Japan International Cooperation Agency (JICA)
Department of Transportation and Communications (DOTC)

The Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines

MMUTIS Update and Enhancement Project
(MUCEP)

Manual vol. 4

Policy Formulation

December 2015

ALMEC Corporation

Oriental Consultants Global Co., Ltd

PREFACE

The acceleration of economic activities and population concentration in Metro Manila and other cities in the Philippines has caused severe social problems such as traffic congestion, traffic accidents, and deterioration of the living environment. The development of the public transportation network is crucial in tackling these problems. In addition, investment in infrastructure development is essential to realize a sustainable economic growth. Metro Manila, in particular, requires a transportation policy to facilitate a modal shift from private cars to public transportation by developing and integrating transportation networks and strengthening linkages between transportation modes.

It is within this context that the Government of Japan has provided technical assistance to the Philippines' Department of Transportation and Communications (DOTC) and other related agencies through the Japan International Cooperation Agency (JICA) in conducting a capacity development project entitled "The Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines." MUCEP, as the project is known (short for MMUTIS Update and Capacity Enhancement Project), has been carried out for more than four years, starting on 27 September 2011 and completing on 30 November 2015.

The overall project goal of MUCEP is to enable the DOTC to prepare a public transportation plan for Metro Manila for strategic corridors by strengthening their capacity in transportation database management and public transportation network planning.

Toward this end, the project included the conduct of studies on policy formulation and the preparation of this document which compiles the manuals on policy formulation prepared by the JICA Project Team with the support of the DOTC's Transport Planning Unit and the MUCEP Counterpart Project Team. It comprises three parts, namely, Part 1 on public transportation policy options, Part 2 on setting public utility bus and jeepney fares, and Part 3 on evaluating franchise applications.

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ABBREVIATIONS

BRT	bus rapid transit
CPC	Certificate of Public Convenience
CPI	commodity price index
CPT	Counterpart Project Team
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
EDSA	Epifanio de los Santos Avenue
FTI	Food Terminal Incorporated
GDP	gross domestic product
h	hour
HIS	Household Interview Survey
IMF	International Monetary Fund
ITS	intelligent transportation system
JICA	Japan International Cooperation Agency
km/h	kilometer per hour
LGU	local government unit
LRT 1	Light Rail Transit Line 1
LRTA	Light Rail Transportation Authority
LTFRB	Land Transportation Franchising and Regulatory Board
MMDA	Metropolitan Manila Development Authority
MRT 3	Metro Rail Transit Line 3
MRTC	Metro Rail Transit Corporation
MUCEP	MMUTIS Update and Capacity Enhancement Project
MMUTIS	Metro Manila Urban Transportation Integration Study
NCR	National Capital Region
OD	origin–destination
PHP	Philippine peso
PNR	Philippine National Railways
PPP	purchasing power parity
PT	public transportation
PUB	public utility bus
PUJ	public utility jeepney
PUV	public utility vehicle
RMC	route measured capacity
SLEX	South Luzon Expressway
TDM	Traffic/Transportation demand management
TED	Technical Evaluation Division
TPU	Transport Planning Unit
USD	United States dollar
VOC	vehicle operating cost

Part 1

PUBLIC TRANSPORTATION POLICY OPTIONS

1 PUBLIC TRANSPORTATION POLICY OPTIONS

1.1 Sector Structure and Strategies

1) Fundamental Choices

There are three basic choices or policy regimes for public transport development, viz: (i) through a monopoly, either by a public agency or a private entity; (ii) regulated competition of several operators; and (iii) free-market deregulated transport regime. These choices are amplified further in Table 1.1.

Only the first two paths offer any hope of achieving the ambitious goals set out for urban transport. The third path is equivalent to a private-transport-oriented urban transport strategy. Private bus operators have no access to capital for expansion, or the wherewithal to transform themselves to a different business model. However, this strategy represents a "no-pain-no-gain" alternative. The demands on the resources of the government will then be for an expanded road network, but virtually none for bus transit. The strategy also forecloses any decent hope for a future rail-based mass transit since private investments will not be available.

Public transport development by a public sector monopoly, or by a few large private operators (complemented by small operators on secondary and feeder lines) under a regulated competition regime, offer the potentials to reach a target of high public transport modal share. These two strategies are consistent with the "public-transport-oriented" flank of the master plan, but they differ in their short-term and long-term pains and gains. The second path—controlled competition regime—entails painful (but less costly) adjustments on the part of the government in the short-term period, but promises minimal pains afterwards. It also has the best chances of reaching the target modal share. On the other hand, the public monopoly regime postpones the pain to a future time, but at a higher cost. Moreover, it has a higher risk of not achieving the higher modal share targets because it is dependent on the scarce funds of the government. Bangkok followed this "monopoly strategy" in 1975, but was forced to retreat into the second option when losses mounted amid government funding shortages.

Figure 1.1 shows the case of Singapore. Singapore's bus system has always been privately owned and has been slowly moving (step by step) to the left of this figure, from "deregulation" to "well-regulated franchises." Figure 1.2 also shows the International examples on bus regulation.

2) Public Transportation Development Vision

When the basic policy on public transportation development is determined, development visions and strategies for the following aspects are to be decided for the short, medium, and long term:

(i) Industry structure;
(ii) Regulatory body;
(iii) Procurement of buses;
(iv) Ticketing;
(v) Fares;
(vi) Method of paying operating subsidy;

(vii) Market entry;

(viii) Route planning;

(ix) Service type and scheduling;

(x) Passenger information; and

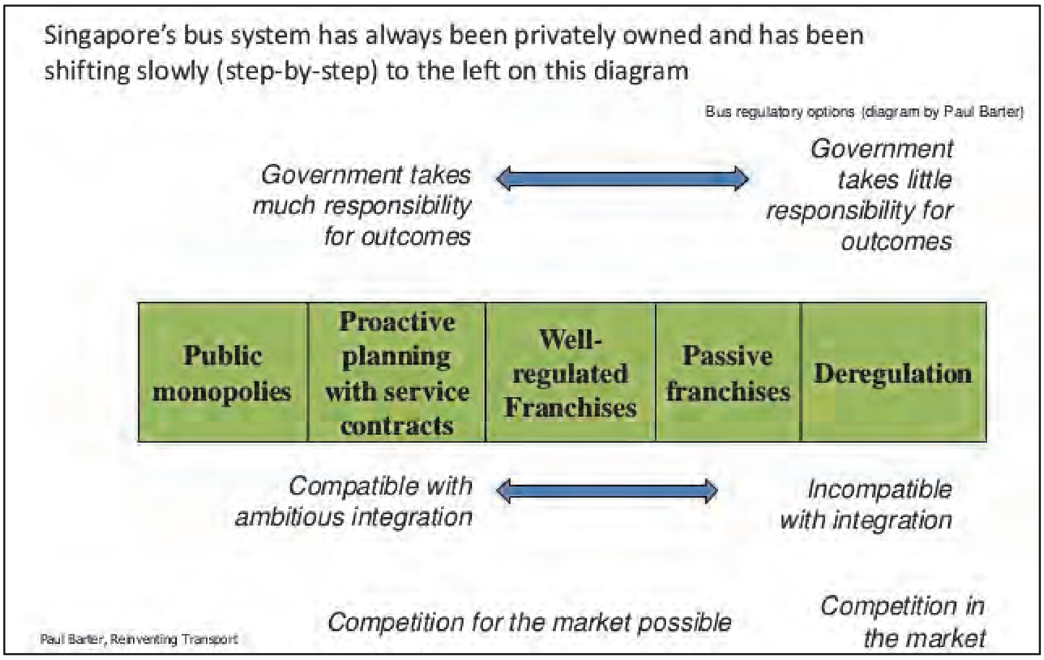
(xi) ITS applications.

Table 1.1: Fundamental Choices in Public Transportation

Item		Public Monopoly	Controlled Competition	Deregulated Regime
Externalities and Cost to Other Sectors	Short Term	HIGH Adverse effects on existing private operators and their investments.	MEDIUM Restructuring of existing private sector operators, to affect only those on trunk routes (Tier 1 market).	LOW No change in existing structure of the bus industry.
	Long Term	LOW Traffic impact is minimized through proper sizing and mix of vehicle fleet.	LOW Traffic impact is minimized through proper sizing and mix of vehicle fleet.	HIGH Congestion to affect all sectors. Dominance of small buses even on trunk routes.
Demand for Public or Government Funds	Short Term	HIGH Government must allocate budget for new fleet, as well as to buy out existing operators.	MEDIUM Government must allocate seed capital to build up fleet, or take risks through leasing.	NONE No investments required.
	Long Term	HIGH Capital and operating subsidies likely to be high. Amounts exceed budget envelope.	LOW Minimal demands for public subsidy – either capital or operational.	NONE No investments required.
Demands on Public Institutions	Short Term	MEDIUM Bureaucracy needs to sharpen its skills in all aspects of bus transit management.	LOW Only a small bureaucracy is needed, with focus on regulation and support facilities.	LOW Only a small bureaucracy is needed to oversee private operators.
	Long Term	HIGH Size of the bureaucracy has to be enlarged. Operational efficiency is likely to be low & costly.	LOW Only a small bureaucracy is needed, with focus on regulation and support facilities.	LOW Only a small bureaucracy is needed to oversee private operators.

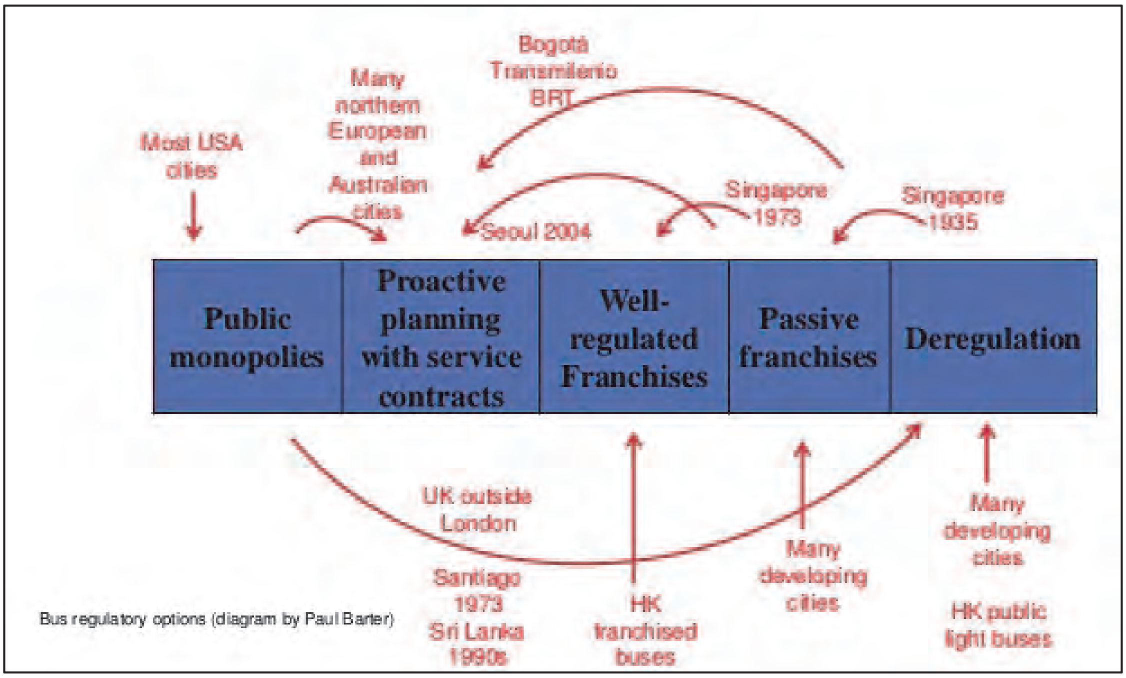
Source: JICA Project Team

Figure 1.1: Bus Regulation in Singapore



Source: Paul Barter, National University of Singapore

Figure 1.2: International Examples on Bus Regulation



Source: Paul Barter, National University of Singapore Source: Paul Barter, National University of Singapore

1.2 Bus and Jeepney System Development

For the long-term strategy, it is envisaged that Mega Manila will move toward a multi-operator strategy with eventual tendering for routes. Under this regime, a maximum of 10 large-fleet bus operators will be franchised to provide diversified services on fixed set of routes (herein called, Tier 1 market). Once the franchises have been defined, no competition within this set of trunk or primary routes will be required. The system is thus based on competition for the market rather than in the market. Buses would have colors representing their function (as in, e.g., Curitiba) but could also have a sign identifying the operator. Small, individual operators such as jeepney shall be allowed to operate in separate areas of their own (i.e., Tier 2 market) under the umbrella of a cooperative, which shall assume more functions—in behalf of its members and in behalf of the government—than currently undertaken.

