694	931	316	-	-	-	-	1,443	-	215														
Off EDSA	Sta Maria	**9,902**	448	2,562	2,091	65	65	2,430	63	-	-	-	-	-	-	-	1,111													
	Grotto	**22,228**	-	-	-	3,953	-	4,106	3,902	-	-	990	-	301	1,731	1,409	-	-												
	SM Fairveiw & Lagro	**30,523**	-	-	59	4,414	831	4,093	2,511	398	1,656	226	-	301	2,540	-	-	2,719	334											
	Novaliches	**6,645**	-	-	2,353	-	-	1,946	1,000	-	-	-	-	-	1,044	215	-	87	-	-										
	Fairview Dahlia	**3,010**	-	-	-	151	-	-	895	-	-	713	-	-	-	-	-	452	570	-	-									
	Litex	**871**	-	-	-	-	-	-	-	-	-	871	-	-	-	-	-	-	-	-	-	-								
	COA/Ever Gotesco	**13,546**	-	-	-	749	895	3,055	2,528	-	-	-	71	-	2,304	715	-	-	981	-	-	-	-							
	Tandang Sora	**21,130**	-	698	-	2,493	581	4,414	2,323	798	713	-	-	-	959	-	556	1,655	1,560	-	229	-	582	-						
	Philcoa/UP	**22,642**	571	-	-	1,000	895	1,237	6,161	107	-	957	-	914	-	-	448	354	5,331	-	-	-	1,667	3,000	-					
	Signal	**10,303**	-	1,000	-	1,150	-	1,334	3,184	1,000	1,902	101	-	-	-	-	63	569	-	-	-	-	-	-	-	-				
	Bicutan	**3,869**	-	-	-	-	-	1,000	1,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	Alabang	**14,550**	-	-	-	-	485	587	2,369	2,054	1,010	3,165	-	514	946	-	-	-	2,000	-	-	-	-	-	-	-	1,371	49		
	Muntilupa	**3,150**	-	-	-	-	-	38	984	591	38	1,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	498	-	-	
	Pacita	**5,951**	576	-	610	570	-	1,778	1,272	-	576	-	-	-	-	-	-	-	-	-	-	-	-	570	-	-	-	-	-	-

4.3.4 System capacity

SWECO has undertaken system capacity analysis within its work, considering the infrastructure requirements in relation to station bays, runningway, vehicle type, fleet requirement and the operational service plan.

In a high demand corridor such as EDSA, E-Bus system design capacity could play a pivotal role in determining the level of ridership of the system. As noted in the ITDP BRT planning manual, the overall system capacity is determined by the capacity constraint at the 'weakest link within the system, i.e. the point of bottleneck. Runningways are rarely the pinch point, as the capacity of a single lane carriageway would typically far exceed realistic headways provided buses can travel at a reasonable speed. The weak links are often to be found at the stations.

The E-Bus stations have been designed to accommodate both 12m and 18m vehicles, and where possible to accommodate passing lanes to allow express or semi-express services which increase system capacity. Half of the stops identified as having higher demand have been specified to feature 'Skip-stop' bays allow the semi-express services to board/alight at higher demand stations without having to wait for all-stop services to load.

The 'standard' stations feature three 18m bays. These are arranged linearly, with a 1m gap between each which in combination with the raised platform does not permit vehicles to leave a bay before the bus in front has departed or indeed to access an empty bay located in front of a bus at the platform.

The SWECO reporting suggests that minimum headway of 1 minute should be feasible within the proposed infrastructure design. Platooning of vehicles in threes to travel between stations is suggested. This may help reduce the challenges presented by the inflexibility of the docking bays and vehicles arriving out of order (for example when a bus is still docked at the rear docking bay). It may also reduce impact on junctions, particularly if priority is given to the buses by the traffic signals.

Operating at average 1-minute intervals equates to 60 buses per hour (bph). Passenger capacity will depend on the vehicle specification, but presuming a typical capacity of a standard 12m bus of around 85 passengers, the system could support passenger flows of just in excess of 5,000 pphpd. This level of capacity is fairly typical of single lane BRT corridors, and therefore should be readily achievable in the 'real world' context. Deploying longer vehicles and increasing frequency through the operation of express or semi-express services could further increase the system capacity.

4.4 Operating cost modelling

An initial operating cost model has been developed to guide the financial and business modelling. The model accompanies this report.

The key inputs are presented transparently, with the source of these inputs defined. The assumptions underpinning the operating cost model should be validated through review and discussion with the PMO and drawing on latest data drawn from the bus industry.