The recommended strategy, therefore, aims to improve the quality and quantity of bus transport through the middle way of controlled competition with operators on clearly defined playing fields, with the following components and features:

1) Market Segmentation and Industry Restructuring

(i) Segmentation of the bus and jeepney transport market into two. Tier 1 for trunk routes to be served by bus operators, and Tier 2 for secondary and feeder routes to be served by single-unit operators such as jeepney belonging to cooperatives.

(ii) Each operator will have his own corridor or zone of responsibility, where competition shall be curtailed. A Tier 1 operator will be assigned a set of contiguous and fixed routes in two to three corridors, while a Tier 2 operator will have a zone or area within which it can operate but with fixed or non-fixed routes.

(iii) In the Tier 1 market, a maximum of 10 large-fleet bus operators will be franchised on a long-term basis. The basis of the Tier 1 system is an integrated route network developed and continuously maintained by the regulatory agency (DOTC/LTFRB). Packages of routes will be designed for operation by one of the operators. The metropolitan area will initially be divided into zones or areas which will to a certain extent coincide with the route network. However, heavy trunk routes will connect between such areas and there will always be some overlap between routes.

(iv) Capability for a modern and systematic fleet management shall be developed among Tier 1 operators. Cooperatives who wish to be in the Tier 1 market segment shall be assisted in their fleet acquisition, as well as in their conversion into joint-stock cooperatives or limited liability companies. New players (and investments) will be encouraged to enter the Tier 1 market.

(v) An expanded role for Tier 2 operators, especially cooperatives, shall be fostered so that they can perform self-regulation and secure more benefits (e.g. joint fuel supply, volume discounts in spare parts procurement, etc.) for their respective members.

(vi) The route network is to be seen as one single system albeit operated by different operators. For this reason, the identity of buses will reflect their role in the system – express buses for example could have a specific color as in Brazil. For ease of identification by passengers and to facilitate control, each operator can add an identification sign.

(vii) To the extent possible, the route network packages will be designed so as to avoid a mix of different operators along the same route. On many segments, however, this cannot be avoided as passengers will have a multiple choice of routes. If compensation to the operator is based purely on production this is not a problem but when, as recommended, this compensation is also based on the number of passengers, then competition will occur. This will be controlled by monitoring timetables and frequencies.

2) Service Improvements

(i) The bus route network shall be redesigned or reconfigured to reflect more closely the locations of demand as well as position the industry towards capturing a bigger share of the market. This will also support the proposed segmentation of the market into Tier 1 (primary routes) and Tier 2 (all other routes).

(ii) Higher frequencies, preferably less than 10 minutes, shall be operated on trunk routes to make buses more ubiquitous and noticeable among the riding public, and thereby attract more passengers. If the economics so dictate, medium-size buses should be employed if only to achieve higher frequencies of service during the market build-up period. Feeder routes in Tier 2 zones shall be expanded to penetrate more areas of the study area and improve accessibility to the public transport network.

(iii) To enable bus transit to respond more closely to travel demand and the changing requirements of its customers, operators on Tier 2 market shall be given the flexibility to plan and decide on their routes within defined parameters. Operators in Tier 1 market should also be given the freedom to increase their frequencies beyond a minimum.

3) Government Support

(i) The regulatory system shall be simplified. Instead of the current 5-year service contract, long-term franchises shall be granted to operators, which would involve tendering at some future time. A fare-setting and adjustment mechanism shall be introduced to bring fares closer towards eventual full-cost cost recovery.

(ii) Government shall extend financial assistance in the formation, fleet acquisition, and acquisition of site for depot/garage, of Tier 1 operators, during the short to medium term. Where required, technical assistance will be provided in fostering a modern and commercial system of fleet management.

(iii) Users' pay and cost recovery principles shall be kept. Direct subsidies to bus operators or to passengers might be considered in order to provide minimum mobility for the target peoples.

(iv) The provision of common-user facilities, such as passenger interchange stations, bus lanes, busways, bus stops, bus shelters, passenger information system, and on-street signals shall be provided by government.

(v) To ensure that travel time on buses remain attractive, bus priority measures shall be introduced and continuously improved in all Tier 1 routes. Where appropriate, traffic restraints and other traffic demand management schemes affecting private transport shall be implemented in the future.

Part 2

PUB AND PUJ FARE SETTING

1 INTRODUCTION

1.1 Study Background and Purpose

In July 2015, one of the top officials of the Department of Transportation and Communications (DOTC) asked MUCEP's JICA Project Team if the MUCEP pilot studies could include an additional study on a review of the current public transportation (PT) fares and recommendation of a theoretical method for rational fare setting. The JICA Project Team agreed to include the said study in pilot projects on one condition: The JICA Project Team would conduct the study by itself due to time constraints but with the support of the Counterpart Project Team (CPT) in data collection. However, every progress of the study would be reported and explained to the CPT during its weekly Thursday meeting.

At the launching meeting in mid-August, the DOTC official approved the purpose, scope, and methodology of the study proposed by the JICA Project Team. The purposes of the study are as follows:

(i) To identify the current issues in the public transportation fare system;

(ii) To set up a reasonable fare system applicable to present Metro Manila; and

(iii) To recommend measures to rationalize the public transportation fare system.

Public transportation vehicles, such as high-occupancy vehicles (UV Express vehicles), tricycles, and pedicabs, are operated in Metro Manila, but they are excluded from the analysis because of data shortage. The major targets of the analysis are buses and jeepneys which are managed by the LTFRB, while railway transits are included in the analysis. The time horizon of the analysis is the present or the near future, i.e., within five years, because the roles and functions of buses and jeepneys will change in the medium and long term when the railway network expands and rail becomes the major transportation mode.

1.2 Study Considerations

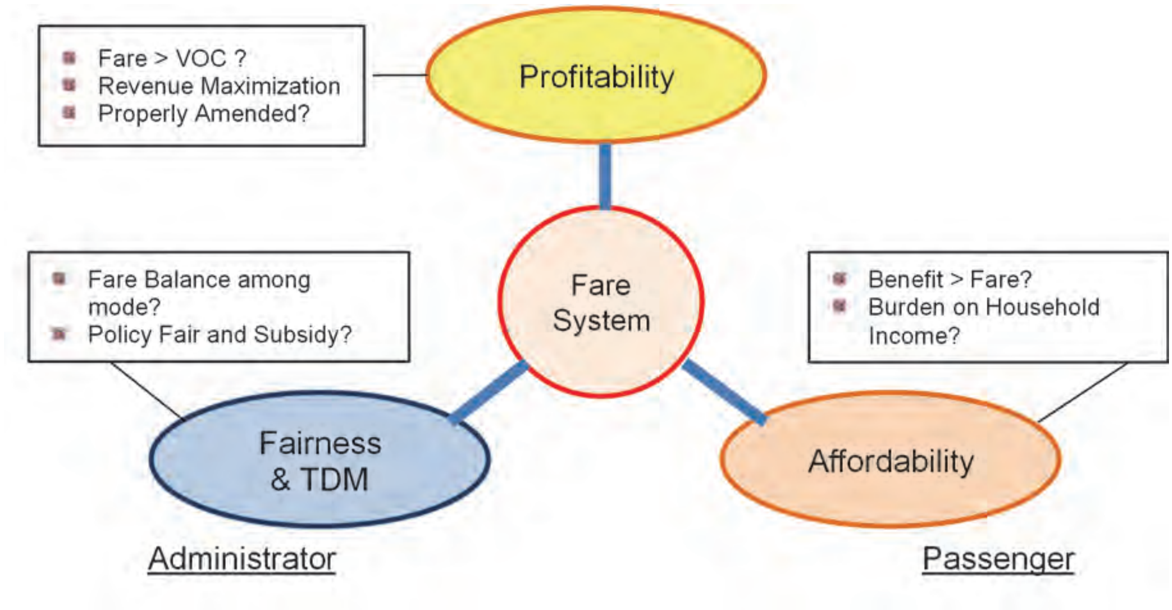
There are three stakeholders of public transportation services, namely, the operators (including vehicle owners), users (passengers), and administrators (government agencies). Figure 1.1 shows the main concerns of each of the three regarding the fare system.

The operators' main concern is profitability of the transportation business. The necessary conditions are how high the fare level is than transport cost and the relationship of fare and total revenue, that is, whether a fare higher than the present one would increase or decrease the total revenue and whether the fare has been revised properly.

Although a lower PT fare is more preferable to passengers, safety and service level will suffer by too low fares due to over-competition. Important conditions are that the fare level remains in the affordable range to the average household and lower than the economic benefit accruing to the passenger by using public transportation.

Meanwhile, government agencies are responsible for realizing and maintaining a fare system that can ensure fair competition among PT operators. In addition, public transport fare can be an effective measure for traffic demand management (TDM). Before taking a TDM policy which may distort a reasonable fare system, careful study is needed concerning operators who will suffer from the disadvantages as a result of TDM measures and subsidies intended to support them.

Figure 1.1: Viewpoints of Stakeholders on the Fare System

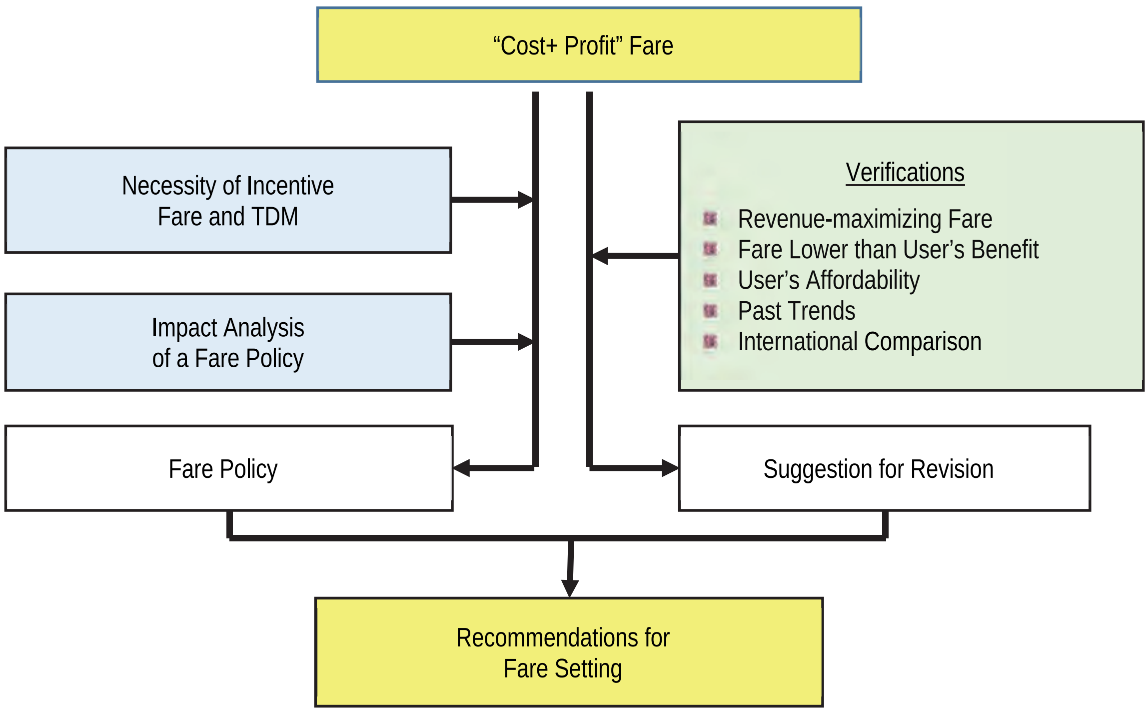


Source: JICA Project Team

1.3 Study Process

The study was carried out according to the flow shown in Figure 1.2 which was developed keeping in mind the concerns of the three stakeholders. The most basic and popular idea for fare setting may be "transport cost plus reasonable profit." This study also followed this idea, reviewing the current fare system from the viewpoint of "cost plus profit."

Figure 1.2: Pilot Study Process



Source: JICA Project Team

Next, the current fare was examined to determine whether it is in a reasonable range from the viewpoint of the three stakeholders. Concerns such as: (i) How close is the current fare to a revenue-maximizing fare; (ii) Whether the current fare is lower than the users' benefit, (iii) Whether the current fare is affordable to households with average income, (iv) Whether the fare has been revised properly; and (v) Whether the fare is reasonable based on an international comparison. Based on the results of these analyses, problems implied in the current fares would be identified, if there are any, and measures to solve the same would be suggested.