The model demonstrates that based on the anticipated fleet size, capacity and demand levels, strong commercial viability may be expected. The key inputs are set out below:

4.4.1 Vehicle costs and financing

The price of a 12m citybus with bi-lateral doors, aligned with the infrastructure specification of the E-bus system has been taken as PHP8,000,000, inclusive of tax. This value has been drawn from a recent GIZ study on the PUV sector, and was used in the submission for NAMA funding. This sits above the JICA dream plan estimate of PHP5.5m.

The cost of vehicle purchase is likely to involve finance, particularly if the responsibility for procurement is borne by the private sector. The following financing terms have been assumed, based on typical financing rates within the automotive sector:

- 20% downpayment
- 60-month loan term
- 6% APR interest

Based on these terms, the annual repayments would be approximately PHP1.5m, and the cost over the term would be PHP9.1m including the PHP1.6m deposit.

4.4.2 Vehicle operating costs

Vehicle operating costs have been derived using a standard operating cost model populated with local values. The inputs to this model include the following:

- Diesel fuel costs – PHP44.75 per liter
- Euro IV bus fuel economy – 40.2l/100km
- Lubricant – 5% of fuel cost
- Tyre costs PHP13,931 per tyre (JICA study)
- Tyre life – 60,000km

Staffing assumptions are as follows:

- Drivers per bus – 2.55 (allowing for 2 shifts and cover for absence)
- Driver salary – PHP18,000 per month
- Conductor, customer care staff – 2.55 per bus
- Conductor salary – PHP15,000 per month
- Maintenance staff per bus – 0.5
- Maintenance staff salary – PHP18,000 per month

4.4.3 Operating service plan

The operating cost model presently considers the opening year service plan set out within the SWECO report. This features the purchase of a fleet of 120 vehicles in order to operate a 1-minute headway on the E-Bus route during phase 1. Our calculations suggest that this would dictate a peak vehicle requirement of 109 vehicles with the overall fleet of 120 vehicles allowing a 10% uplift for out-of-service vehicles (maintenance etc).

Performance statistics for the operation of the above fleet numbers have been compared against those achieved by existing bus routes and found to be sensible. These include:

- Average kms per bus per day – 280km (by comparison with an average 318km network wide)
- Average annual kms per bus – 90,509km (typical of expected mileage observed in BRT systems worldwide)
- Average daily passengers carried per bus – 1,042 (compared to 320 per bus for the EDSA kerbside buses and 790 network-wide)
- Average loading – 43% (citybus operations may be considered to be operating efficiently with average loadings exceeding 50% so greater loading would be likely to be achievable.)

Given the superior operating conditions anticipated within the E-Bus infrastructure, the above figures may be considered to be conservative. It is possible that operations could be even more efficient than those adopted in the operating cost model.

4.4.4 Revenues

Drawing on patronage estimates outlined above, which sit broadly in line with SWECO estimated system capacity for phase 1, we assume a phase 1 ridership of 125,000 passengers per day.

Revenues depend on the level of fare adopted. The prevailing fare levels have been outlined above. The choice of fare level has important implications on the attractiveness of the service. These considerations are summarised in the table below.

Fare Option	Advantages	Disadvantages/challenges
Aligned with MRT3 fares	Easily comprehended by existing MRT travellers Potential to share MRT3 ticketing infrastructure Marginally higher fares for most journeys by comparison with standard bus	Open to challenge as not in line with standard LTFRB regulated fares Common ticketing and fare with MRT3 has potential to increase volatility in traveller modal choice between the two modes
Standard Bus Fare	Comprehensible by travelling public In line with existing LTFRB fare regulations	Distance based fares difficult to enforce without ticket validation at exit – risk of over-riding, or need for onboard conductors Potentially difficult to integrate into existing MRT3 ticketing infrastructure Travellers will need to choose mode of travel before entering MRT station (may be seen as positive in terms of people management, but offers less flexibility for short term response to disrupted service on either mode)
Air-Conditioned Bus Tariff	Comprehensible by travelling public Represents a 'premium' fare which may be justifiable by higher levels of service (dedicated lanes, modern vehicles) even if buses not air conditioned	Open to challenge if buses not air conditioned May store up future problems when eliminating lower priced standard buses from corridor in future
P2P Fare	A premium fare which may be justified by the provision of higher service levels than existing bus services – modern comfortable vehicles, faster and more reliable journey times, scheduled services.	Political considerations related to the charging of much higher fares for a government promoted scheme intended to support MRT3 riders during rehabilitation.
New E-bus fare structure (e.g. flat fare, zonal)	Can be tailored to operating costs and trip patterns specific to E-bus corridor.	Will require traveller awareness raising campaign Complicates the public transport landscape with introduction of new fare.