Another important approach is a "fare policy." Political considerations will modify the "cost plus profit" fare. In case the construction cost is huge and the cost-plus-profit fare is far beyond the affordable range, the fare will be politically controlled at a low level and the deficit covered by subsidies. An urban rail transit requiring a huge amount of investment is often developed with an official subsidy.

The government controls PT fares with the intention of guiding transportation demand toward a certain direction. Large-scale TDM measures will therefore be examined regarding their applicability to Metro Manila. Based on these works, recommendations for fare setting will be made.

2 CURRENT PUBLIC TRANSPORTATION FARES

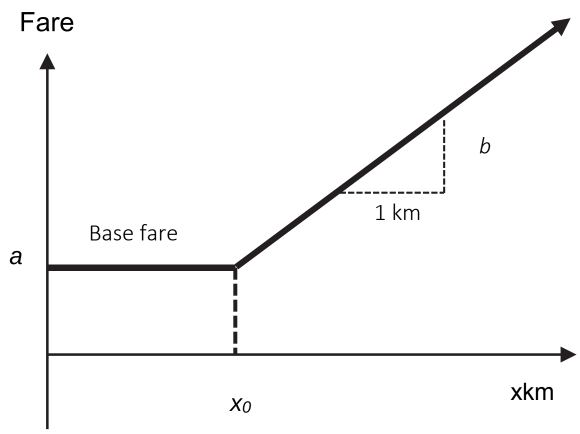
2.1 General Information

Public transportation fares are mainly classified into three types, i.e., flat fare, constant plus distance-proportional fare, and zone fare. Flat fare is a constant rate regardless of used distance. This flat rate can be applied only in a small city. The second one is the most popular fare system in large cities and also in Metro Manila, all of urban buses, jeepneys and rail transits are adopting this fare system.

This fare system can be illustrated as shown in Figure 2.1. The fare is flat (i) up to the base distance x_0. This flat rate is called base fare and beyond the base distance, b pesos are additionally charged per succeeding one kilometer. The fare system is expressed by the following formula:

$$\begin{cases} g(x) = a & (x <= x_0) \\ g(x) = a + b\,(x - x_0) & (x > x_0) \end{cases}$$

Figure 2.1: Constant-plus-distance-proportional Fare

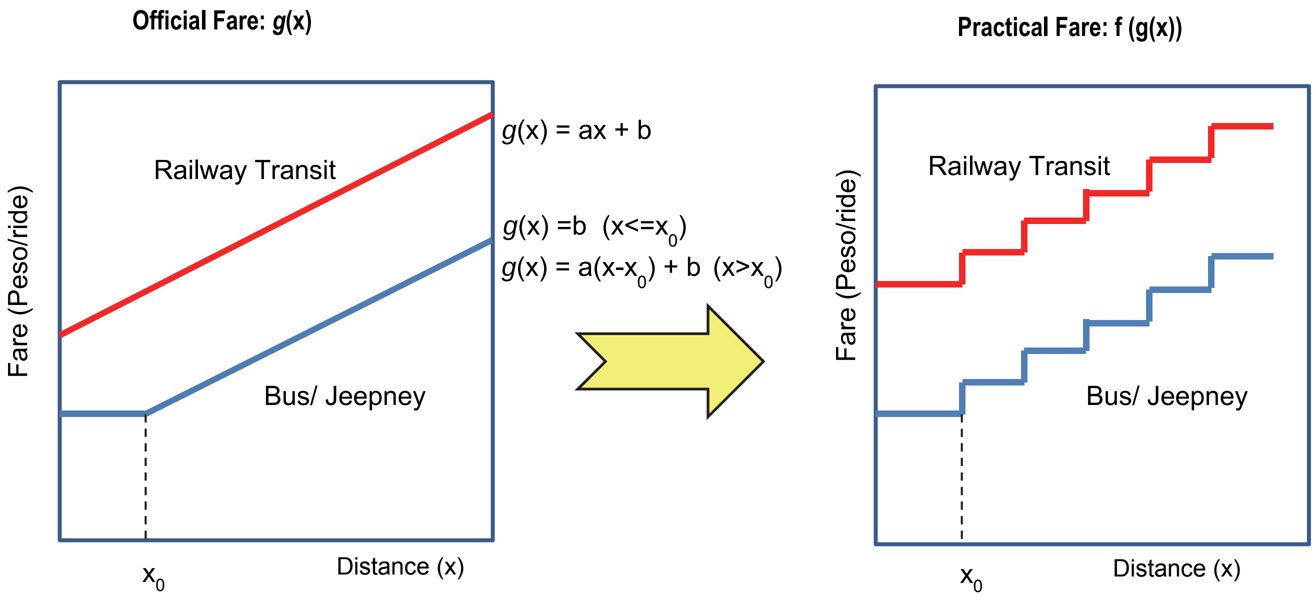


Source: JICA Project Team

If the fare per kilometer *(b)* is a decimal fraction, total fare will also be decimal fraction, which is not practically convenient as a fare. Therefore, after calculating the fare using the formula, the fare is rounded off. The way of rounding is different by mode. Here, the fare before rounding is referred to as official fare *(g(x))* and the fare after rounding is referred to as practical fare *(f(g(x)).* Both fares are illustrated in Figure 2.2. In case of rail transit in Metro Manila, there is no base fare section (x_0 = 0).

For rounding off, the function "INT" prepared in Excel will be used. INT(x) returns maximum integer not larger than X. If x > 0.0, return integer part of X, by disregarding fractions smaller than decimal.

Figure 2.2: Official Fare and Practical Fare



Source: JICA Project Team

2.2 Bus and Jeepney Fares

Current fares for ordinary buses are PHP10.0 for the first 5.0 km and PHP1.85 for each succeeding kilometer. The fare is rounded off to the nearest 25 centavos. In reality, however, 25, 50, and 75 centavos are rounded off to peso.

Official Fare: $g(x) = 10 + 1.85\ (x - 5.0)$

Practical Fare: $f\ (g(x)) = INT\ ((\ g(x)\ ) / 0.25 + 0.99) * 0.25$

In Reality: $f\ (g(x)) = INT\ (\ g(x) + 0.99)$

Current jeepney fares are PHP7.50 for the first 5.0 km and PHP1.50 for each succeeding kilometer. The decimal function is always 50 centavos and there is no practical fare.

Official Fare: $g(x) = 7.5 + 1.5\ (x - 5.0)$

Practical Fare $f(x) = g(x)$

2.3 Rail Transit Fares

Current fares on urban rail transits are shown in the form of fare matrices in Table 2.1 for LRT 1, Table 2.2 for LRT 2, Table 2.3 for MRT 3, and Table 2.4 for the Philippine National Railways (PNR). LRT 1 and LRT 2 have two matrices, the first of which shows the official fares and the second one shows the practical fares. In case of LRT and MRT, electronic tickets named “stored value tickets” have been used[1] and official fares are applied to such electronic tickets and the practical fares applied only to single trip tickets. The official fares in NCR are originally rounded off to zero or five and then the practical fares are equal to the official ones.

[1] Since 3 October 2015, beep cards have replaced stored-value cards. Commuters can use the beep cards on the LRT 1, LRT 2, and MRT 3.

Table 2.1: Current Fare Matrix of LRT 1

(1) Official Fares (for Stored-value Card)

		Ba	Ed	Li	GP	VC	Qu	PG	UN	CT	Ca	Dj	Bm	Ta	Bl	AS	RP	SA	Mc	BW	RV
1	Badaran	11	12	13	13	14	15	16	17	18	19	19	20	21	21	22	23	24	25	27	29
2	EDSA	12		12	13	14	15	15	16	17	18	19	19	20	21	22	22	23	24	27	29
3	Libertad	13	12		12	13	14	14	15	16	17	18	18	19	20	21	21	22	23	26	28
4	G. Puyat	13	13	12		12	13	14	14	16	16	17	18	18	19	20	21	22	23	25	27
5	V. Crus	14	14	13	12		12	13	13	15	15	16	17	17	18	19	20	21	22	24	26
6	Quirino	15	15	14	13	12		12	13	14	14	15	16	16	17	18	19	20	21	23	25
7	P Gil	16	15	14	14	13	12		12	13	14	14	15	16	16	17	18	19	20	22	24
8	UN Ave.	17	16	15	14	13	13	12		12	13	14	14	15	16	17	17	18	19	22	23
9	C. Terminal	18	17	16	16	15	14	13	12		12	12	13	14	14	15	16	17	18	20	22
10	Carrieds	19	18	17	16	15	14	14	13	12		12	12	13	14	15	15	16	17	20	22
11	D Jose	19	19	18	17	16	15	14	14	12	12		12	12	13	14	15	15	17	19	21
12	Bambamg	20	19	18	18	17	16	15	14	13	12	12		12	12	13	14	15	16	18	20
13	Tayuman	21	20	19	18	17	16	16	15	14	13	12	12		12	13	13	14	15	18	20
14	Blumentritt	21	21	20	19	18	17	16	16	14	14	13	12	12		12	13	14	15	17	19
15	Abad Santos	22	22	21	20	19	18	17	17	15	15	14	13	13	12		12	13	14	16	18
16	R. Papa	23	22	21	21	20	19	18	17	16	15	15	14	13	13	12		12	13	15	17
17	5th Ave.	24	23	22	22	21	20	19	18	17	16	15	15	14	14	13	12		12	15	16
18	Monumento	25	24	23	23	22	21	20	19	18	17	17	16	15	15	14	13	12		13	15
19	Balimtawak	27	27	26	25	24	23	22	22	20	20	19	18	18	17	16	15	15	13		13
20	Roosevely	29	29	28	27	26	25	24	23	22	22	21	20	20	19	18	17	16	15	13	

(2) Practical Fares

		Ba	Ed	Li	GP	VC	Qu	PG	UN	CT	Ca	Dj	Bm	Ta	Bl	AS	RP	SA	Mc	BW	RV
1	Badaran		15	15	15	15	15	20	20	20	20	20	20	30	30	30	30	30	30	30	30
2	EDSA	15		15	15	15	15	15	20	20	20	20	20	20	30	30	30	30	30	30	30
3	Libertad	15	15		15	15	15	15	15	20	20	20	20	20	20	30	30	30	30	30	30
4	G. Puyat	15	15	15		15	15	15	15	20	20	20	20	20	20	20	30	30	30	30	30
5	V. Crus	15	15	15	15		15	15	15	15	15	20	20	20	20	20	20	30	30	30	30
6	Quirino	15	15	15	15	15		15	15	15	15	15	20	20	20	20	20	20	30	30	30
7	P Gil	20	15	15	15	15	15		15	15	15	15	15	20	20	20	20	20	20	30	30
8	UN Ave.	20	20	15	15	15	15	15		15	15	15	15	15	20	20	20	20	20	30	30
9	C. Terminal	20	20	20	20	15	15	15	15		15	15	15	15	15	15	20	20	20	20	30
10	Carrieds	20	20	20	20	15	15	15	15	15		15	15	15	15	15	15	20	20	20	30
11	D Jose	20	20	20	20	20	15	15	15	15	15		15	15	15	15	15	15	20	20	30
12	Bambamg	20	20	20	20	20	20	15	15	15	15	15		15	15	15	15	15	20	20	20
13	Tayuman	30	20	20	20	20	20	20	15	15	15	15	15		15	15	15	15	15	20	20
14	Blumentritt	30	30	20	20	20	20	20	20	15	15	15	15	15		15	15	15	15	20	20
15	Abad Santos	30	30	30	20	20	20	20	20	15	15	15	15	15	15		15	15	15	20	20
16	R. Papa	30	30	30	30	20	20	20	20	20	15	15	15	15	15	15		15	15	15	20
17	5th Ave.	30	30	30	30	30	20	20	20	20	20	15	15	15	15	15	15		15	15	20
18	Monumento	30	30	30	30	30	30	20	20	20	20	20	20	15	15	15	15	15		15	15
	Balimtawak	30	30	30	30	30	30	30	30	20	20	20	20	20	20	20	15	15	15		15
20	Roosevely	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	20	20	15	15	

Table 2.2: Current Fare Matrix of LRT 2

(1) Official Fares (for Stored-value Card)

	Re	Le	Pu	VM	JR	Gi	BG	AC	An	Ka	Sa
Recto		12	14	15	16	17	18	19	21	22	24
Legarda	12		13	14	15	16	17	18	20	21	23
Pureza	14	13		13	14	15	16	17	19	20	22
V Mapa	15	14	13		13	14	14	16	18	19	21
J Ruiz	16	15	14	13		12	13	14	16	17	19
Gilmore	17	16	15	14	12		12	13	15	16	18
Betty Go- Belmonte	18	17	16	15	13	12		12	14	15	17
Araneta - Cubao	19	18	17	16	14	13	12		12	13	15
Anonas	21	20	19	18	16	15	14	12		12	14
Katipunan	22	21	20	19	17	16	15	13	12		13
Santolan	24	23	22	21	19	18	17	15	14	13	

(2) Practical Fares

	Re	Le	Pu	VM	JR	Gi	BG	AC	An	Ka	Sa
Recto	0	15	15	15	20	20	20	20	25	25	25
Legarda	15	0	15	15	15	20	20	20	20	25	25
Pureza	15	15	0	15	15	15	20	20	20	20	25
V Mapa	15	15	15	0	15	15	15	20	20	20	25
J Ruiz	20	15	15	15	0	15	15	15	20	20	20
Gilmore	20	20	15	15	15	0	15	15	15	20	20
Betty Go- Belmonte	20	20	20	15	15	15	0	15	15	15	20
Araneta - Cubao	20	20	20	20	15	15	15	0	15	15	15
Anonas	25	20	20	20	20	15	15	15	0	15	15
Katipunan	25	25	20	20	20	20	15	15	15	0	15
Santolan	25	25	25	25	20	20	20	15	15	15	0

Table 2.3: Current Fare Matrix of MRT 3

		NA	QA	GWA	CB	ST	OTG	SB	BA	GL	BD	AA	AG	Tft
1	North Ave		13	13	16	16	20	20	20	24	24	24	28	28
2	Quezon Ave	13		13	13	16	16	20	20	20	24	24	24	28
3	GMA Kamuning	13	13		13	13	16	16	20	20	20	24	24	24
4	Cubao	16	13	13		13	13	16	16	20	20	20	24	24
5	Santolan	16	16	13	13		13	13	16	16	20	20	20	24
6	Ortigas	20	16	16	13	13		13	13	16	16	20	20	20
7	Show Blvd	20	20	16	16	13	13		13	13	16	16	20	20
8	Boni Ave	20	20	20	16	16	13	13		13	13	16	16	20
9	Guadalupe	24	20	20	20	16	16	13	13		13	13	16	16
10	Buendia	24	24	20	20	20	16	16	13	13		13	13	16
11	Ayala Ave	24	24	24	20	20	20	16	16	13	13		13	13
12	Magallanes	28	24	24	24	20	20	20	16	16	13	13		13
13	Taft	28	28	24	24	24	20	20	20	16	16	13	13	

The fares of urban rail transit are as follows:

(i) LRT 1: Base fare of PHP11.00 plus PHP1.00 per kilometer;
(ii) LRT 2: Base fare of PHP11.00 plus PHP1.00 per kilometer;
(iii) MRT 3: Base fare of PHP11.00 plus PHP1.00 per kilometer; and
(iv) PNR: Base fare of PHP10.00 up to 14 km and PHP5.00 for seven kilometers.

Table 2.4: Current Fare Matrix of PNR in Metro Manila

	Distance (km)	Manila	Blumentrit	Laon Laan	Espana	Sta Mesa	Pandacan	Paco	San Andres	Vito Croz	Buendia	Pasay Road	EDSA	Nichols	FTI	Bicutan	Sucat	Alabang	Muntinlupa	San Pedro, L	Pacita MG	Golden City	Binan	Sta Rosa	Golden City 2	Cabuyao	Mamatid	Banlic	Calamba
Manila	0.000																												
Blumentrit	2.700	10																											
Laon Laan	3.820	10	10																										
Espana	4.500	10	10	10																									
Sta Mesa	6.500	10	10	10	10																								
Pandacan	7.980	10	10	10	10	10																							
Paco	9.460	10	10	10	10	10	10																						
San Andres	10.420	10	10	10	10	10	10	10																					
Vito Croz	11.020	10	10	10	10	10	10	10	10																				
Buendia	12.280	10	10	10	10	10	10	10	10	10																			
Pasay Road	13.220	10	10	10	10	10	10	10	10	10	10																		
EDSA	14.300	15	10	10	10	10	10	10	10	10	10	10																	
Nichols	17.900	15	15	15	10	10	10	10	10	10	10	10	10																
FTI	18.600	15	15	15	15	10	10	10	10	10	10	10	10	10															
Bicutan	20.900	15	15	15	15	15	10	10	10	10	10	10	10	10	10														
Sucat	25.020	20	20	20	15	15	15	15	15	10	10	10	10	10	10	10													
Alabang	28.693	25	20	20	20	20	15	15	15	15	15	15	15	10	10	10	10												
Muntinlupa	32.013	25	25	25	20	20	20	20	20	15	15	15	15	15	10	10	10	10											
San Pedro, L	35.374	30	25	25	25	25	20	20	20	20	20	20	20	15	15	15	10	10	10										
Pacita MG	37.550	30	25	25	25	25	25	25	20	20	20	20	20	15	15	15	10	10	10	10									
Golden City	38.720	30	30	25	25	25	25	25	25	20	20	20	20	15	15	15	10	10	10	10	10								
Binan	39.746	30	30	30	30	25	25	25	25	25	20	20	20	20	20	15	15	10	10	10	10	10							
Sta Rosa	43.806	35	30	30	30	30	30	25	25	25	25	25	25	20	20	20	15	15	10	10	10	10	10						
Golden City 2	45.760	35	35	30	30	30	30	30	30	25	25	25	25	20	20	20	15	15	10	10	10	10	10	10					
Cabuyao	47.420	35	35	35	35	30	30	30	30	30	30	25	25	25	25	20	20	15	15	10	10	10	10	10	10				
Mamatid	52.956	40	40	40	35	35	35	35	35	30	30	30	30	30	25	25	20	20	15	15	15	15	10	10	10	10			
Banlic	54.800	40	40	40	40	35	35	35	35	35	35	30	30	30	30	25	25	20	20	15	15	15	15	10	10	10	10		
Calamba	56.138	45	45	40	40	40	35	35	35	35	35	35	30	30	30	30	25	20	20	15	15	15	15	10	10	10	10	10	

2.4 Fare Comparison by Public Transportation Mode

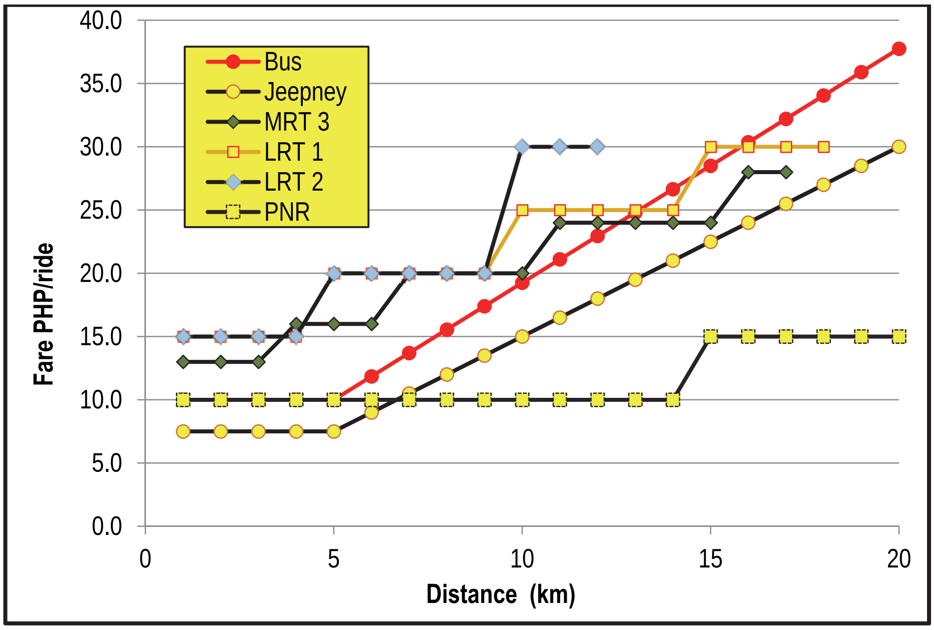
Official fares and practical fares are expressed in the formulas shown in Table 2.5 and illustrated in Figure 2.3. Average riding distance on public transportation services is about 8.0 km. Comparing the fares at 8.0 km for each mode, PNR fare is the cheapest of all urban rail transit systems, as shown in Table 2.5.

Table 2.5: Comparison of Current Rail Fares in Metro Manila

PT Mode	Official Fare: g (x)	Practical Fare: f (g(x))	Fare for 8.0 km / Ride (PHP)
1. Bus	g(x) = 10 + 1.85 (x – 5.0)	f (g(x)) = INT (g(x) / 0.25+ 0.99) * 0.25 or f (g(x)) = INT (g(x) + 0.99)	16.0
2. Jeepney	g(x) = 7.5 + 1.5 (x – 5.0)	f(x) = g(x)	12.0
3. LRT 1	g(x) = 11.0 + 1.0 * x	f(g(x)) = 5.0 * INT ((g(x) / 5 + 0.99) + INT((x - 1) / 20) * INT(25 / x))	20.0
4. LRT 2	g(x) = 11.0 + 1.0 * x	f(g(x)) = 5.0 * INT((g(x)) / 5 + 0.99)	20.0
5. MRT 3	g(x) = 11.0 + 1.0 * x	f(g(x)) = g(x)	19.0
6. PNR	g(x) = 10.0 + 5.0 * INT((x – 14) / 7.0 + 0.99)	f(g(x)) = g(x)	10.0

Source: JICA Project Team

Figure 2.3: Modal Comparison of Current Fares



Source: JICA Project Team

3 HISTORY OF FARE REVISION

3.1 Inflation and CPI in Metro Manila

Figure 3.1 compares the past trend of inflation in the Philippines and Japan since 1980. The Philippines experienced a hyperinflation over 40% in 1984, when Typhoon Nitang struck the Philippines, killing 1,492 people, injuring more than 1,856, and affecting roughly 1.6 million in the country. In the 1990s, however, inflation was controlled well. The annual inflation rate fell to 4.0 to 6.0%. From 2000 until 2014, the average is 4.4%.

On the other hand, Japan has been suffering from economic stagnation for a long time now together with deflation after the bubble economy burst in the early 1980s. From 2000 until 2014, the average inflation rate is 0.0%. The Government of Japan has set a goal for the annual inflation rate, i.e., 2.0%, to help stimulate the national economy.

The commodity price index (CPI), which is another economic indicator expressing inflation, is illustrated in Figure 3.2 for both Metro Manila and the Philippines for the period 2000 to the present. The CPI in the base year (2006) was assumed at 100. Since 2008, the country's CPI was higher than that of Metro Manila by 3.0 to 4.0 points. In the next section, the Manila CPI will be used to convert the nominal change in public transportation fares into real terms at fixed prices.

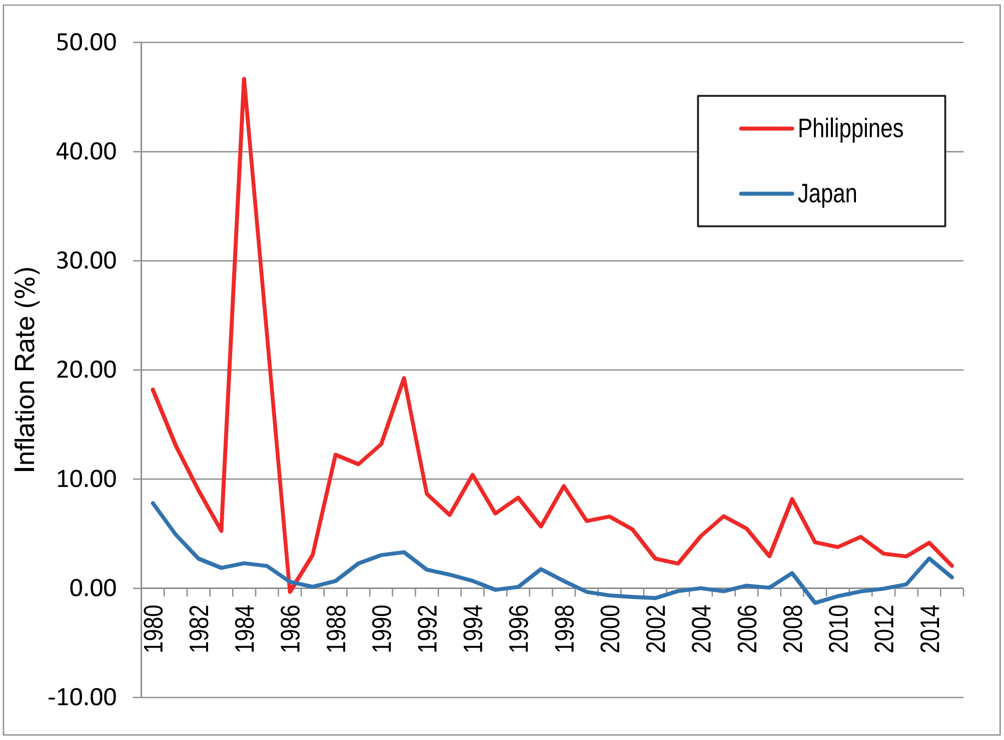
3.2 Past Trend of Bus and Jeepney Fare Revisions

Figure 3.3 illustrates the changes in bus fares in Metro Manila for an 8.0-kilometer ride since 1996. The red line shows nominal bus fares expressed at current prices, which were converted into real terms at year 2000 constant prices (black line). Simply speaking, the red line shows the trend which included the inflation factor, while the black line showed the trend minus inflation. As the base year is 2000, both lines cross that year.