This daily revenues per bus are estimated to be as follows, according to fare level adopted:

- Non-AC bus fare – PHP18,125 per bus per day
- A/C bus fare – PHP21,875 per bus per day
- MRT3 fare – PHP20,833 per bus per day
- P2P fare – PHP60,000 per bus per day*

* providing ridership levels are maintained at the higher fare. Premium pricing is likely to reduce demand. Whilst this may allow reduced vehicle requirement to maintain loading, ensuring a premium service would suggest maintaining frequencies and offering less crowded services. Therefore, average revenue per bus likely to be lower than PHP60,000.

4.4.5 Conclusions of operational modelling

Based on the operational cost and revenue modelling, we are able to evaluate the commercial viability of operating the E-bus service. The main conclusions are as follows:

- At the non-AC bus fare, operating profit averages as 14%. However, due to the impact of the deposit, cumulative cashflow is negative for the first 4 years. This would be unviable for a private sector operator.
- At the AC/fare level, commercial performance is enhanced. Revenues of in excess of PHP20,000 per bus per day allow cumulative cashflow to be net positive in the first year of operation, with an average profit margin of over 25% over the modelled period (10 years)
- At the MRT3 fare level, cumulative cashflow is also net positive in first year of operation, with an average profit margin of over 25%.

The analysis indicates that:

- System revenues will be sufficient to cover the cost of daily vehicle operating costs at all fare levels
- Fares set at A/C bus fare or MRT3 fare levels will be sufficient to cover both operating costs and vehicle financing costs and offer commercial viability for private operators
- Premium fares would offer a surplus which could be channelled to cover system management costs.

5 Business model

5.1 Introduction

This chapter considers how delivery of the E-Bus service could be organised, starting with a look at examples of similar work elsewhere, to identify common features, then examining how best to apply this to E-Bus.

5.2 Case study cities

5.2.1 The general model

This section reviews operating models from other cities using the following generic categories for the key roles involved in providing a bus system:

- The **System Owner**, who is accountable for overall delivery of the service.
- A **System Manager**, the entity appointed by the system owner to ensure daily delivery.
- The manager may deliver some of the operating functions itself, or it may work with one or more **System Operators**, for example a bus company.

These definitions are useful for comparing how bus systems are structured. However, applications will vary in detail according to local context.

The roles link along a **delivery chain** from transport strategy to daily production of services for customers:

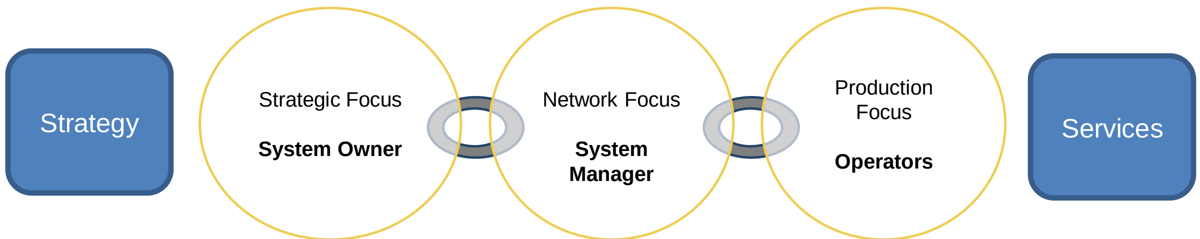


Figure 5.1: bus system model

Effective delivery chains have clear division of accountabilities and operate in a self-reinforcing manner:

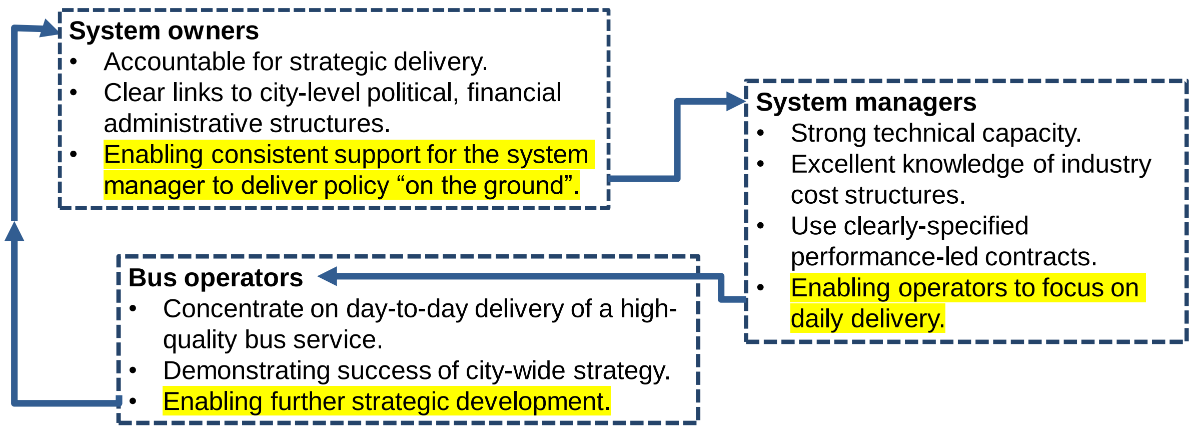


Figure 5.2: a successful delivery chain

5.2.2 The Cebu BRT proposals

Planning work for the Cebu BRT included development of an organisational model. It has not been implemented as yet, but is a useful comparator as it reflects Philippine legal and institutional circumstances.

The **System Owner** would be DOTr. They would procure a **System Manager** and bus operator(s), specifying a level of service and other terms, and then carry out the subsequent management of the contract. The contracts would be gross cost (per km) for seven years. Bonus or penalty would be applied according to performance. The System Manager would support the DOTr in procurement and management, but selection would be by the DOTr alone. Network planning and development would be carried out by DOTr.

The **LTFRB** would develop a legal mechanism to allow the operator(s) exclusive rights to serve a given BRT route and regulate compliance with standards for drivers and vehicles. PUJs in the corridors impacted by BRT would remain LTFRB-regulated. The **City Government** would provide traffic management and bus priority. The BRT project would fund an integrated traffic management system Most of the busway would be on DPWH roads. The **System Manager** would be responsible for all aspects of system performance. Their responsibilities and those of the **Bus Operators** are shown in the table.

Cebu BRT Proposals	**System Owner:** DOTr	**System Manager:** Under contract to DOTr	**Bus Operators** Under contract to DOTr
Bus Services	Network planning	Dispatching & on-street supervision. Monitor reliability and compliance	Providing the contracted bus-km.
Staff	Small team dedicated to the System Owner role.	Not directly specified. Some functions may be provided by subcontracts	Ensure sufficient staff for bus services and maintenance.
Vehicles	General vehicle specification		Provide and maintain all vehicles
Fares & Ticketing	Fare-setting in accordance with legislation. Owners of all fare revenue.	Fare collection, including kiosk staff. Distribution to sales points. Revenue protection. Cash-handling.	Nil
Customer Service	General setting of standards	Passenger information and marketing. General customer support	Driving standards and on-board customer care.
Data & Reporting	Receive data from System Manager and Operators per contract	Support DOTr contract management. General IT and ITS management	Report to SM and DOTr per contract.
Infrastructure	Work with DPWH and City to supply busway and traffic control system	Station management. Liaison with busway owners on maintenance, repairs, & rehabilitation	Nil. (Depot provided by the BRT project).

Table 5.1: Cebu BRT – proposed responsibilities

Key points to note from the proposed Cebu model are:

- DOTr would play a central role, contracting directly with both the System Manager and the Operators.
- Operators would be paid on a gross cost basis, with DOTr owning the revenue.

DOTr's central role was recommended in order to build on existing expertise, and to compensate for the lack of local capacity. It was however determined later that DOTr cannot act as a revenue manager.

5.2.3 London's bus network

Transport for London's bus network consists of approximately 650 routes, each with its own contract. Currently around five large companies operate approximately 90% of the network. TfL contracts consist of a Framework Agreement, applying to all routes and a Route Agreement. The latter sets out the route to be followed, the detailed frequency (by hour of day and day of week) and the bus configuration (capacity, maximum length / height, number of decks, number of doors) and the vehicle requirements including form of propulsion (diesel or electric) and emissions. Minimum standards are set for passenger waiting times.

Operators who have pre-qualified (so meeting required financial and competency standards) bid against the specification on a gross cost basis. Bids must be based on new buses, so that one can be compared with another, but awards may subsequently allow for a negotiated discount for using existing vehicles. Contracts last five years, with the possibly of extension for two years at the operator's discretion if performance standards are exceeded by a large margin. Given that contracts are at route level, Invitations to Tender are being issued every two weeks. In general, there is no geographic or operator batching of the ITTs.

Having been awarded a contract, operators are paid the gross cost per km, with a bonus (up to 15%) or a deduction (up to 10%) based on performance against the minimum standard for passenger waiting time. Both km-operated and waiting time are measured using the Automatic Vehicle Location system. TfL requires that vehicles are fitted with TfL's AVL equipment. The data is owned by TfL and operators are given access to it for service control and for analysis of service performance. A process operates to correct any gaps due to equipment failure etc, based on auditable self-certification. Revenue is owned by TfL. No cash is accepted on the system. Payment is by smartcard or contactless bank payment card. Buses are equipped with TfL-owned card readers.