The red line shows an increase in fares in 2004 and 2005, from PHP11 per ride to PHP22 per ride, although there was no significant inflation then. After 2005, however, the fare shows moderate increase at an annual average of 1.2%, which is lower than the inflation rate in each corresponding year. Therefore, the real changes in the black line show a peak in 2005, before falling to the 2004 level in 2015. From 2000 to 2014, bus fares nominally increased by 2.3 times, while fares in real terms increased by 1.2 times in 2000.

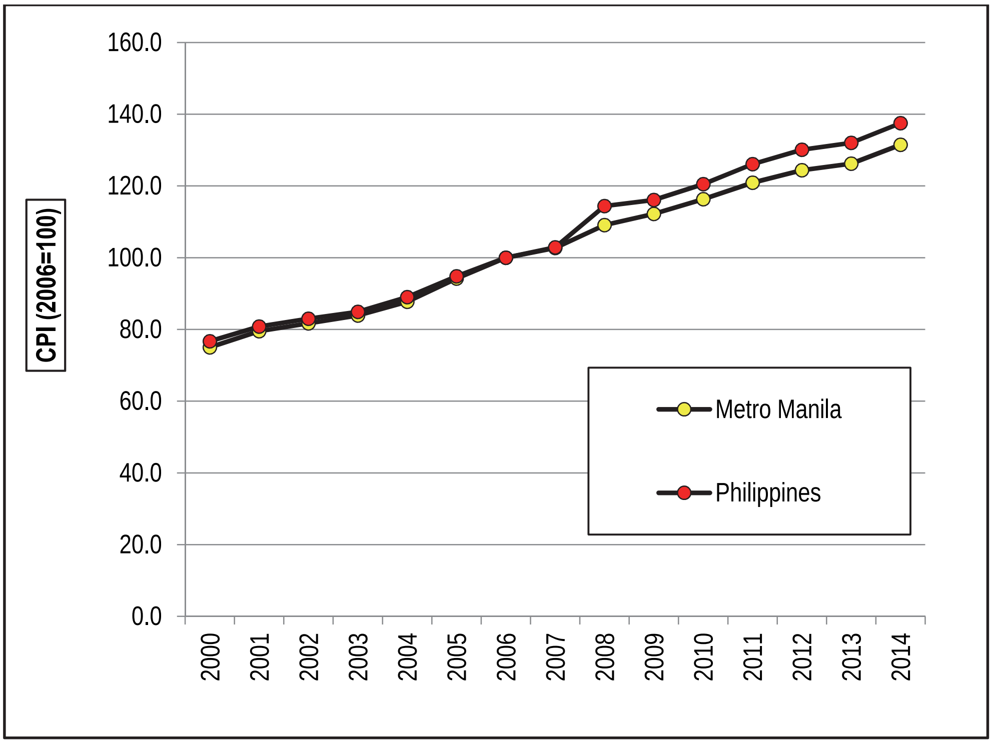
The changes in jeepney fares as shown in Figure 3.4 almost mirror that of bus fares. The difference, however, is that the fares in real terms in 2015 are lower than those in 2000 by 8%. It should be noted that current jeepney fares have not been revised to reflect the high inflation since 2000, although passenger affordability has improved due to increases in household incomes.

Figure 3.1: Changes in Inflation Rates in the Philippines and Japan, 1980–2014



Source: NSO and Japan National Statistics Office

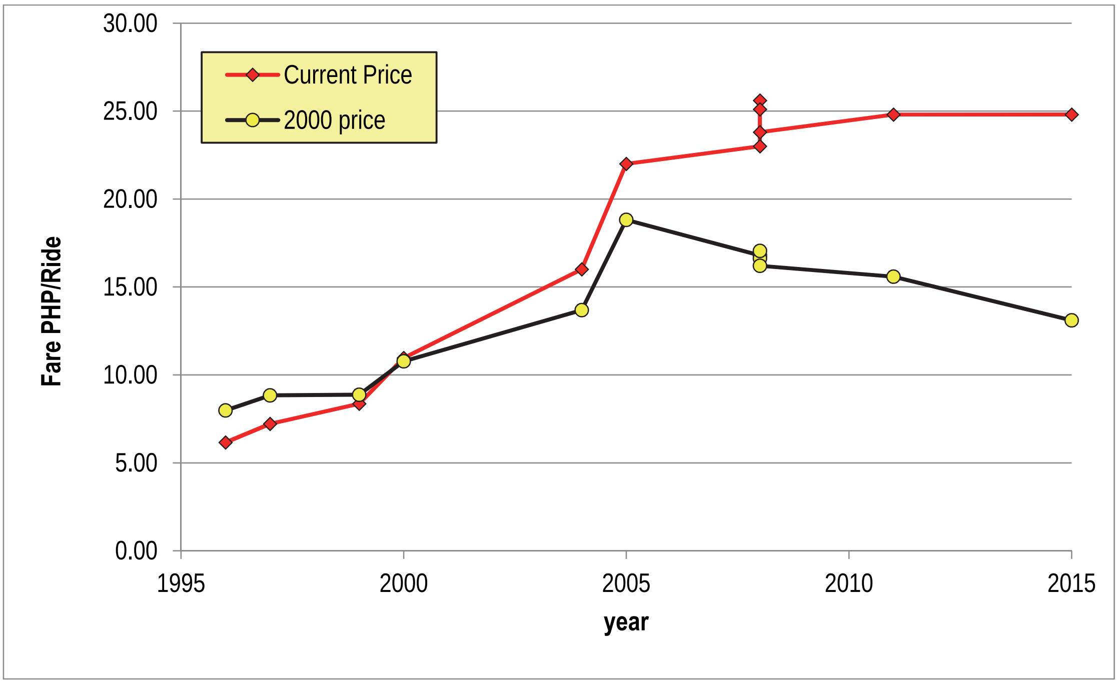
Figure 3.2: Commodity Price Indices in the Philippines and Japan, 2000–2014[1]



Source: JICA Project Team

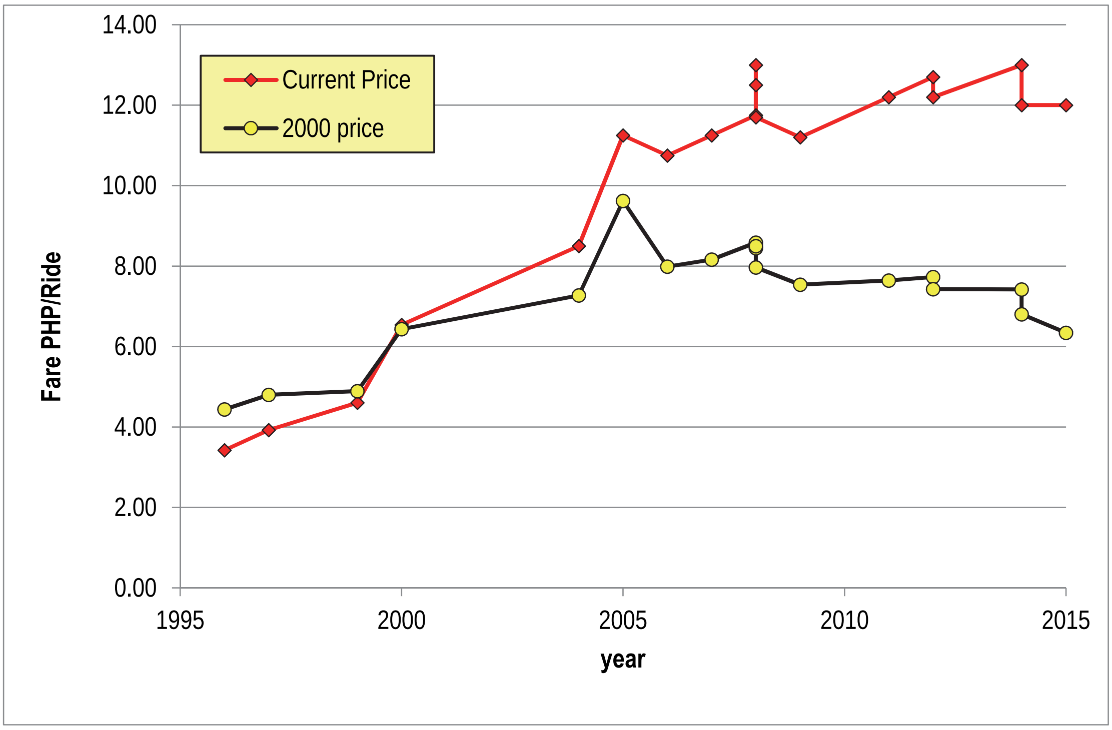
[1] CPI year 2006=100

Figure 3.3: Changes in Bus Fares in Nominal and Real Terms, 1995–2015



Source: DOTC and NSO, and illustrated by the JICA Project Team

Figure 3.4: Changes in Jeepney Fares in Nominal and Real Terms, 1995–2015



Source: DOTC and NSO, and illustrated by the JICA Project Team

4 COST-PLUS-PROFIT FARES

4.1 Vehicle Operating Costs

In MUCEP, vehicle operating costs (VOCs) for 2015 were estimated. For the purpose of this fare study, bus and jeepney VOCs were used. The major inputs for VOC estimates are shown in Table 4.1. Before setting the main characteristics in Table 4.1 (1), the most popular makes and models in Metro Manila were identified by type of vehicle as representative vehicles, after which prices and other data were surveyed for each vehicle.

The Department of Public Works and Highways (DPWH) annually estimates the VOCs, with its main concern being intercity traffic. The VOCs depend on road surface conditions and topography. In urban traffic, however, the dominant factor affecting VOCs is neither surface condition nor topography, but travel speed. Therefore, such cost components as fuel, oil, and tire were expressed by travel speed in MUCEP. The VOCs were estimated by financial and economic costs. Economic cost is estimated by deducting all taxes from financial cost and used for economic evaluation.

Table 4.1: Major Inputs for VOC Calculation

(1) Vehicle Characteristics

Item	Taxi	HOV	Van	Jeepney[1]	Standard Bus
1. Price (PHP)					
• Financial Price	1,082,206	1,870,488	1,054,250	972,000	5,500,000
• Tax Rate (%)	42-59	43-59	37-57	46	37
• Economic Price[2]	631,024	1,084,341	637,009	665,753	4,014,599
2. No. of Tires	4	4	4	4	6
3. Main Fuel	Gasoline	Gasoline	Gasoline	Diesel	Diesel
4. Annual Vehicle-Kilometers	60,000	60,000	25,000	70,000	80,000
5. Average Speed (km/h)	25.0	25.0	16.7	18.0	20.0
6. Annual Working Hours	2,400	2,400	1,500	1,800	2,200

[1] Interview with dealer.
[2] Excludes VAT, consumption tax, import tax, and registration cost.
Source: DPWH

(2) Fuel Prices (as of 1 September 2015)

(PHP/Liter)

Item	Gasoline	Diesel
Financial Cost	37.65	25.00
Economic Cost	33.13	22.00

Note: Surveyed at fuel stations.

(3) Oil Prices (as of October 2015)

(PHP/Liter)

Item	Car	Bus/Jeepney
Financial Cost	265.0	200.0
Tax	34.5	28.0
Economic Cost	230.6	172.0

Note: Surveyed at fuel stations.

(3) Tire Prices (as of October 2015)

(PHP)

Item	Jeepney	Bus
No. of Tires	4	6
Unit Price	7,327	13,931
Financial Cost	29,309	83,583

Note: Surveyed at market

The cost components of VOC are fuel cost, oil cost, tire cost, repair cost, depreciation cost, capital opportunity cost, as well as crew and other costs. The overhead cost of commercial-use vehicles is included in other costs. Of these components, the first four are proportional to traveled distance by each mode, while the last two are proportional to used time. Depreciation is partly proportional to distance and time.

Estimated VOCs are shown by component in Table 4.2. Oil cost rises as speed increases, while tire cost decreases at higher speeds. Both of them are smaller compared to other components. Other components show more or less the shape of "U," decreasing at speeds of 40–50 km/h and rising as speeds increase.

Table 4.2: Vehicle Operating Costs of Bus and Jeepney by Speed

(1) Bus

Operating Speed	VOC Cost Component							Total VOC
	Fuel Cost	Oil Cost	Tire Cost	Repair Cost	Depreciation	Capital Opportunity	Crew & Others	
5	16,818	1,602	886	7,257	13,844	35,453	29,191	105,050
10	10,760	1,028	936	6,836	8,734	17,726	14,595	60,616
20	7,780	706	1,003	6,100	5,931	8,863	7,298	37,681
30	7,105	584	1,120	5,416	4,801	5,909	4,865	29,800
40	6,613	536	1,304	5,101	4,251	4,432	3,649	25,885
50	7,105	516	1,538	5,048	3,989	3,545	2,919	24,661
60	8,153	472	1,672	5,416	3,980	2,954	2,433	25,080
70	9,523	428	1,789	5,785	4,049	2,532	2,085	26,190
80	10,953	374	2,090	6,153	4,116	2,216	1,824	27,725
90	12,098	336	2,524	6,521	4,202	1,970	1,622	29,272

(2) Jeepney

Operating Speed	VOC Cost Component							Total VOC
	Fuel Cost	Oil Cost	Tire Cost	Repair Cost	Depreciation	Capital Opportunity	Crew & Others	
5	12,181	820	223	1,532	2,917	7,542	15,459	40,673
10	7,793	526	236	1,413	1,822	3,771	7,729	23,290
20	5,635	362	253	1,197	1,203	1,885	3,865	14,400
30	5,146	298	282	958	978	1,257	2,576	11,495
40	4,789	266	329	802	768	943	1,932	9,829
50	5,146	258	388	778	712	754	1,546	9,582
60	5,905	256	421	850	705	628	1,288	10,053
70	6,897	252	451	946	720	539	1,104	10,909
80	7,933	236	527	1,077	756	471	966	11,966
90	8,762	212	636	1,209	803	419	859	12,900

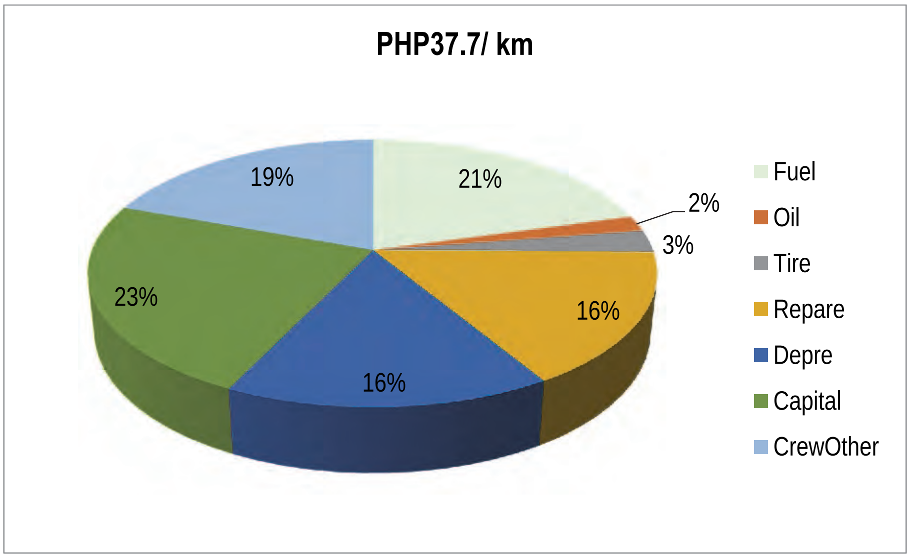
Source: JICA Project Team

Figure 4.1 illustrates the cost components at a speed of 20 km/h. The overall VOC of bus is PHP37.70 per kilometer, of which fuel cost accounts for 21%. When petroleum price fluctuated drastically in 2008, bus fares changed four times in one year. It should be noted, however, that a 21% change in fuel prices, for example, will bring about a 5% change in total bus VOC.

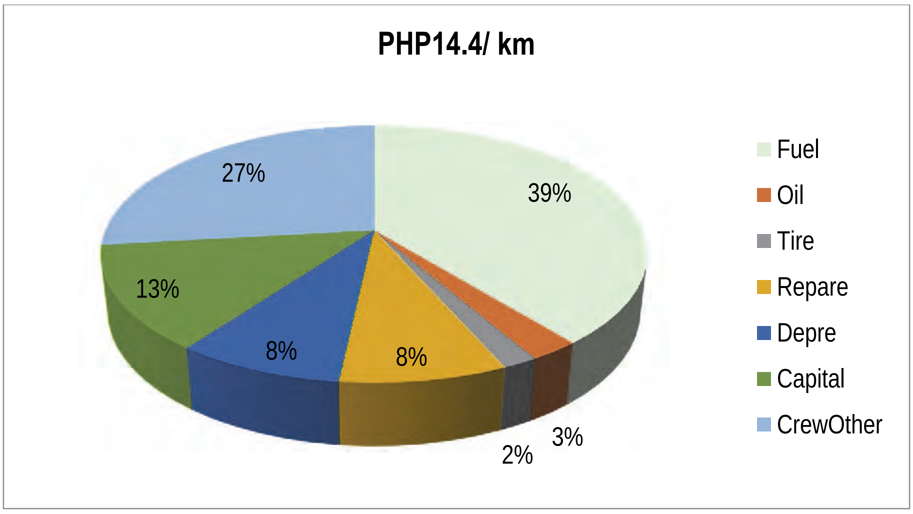
As for jeepney, the overall VOC is PHP14.40 per kilometer. Vehicle prices and overhead costs of jeepneys are lower than those of buses. Consequently, fuel cost occupies a comparatively high share of 39%. Direct cost of fuel, oil, tire and repair is about half of total and the other half is depreciation, capital cost and crew/ overhead cost.

Figure 4.1: Vehicle Operating Cost by Component at 20-km/h Speed

(1) Bus



(2) Jeepney

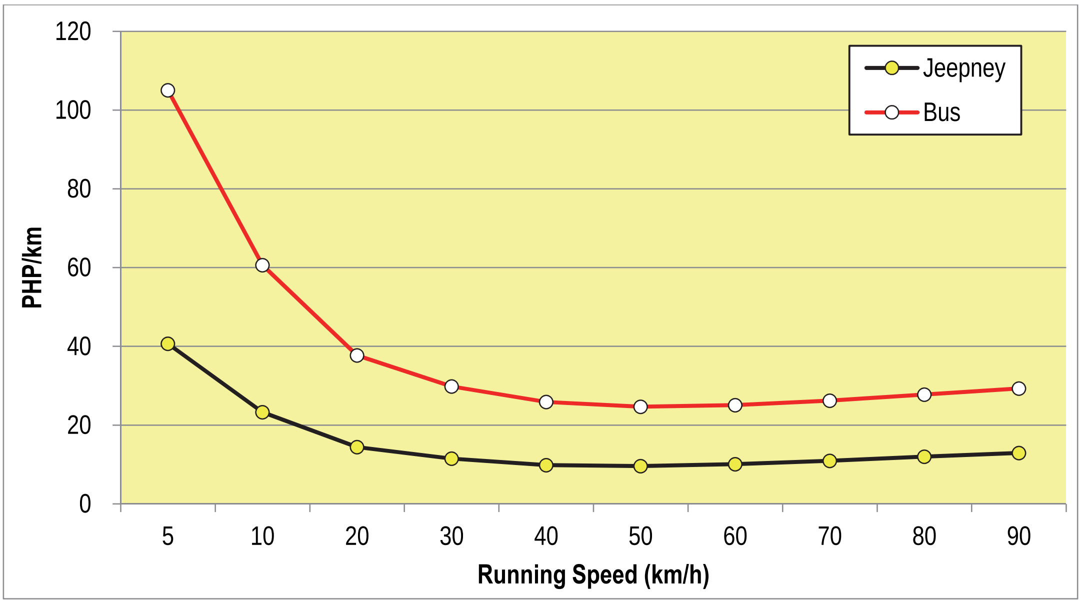


Source: JICA Project Team

Figure 4.2 shows the relationship of VOC of bus/ jeepney and travel speed. As stated in the previous section, VOCs show "U" shapes against travel speed with the bottom representing speeds of 40–50 km/h. Therefore, the speed is called economic speed. Jeepney VOC is less than half of bus VOC at every speed. Based on the results of the MUCEP screen line and cordon line surveys, the average load factor (seat occupancy rate) of a bus is 34.19 persons and that of a jeepney is 8.84 persons. Based on this, the VOC per vehicle in Figure 4.2 can be converted to VOC per passenger, as shown in Figure 4.3, where bus VOC is lower than jeepney VOC by about 30%. This should be noted at the next fare review.

Figure 4.2: Vehicle Operating Costs of Bus and Jeepney

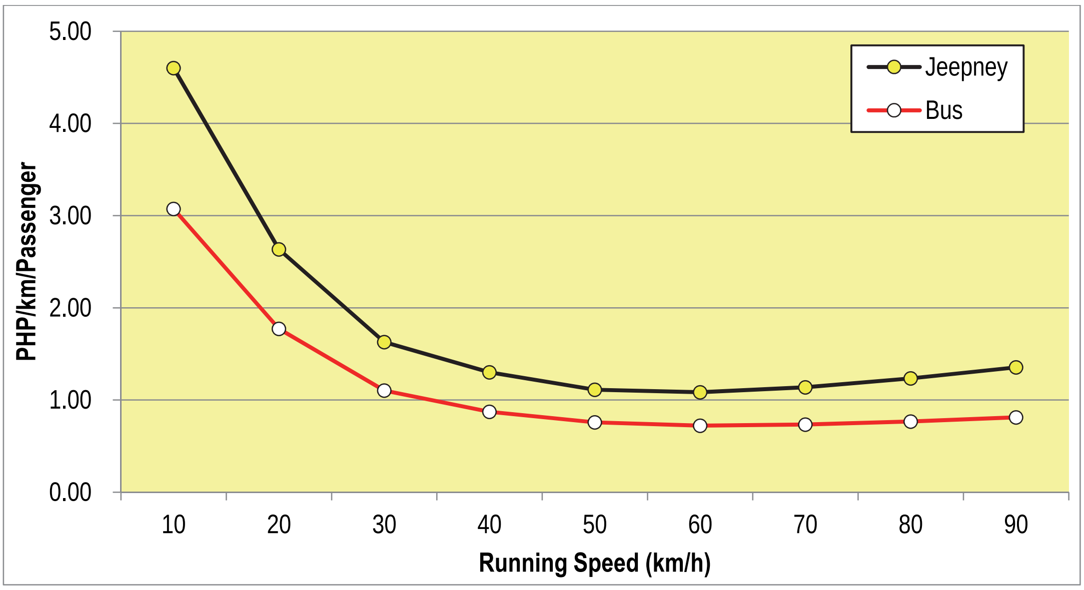
(PHP/km/vehicle)



Source: JICA Project Team

Figure 4.3: Transport Costs of Bus and Jeepney Passengers

(PHP/km/passenger)



Source: JICA Project Team

4.2 Fare Review from Cost plus Profit Viewpoint

At an average riding distance of 8.0 km, bus fare per passenger-km is PHP2.00 and jeepney fare per passenger-km is PHP1.50. Therefore, it is a necessary condition that the VOC per passenger-km is lower than these fares. The difference is regarded as profit. If the cost is higher than the fares, the bus business is in the red.

When asked for an opinion on current bus fares, an executive of a major bus company in Metro Manila replied that the current fare level was okay, but a serious issue hurting profitability was traffic congestion. Traffic congestion not only lowers the efficiency of vehicle operation but increases the VOC as well. The average operating speed of bus and jeepney is about 20 km/h in the urban area. At peak hours, however, this drops to 10–15 km/h, sometimes even 5 km/h.