London Bus Network	**System Owner** Mayor of London	**System Manager** Transport for London	**Bus Operators** c.20 companies under contract
Bus Services	General strategy for the role of the bus in London's transport mix.	Network planning and development. Tender for incentivised route-level contracts	Deliver the bus-km specified in each contract to the minimum performance standard
Staff	-	Stations, planning, marketing, technology, contracts	Provide drivers, engineers, administrators and managers
Vehicles	General strategy	Sets specification per route	Procure and maintain vehicles to TfL specification
Fares & Ticketing	Sets fares	Provide all ticketing equipment. Owner of all revenue	Operate TfL equipment
Customer Service	General policy on standards.	All marketing and information. All customer contact channels	On-board customer care
Data & Reporting	-	Receive data from operators per contract	Report to TfL per contract
Infrastructure	-	Provide AVL and ticketing equipment	Provide depots

Table 5.2: London bus network responsibilities

Key points to note from the London model are:

- The system manager and owner are both in the public sector.
- The Mayor (system owner) has powers of direction over TfL (system manager).
- Operators are paid on a gross cost basis.

5.2.4 BRT in Bogotá

The Transmilenio BRT system operates in Bogotá, Colombia.

Bogotá	**System Owner** Mayor of Bogotá	**System Manager** Transmilenio SA, a city-owned company	**Bus Operators** Private companies under contract
Bus Services	-	Plans services and ensures operators deliver the specification	Trunk services operated on a gross cost basis, feeders on "payment per passenger" basis
Staff	-	Staff to manage operations. Later expanded to include direct operational employees on the system	
Vehicles	-	Sets specification	Procure and maintain
Fares & Ticketing	Sets fare policy	Ticketing is contracted out to the private sector, including revenue management and payment to contractors via a trust fund.	
Customer Service	-	Publicity, marketing and in stations	On-board service
Data & Reporting	-	Receives data from operators	Required to supply data on service performance
Infrastructure	City Government provides busway, stations, control centre	-	Depots

Table 5.3: Transmilenio responsibilities

Key points to note:

- Transmilenio SA is a company wholly-owned by city government.
- Bus operations, ticketing and revenue management / operator payments are handled by private sector contractors.
- When the system was created the city mayor played a very active role in championing the proposal.
- It was introduced as part of a wider mobility strategy for the city
- After some years of operation it was found necessary for the city to take closer control of other bus services in the city.

5.2.5 BRT in other cities

The table summarises how BRT (or High-Quality bus) roles were arranged in five cities – Lagos, Johannesburg, Jakarta, Ahmedabad and Delhi – at a point a few years on from commencement of operations, based on analysis by the World Bank.

Arrangements in each city have developed since this information was compiled. The purpose is to illustrate the organisational similarities and differences between the five cities. Each had faced some of the same issues as Metro Manila during the creation of their BRTs.

System & City	System Owner	System Management	Bus Operations	City context
Lagbus **Lagos** Nigeria	Lagos Metropolitan Area Transport Authority (LAMATA), sponsored by the Ministry of Transportation of the Lagos State Government.	First BRT Co-operative with assistance from LAMATA	First BRT Co-operative, a 50-member cooperative of bus operators. Some of responsibilities outsourced.	Over 75,000 minibuses in the city. LAMATA responsible for all transport planning and co-ordination in the metro area.
Rea Vaya **Johannesburg** South Africa	Mayor of the City of Johannesburg	Rea Vaya Business Unit, a division within the City of Jo'burg Transportation Department	PioTrans, a limited company owned by nine former taxi-minibus companies	City-owned MetroBus company. Numerous shared taxi – minibus services.
TransJakarta **Jakarta** Indonesia	Governor of the Jakarta Special Capital City District	TransJakarta Busway Public Services Agency, a division of the JSCCD transportation department	Four consortia of existing operators plus two operators awarded contracts after competitive tendering	Many informal minibus services
Janmarg **Ahmedabad** India	Chief Minister of the State of Gujarat	Ahmedabad Janmarg Ltd, wholly-owned by the City of Ahmedabad	Charter Speed Private Ltd, operating under a gross cost contract with Ahmedabad Janmarg Ltd	Bus network operated by the city-owned Ahmedabad Municipal Transport System
High Capacity Bus System **Delhi** India	Chief Minister of the Govt. of the National Capital Territory Delhi	Delhi Integrated Multi-modal Transit System Ltd, a company owned by the GNCTD.	Delhi Transport Corporation and private operators licensed by GNCTD. DTC is owned by the GNCTD	The network was not revised on opening of the HCBS