Another factor affecting revenue of bus/ jeepney businesses is seat occupancy rate (or load factor). As described earlier, the average seat occupancy of a bus is 34 passengers or 63% of its capacity, while the average occupancy of a jeepney is 8.8 passengers or 52% of its capacity. It is apparent that higher occupancy will bring about higher profit.

Figure 4.4 (1) shows how bus/ jeepney VOCs change as occupancy rates increase. The higher the occupancy, the lower the fare per passenger. As a result, the locus draws a hyperbola. The aforementioned executive of a bus company said that his company imported a bus fleet from China, Korea, and Japan. The price of a bus is different by country, ranging from PHP5.5 million to PHP7.0 million. In the graph, seven curves are drawn to represent various amounts from PHP4.0 million to PHP7.0 million, with intervals of PHP0.5 million. The average is PHP6.0 million, which is marked by red circles.

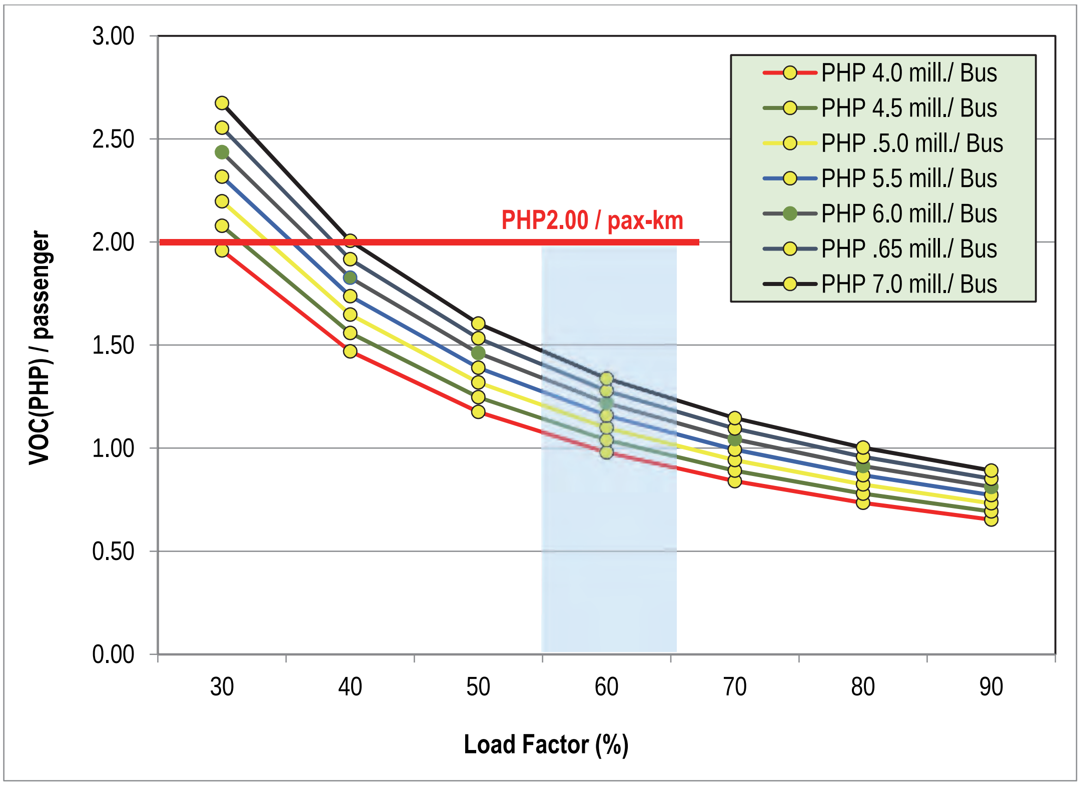
Looking at 60% of occupancy, the fare level is higher than the VOC curves by 50% to 100%, which are regarded as crude profit ratios and look high enough. The DOTC Executive Order No. 202, Section 5, Item C says: “Margin of profit of the public transport operator/s should be within the 12% allowable limit.” If the Order has become impractical, it should be voided or amended.

Figure 4.4 (2) for jeepney shows the same pattern as that for bus. Jeepney fare at PHP1.50 pesos per passenger-km is lower than the VOC, meaning, it is not enough to cover capital costs (depreciation as well as capital opportunity cost). Jeepney operators may be satisfied just to earn just enough to cover direct cost plus profit, disregarding the capital or initial costs. Not considering all VOC components cannot be sustainable.

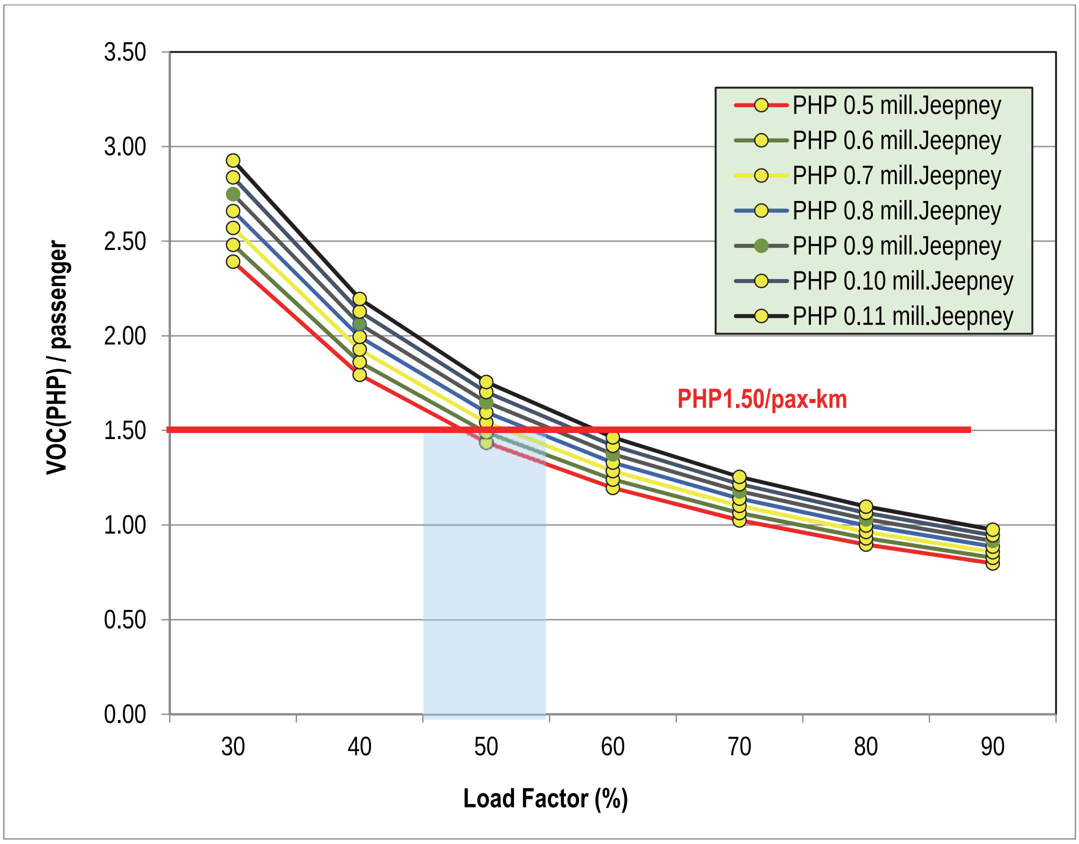
The national government has a plan to organize jeepney businesses in a modern way. However, it may be difficult to organize jeepney operators into forming a corporate body and modernizing their vehicles, as long as the business remains in such a low or negative level of profitability. If the occupancy rate exceeds 70%, jeepneys can earn enough profit. Otherwise, the current fare should be raised by about 30% in order to make jeepney businesses sustainable.

Figure 4.4: Vehicle Operating Costs by Load Factor

(1) Bus



(2) Jeepney

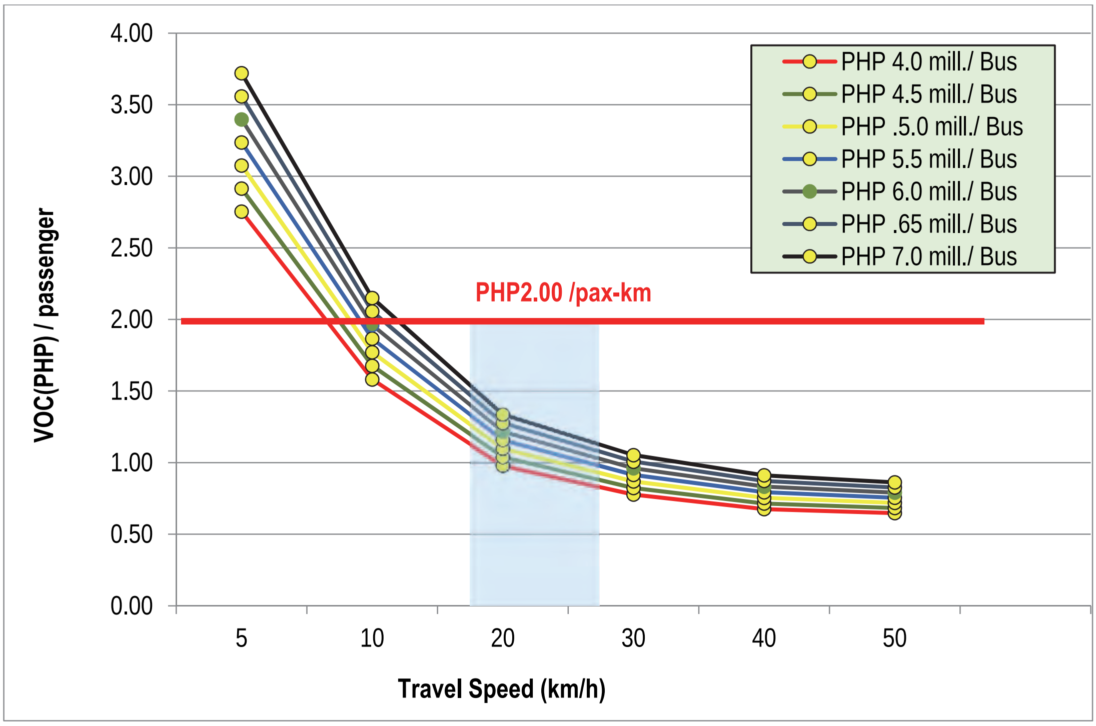


Source: JICA Project Team

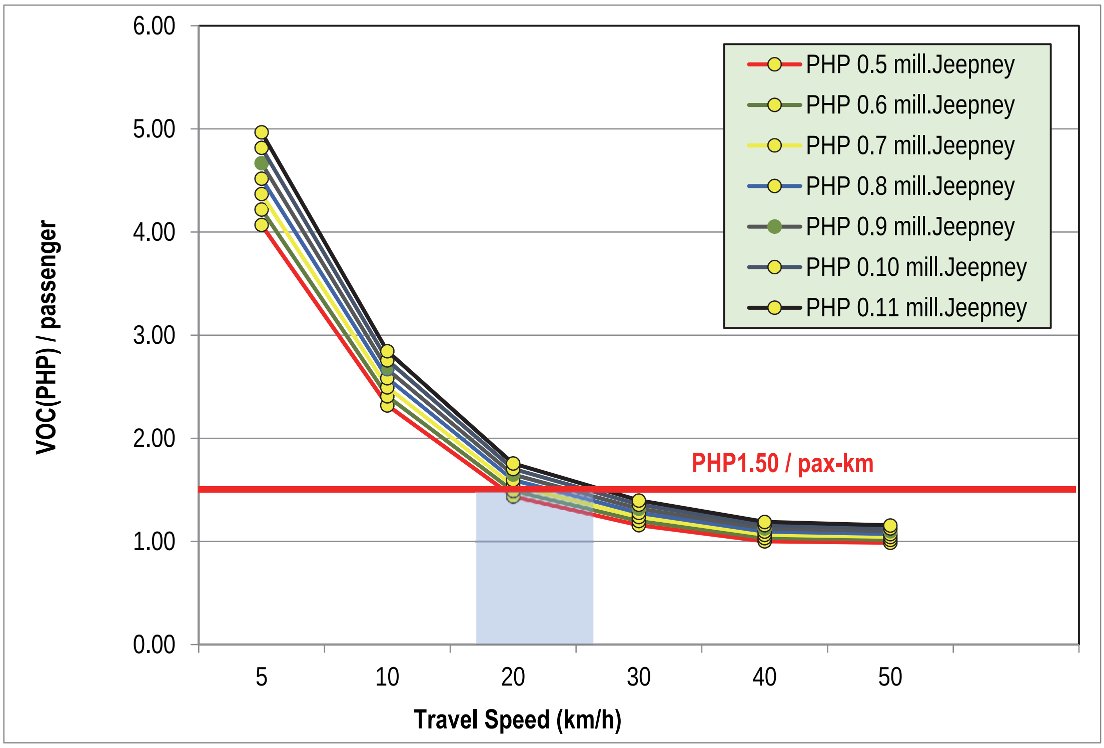
Figure 4.5 shows VOCs using travel speed as the horizontal axis, instead of the load factor. The figure shows the same tendency shown in Figure 4.4: At the speed of 20 km/h, bus is profitable, while jeepney is unprofitable. Bus business will also lose its profitability as travel speeds decrease to 10 km/h.