Table 5.4: BRT / High-quality bus – responsibilities in five cities

Source: author's summary of information in "International Experience in Bus Rapid Transit (BRT) Implementation: Synthesis of Lessons Learned from Lagos, Johannesburg, Jakarta, Delhi, and Ahmedabad": Ajay Kumar, Samuel Zimmerman and O.P.Agarwal (World Bank)

Key points to note from the five cities are:

- In all cases the System Manager is in the public sector.
- The variety of Operator configurations, including consortia, public sector and private companies.

5.2.6 Summary

The international case studies have the following in common:

- System ownership by a city or regional-level champion.
- System management in the public sector, associated with local government or regional transport authority and under the close direction of the system owner
- Operations in the private sector, in some cases on a consortium basis.

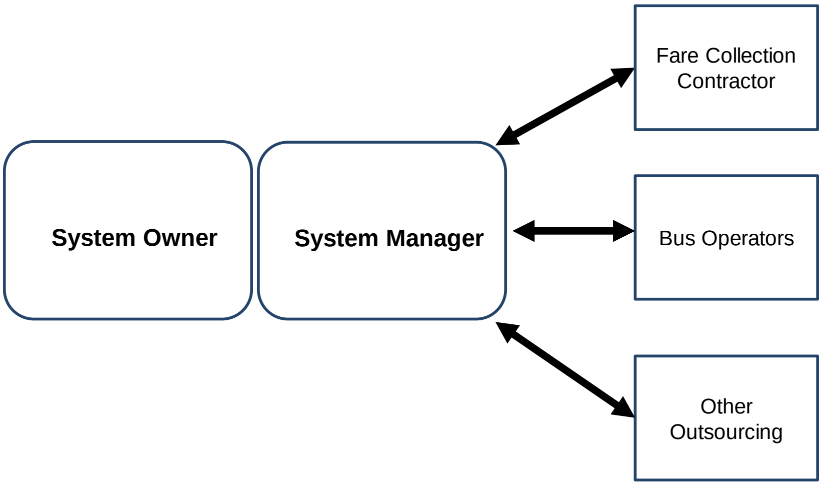


Figure 5.3: model from the international cities.

The Philippine example (Cebu) differs by the need to locate more the of the system manger's functions with the system owner (DOTr). This requires more contractual relationships, tending to make the delivery chain longer and less-focused.

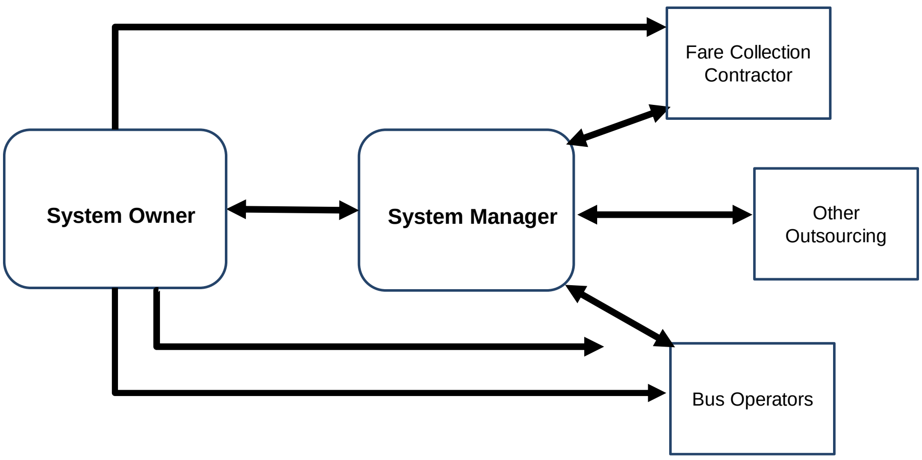


Figure 5.4: CEBU proposed model

5.3 Creating a model for E-Bus

This section considers the challenges to be faced and the opportunities available in developing a business model for E-Bus.

5.3.1 Challenges

There are four major challenges:

- **Timescale.** E-Bus is intended to be delivered in the short-term, matching the timescale for rehabilitation of MRT-3. However, the institutional development needed to create an effective delivery chain is not a short-term process. Initial arrangements for E-Bus should be explicitly designed to evolve as capacity-building progresses.
- **Institutional Capacity.** There is no metro-level entity responsible for local public transport in Metro Manila, with all practical accountability residing with the national DOTr. The closest matches are the MMDA, which has metro-wide traffic-management expertise but no public transport capabilities, and the LTFRB which has detailed knowledge of the local bus industry and an active approach to managing the PUV modernisation programme but no direct role in network planning within Metro Manila. The success of the system will rely on developing the institutional capacities of these three agencies.
- **Operational Complexity**. E-Bus will operate in a highly-congested environment. Headways will need to be carefully managed to ensure throughput of buses along the busway. Passenger numbers will be very high, so flows through the stations and on / off the buses will need to be supported by efficient ticketing, signage and supervision. Sometimes this will be on land off the busway, for example in the MRT stations. Ticketing equipment may need to be shared with the MRT, for space reasons. Buses will interact with other traffic at numerous junctions so close working with the MMDA and other entities controlling traffic or enforcing regulations is required. The E-Bus programme will affect the operation of parallel bus services by reducing the roadspace available for non E-Bus services and by competition for passengers.
- **Financial Complexity**. The E-Bus project is financed separately from funding streams for MRT. However, its fares revenue will derive from the same pool of passengers, and would possibly be collected using the same ticketing equipment. The DOTr does not have a mandate to own revenue from the service.

The challenges are dominated by the first – timescale. The case studies and previous work show that creation of an appropriately-skilled city-wide public transport management organisation linked with a local public transport champion is a pre-cursor for successful general delivery of an enhanced bus network. Given that E-Bus is required in the short-term, ways of building on existing organisations and process are needed. Therefore the following sections assess opportunities within existing organisations and existing processes.

5.3.2 Opportunities - organisations

The table shows the areas of higher and lower capacity within existing bodies.

	DOTr	LTFRB	MMDA	Bus Operators
Higher Capacity	Has strategic accountability for the delivery of public transport. Centre of expertise in the BRT National Project Management Office.	Closely engaged with the bus operating industry. Actively leading the PUV modernisation programme.	Close to metro-level political and administrative structures. Experience in operating metro-wide traffic management.	Knowledge of bus operating conditions. Experienced in recruiting and training operating staff and maintaining vehicles.
	Experienced in contract awards for large-scale transport projects.	Experienced in contracting bus services, via the franchising system.		
Lower Capacity	Difficult for a national body to focus sufficiently on delivery of E-bus.	Not directly part of metro-level political, administrative and financial structures.	No experience of managing public transport services.	Interests in existing bus services may conflict in some respects with plans for E-bus.
	Legal restrictions on trading activities (cannot own fares revenue).	Lacks expertise in bus network planning and service quality management.	No direct links with the bus operating industry.	Small average company size

Table 5.5: capacity in existing institutions

Based on the above capacities, the opportunities for development are shown in the next table.

	DOTr	LTFRB	MMDA	Bus Operators
Opportunities	Likely to be the most appropriate place for System Ownership in the short-term, due to existing expertise and the DOTr's accountabilities.	The franchising system could form a basis for more detailed bus service contracts. LTFRB has the powers to implement the outcomes of network planning.	MMDA's mandate permits its involvement in a broad range of activities supporting the delivery of metro-wide objectives. It can potentially also deal with fare revenue.	The operating industry is seeking clear leadership from the public sector as to the service to be delivered, the standards required, and how existing services may need to change.
Development priorities	How to enable more devolution to local agencies.	How to make best use of existing franchising powers to increase bus service quality.	How to expand active support for bus service performance.	Organisational consolidation in line with PUV modernisation.

Table 5.6: capacity development in existing institutions

The organisational capacity assessment shows that no single entity is close to having all the features associated with successful system management. However, aspects of the success factors exist across the three public bodies when considered together.

5.3.3 Opportunities - processes

As significant organisational change will take time, it is useful to review the existing forms of bus service already covered by the LTFRB processes. Two are of interest in the context of E-Bus: standard city buses and Point-to-Point (P2P) buses.

	City Bus	**P2P Bus**	**Strength / weakness assessment**
Services	Operators authorised for a certain route and number of buses but no timetable	Operators authorised for a certain route, number of buses and fixed timetable	The fixed timetable specification developed for P2P is a potential basis for E-Bus contracts.
Fares	Generally lower fares	Generally at premium fares	City bus fares are closer to the likely desirable level for E-Bus. The P2P premium reflects higher quality but also lower patronage.
Ticketing	Fares collected by conductors and retained by operator	Fares collected by driver or conductor and retained by operator	Neither is ideal – E-Bus would preferably be 100% off-bus fare payment.
Vehicles	High floors, narrow door and aisle increase stop dwell-times	Some services using vehicles with low-floors, two wide doors and wide aisles.	Vehicles on city bus routes are unsuitable for E-Bus. P2P shows that more accessible formats can operate successfully, though there is a cost premium.
Staff	Usually on commission, leading to higher dwell times.	Timetabled nature of the service means commission not appropriate. Tend to focus on attendance and safety in bonus structures.	Commission on ticket sales per individual bus would not be appropriate on E-Bus.

Table 5.7 strengths and weaknesses of existing business models

In summary, the strength / weakness assessment demonstrates that LTFRB are already running a form of franchising which could be adapted to the E-Bus service.

5.4 Conclusions

5.4.1 Form of contract

If the projected busway time-savings are delivered, E-Bus could cover its operating costs from revenue, at the Air-Con or MRT-3 fares levels. (There might still be a need to cover the cost of the system manager). It would therefore be possible to appoint operators on the basis of them keeping the revenue and seeking no subsidy. However:

- While buses could be equipped with card readers, it will be necessary to allow fare payment at existing MRT-3 fare collection locations (for logistical reasons), and desirable at other off-site locations also. Therefor some form of revenue apportionment would be needed.
- There may be undesirable driver behaviour on the busway if there is more than one operator.
- Operators would make super-profits if the system attracts more passengers than forecast, which would be difficult to adjust for in the short-run.

The alternative is gross cost contracts where operators are paid a fee per km, and the revenue stays within the system. This allows operators to focus on service quality and avoids undesirable driver behaviour. However:

- The system manager must have the legal powers to handle revenue.
- Ultimately, government bears the ridership risk.
- The public sector would effectively be competing with private-sector operators running parallel services.

DOTr will need to weigh the risks in each option. On balance the gross-cost option is likely to be a better match to wider long-term strategy because it will better-support overall network rationalisation and it gives government the ability to cross-subsidise between different parts of the network – for example enabling loss-making services in development areas to be funded by the surplus from profitable services.

5.4.2 Contract duration and number of operators

Contracts of about five years are generally best for public purposes, striking a balance between the contract price and the ability to change contractors / services as the city develops. The length of the contract must also take into account assumptions about how long it will take operators to repay vehicle loans. There should be arrangements to alter the level of service at the prevailing rates during the life of the contract, upwards or downwards. If gross cost contracts are used, a formula for automatic annual adjustments of the price will need to be agreed, taking account of fuel and driver costs preferably using independently-published indices.

Appointing a single operator facilitates good headway management but represents a large vehicle-financing commitment. It may be that detailed service planning will allow two or three separately-identifiable services to be defined, for example an express, and two overlapping two-stopping services. These could be issued as separate franchise opportunities, allowing the appointment of up to three operators.

5.4.3 Service specification and performance management

The service frequency must be specified in detail, effectively providing the timetable to be run as part of the contract documentation. Performance standards can also be set, including the minimum level of scheduled km to be delivered (c.98%) and the headway requirements.

Specification can be done as an extension of the process LTFRB uses for P2P services.

A system to ensure that operators deliver the specification and that appropriate action is taken where not will be needed. This will be a new activity and can be carried out by the system manager. It will be greatly facilitated if there is a reporting system based on GPS data from the vehicles. Such systems are available commercially and a decision will be needed on who would procure. In the longer-term it is beneficial if this is done by the public sector so that the same system can be extended to other services and so that the data generated by the system is accessible for future report development.

5.4.4 System Manager – structure and responsibilities

Most cities locate the system manger function in the public sector as part of a city-level transport authority. As this is not available yet in Metro Manila, a hybrid public / private arrangement could be considered:

- A private-sector operator would run the stations, ticketing and fare collection, bus despatching and day-to-day liaison with the MMDA over traffic management and DPWH over road infrastructure and maintenance.
- A public sector entity would hold the contracts with the System Manager and the bus operators.

If gross cost contracts are used the public sector entity would be responsible for receiving the revenue from the System Manager, then paying the System Manager and the operators. It would own the task of anticipating and dealing with any projected shortfall so would therefore require government financial guarantee. In this case the public sector entity could not be located in the DOTr but would need to be a new body, or be located within the MMDA, LTFRB or some other suitable organisation. Wherever located, a certain number of full-time staff would be needed for: contract administration and payments; performance management; liaison with government and the public.

Rights to commercial advertising and property opportunities would need to be allocated.

5.4.5 Bus Operator responsibilities

The Bus Operators would own the vehicles and provide drivers, service controllers and depot engineers. To get services going in the short-run they should also own the depots, unless it is considered that this requirement would negatively affect competition for contracts.

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