Figure 4.5: Vehicle Operating Costs by Travel Speed

(1) Bus



(2) Jeepney



Source: JICA Project Team

5 REVENUE-MAXIMIZING FARE

5.1 General Information

In general, the number of passengers of a public transportation service will decrease as its fare goes up. If the service is free of charge, the number of passengers will reach the maximum capacity. On the other hand, fare revenue will be zero if the fare is zero even though the number of passengers at the maximum level. If the fare is extraordinarily high, the number of passengers will be zero and there will be no revenue. Thus, revenue will draw an upward convex as shown in Figure 5.1. Taking a point on the passenger curve, an area of a rectangle with the point and the coordinate origin as a pair of diagonal corners corresponds to the revenue at the fare.

To PT operators, more revenue is preferable. This does not mean that higher fares are always better. If the current fare is higher than the revenue-maximizing fare (r_{max} in Figure 5.1), this will decrease the total revenue. Therefore, it is important not only for administrators but for operators to know the revenue-maximizing fare.

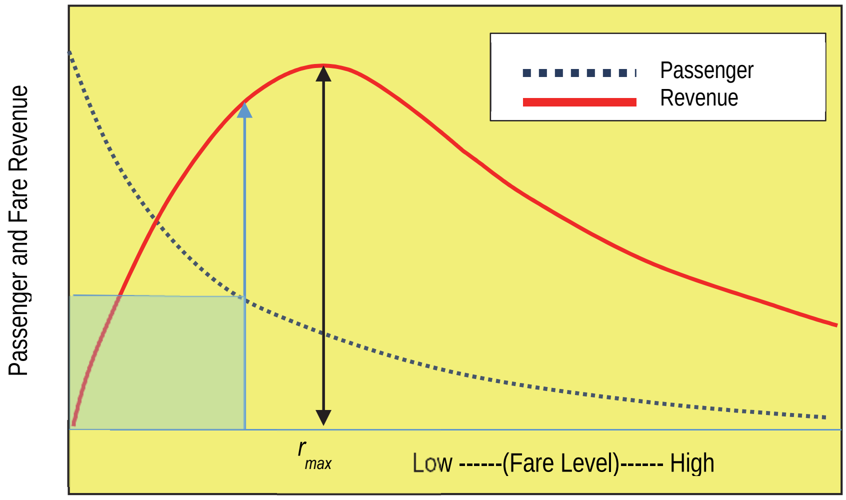
As long as social experiments to know the revenue-maximizing fare by changing the fares many times in a short period is difficult to implement, computer simulation is the only way to estimate the r_{max} . Hereunder, several simulation results are shown as examples. They suggest that the relationship between current fare level and r_{max} varies on a case-by-case basis.

5.2 MRT Line 3

Currently, four urban rail transit lines operate in Metro Manila, including PNR, as shown in Figure 5.2. Of these lines, MRT Line 3 is the first to be developed through the PPP scheme of build–operate–transfer. The Metro Rail Transit Corporation (MRTC), a private company in partnership with the DOTC, started operating the line in December 1999. It runs on Epifanio de los Santos Avenue (EDSA) and has a length of 16.9 km from North Avenue to Taft Avenue.

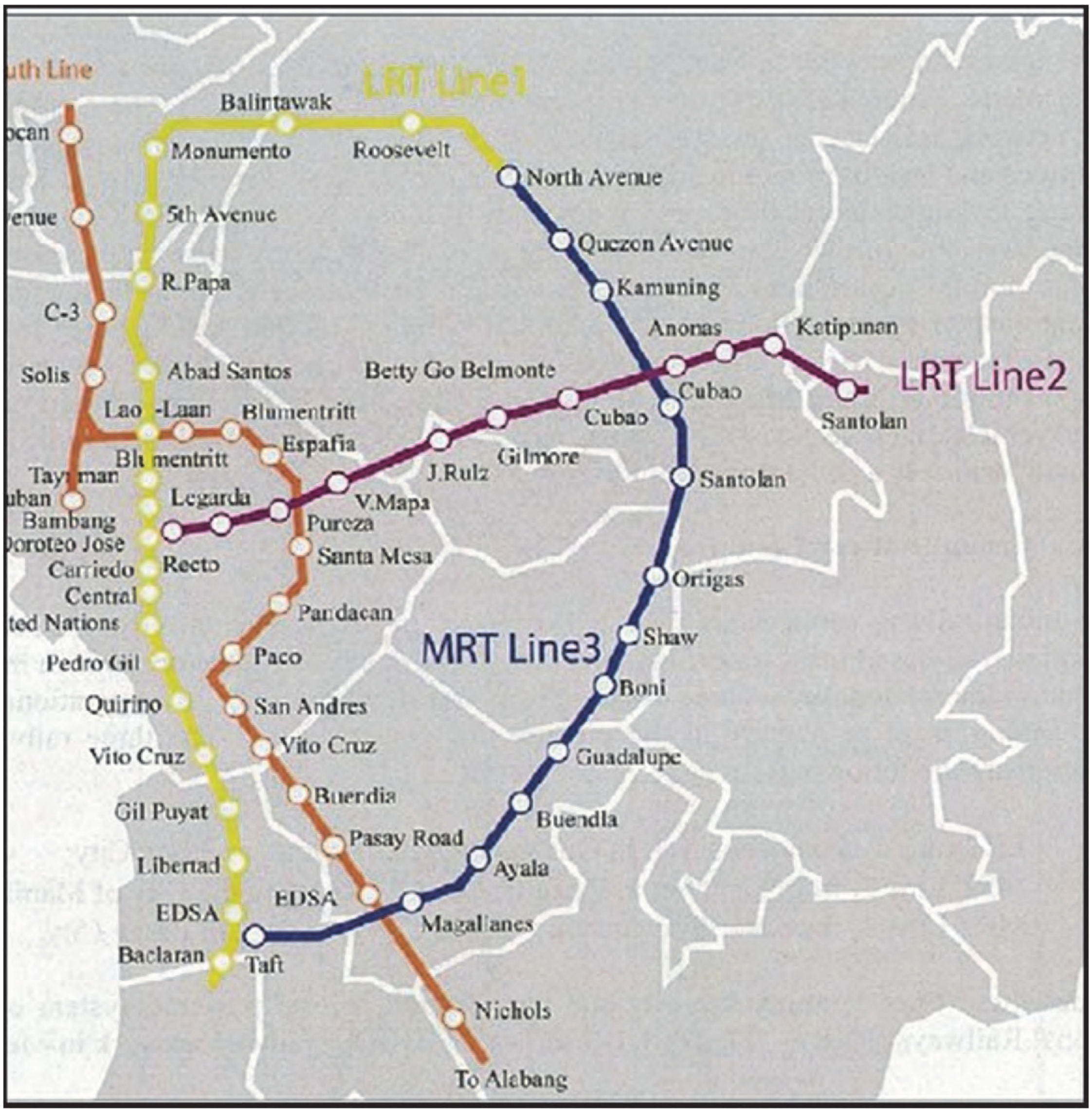
It was planned as a rapid transit with a capacity of 450,000 passengers per day, but the increase in ridership has been remarkable, recording some 650,000 passengers in 2012 to 2013. The current fare is PHP13.00 plus PHP1.00 per kilometer.

Figure 5.1: Relationship between Passenger and Revenue



Source: JICA Project Team

Figure 5.2: Rail Transit Network in Metro Manila



Note: As of September 2015.
Source: Information Collection Survey for the Mega Manila Subway Project, JICA, August 2015

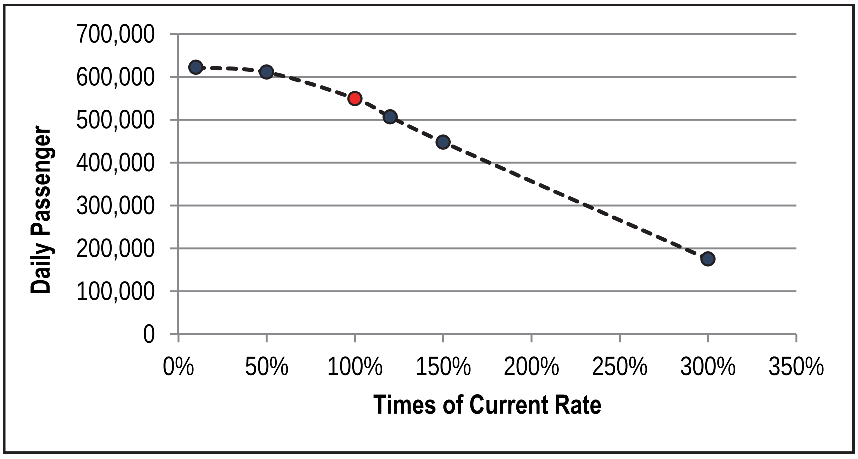
Keeping the fares of other PT modes as they are, only the fare of MRT Line 3 changed from 10% to 300% of the current fare in the computer simulation. Capacity was assumed at 620,000 passengers per day. The results are shown in Figure 5.3 and Figure 5.4.

Ridership decreases as fares go up, as shown in Figure 5.3. If the fare doubles that of the present, demand drops to two-thirds of the present level. And if fares decrease, ridership increases only slightly because of the maximum capacity.

As fares go up, ridership decreases almost in a straight line. Revenue is approximated by a parabola, as shown in Figure 5.4. At double the current fare, the revenue of MRT 3 will be maximized at PHP16.0 million or 1.33 times that of the present. Under such a condition, the number of passengers will be about 350,000 per day, less than 70% of that of the present. To solve the current congestion, the easiest way is to double the current fare. This will decrease the number of passengers by a third of its current number, and at the same time increase the revenue also by a third of the current level.

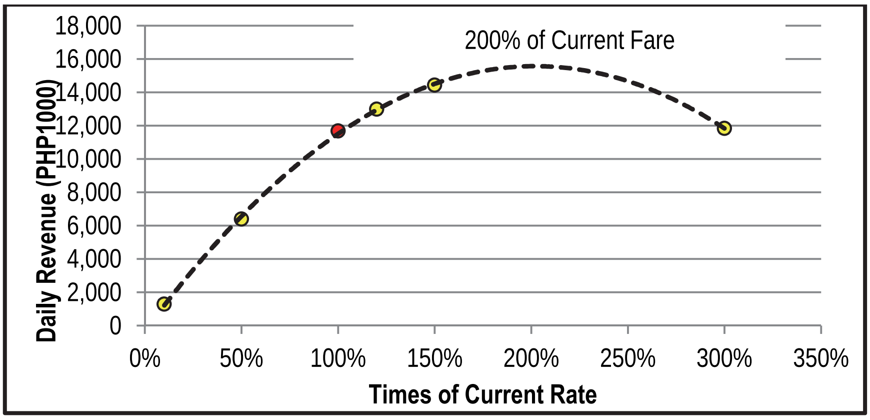
However, fares cannot be determined only by revenue. For example, the economic benefit of a project will become largest when there are many users of the service, and as the fare becomes higher, the economic benefit and the economic IRR decrease. If passengers shift to other road transportation modes, road traffic congestion will worsen. Thus, public transport fare must be studied comprehensively by looking at various viewpoints.

Figure 5.3: Changes in Ridership by Fare Level



Source: JICA Project Team

Figure 5.4: Changes in Fare Revenue by Fare Level



Source: JICA Project Team

5.3 Pasig River Ferry

In the pre-war era, Pasig River played an important role not only in transportation, but also in industries and the people's daily life. But during the war in the 1930s, the contamination of the river water became worse. The river had become a huge sewer and no longer used even for transportation.

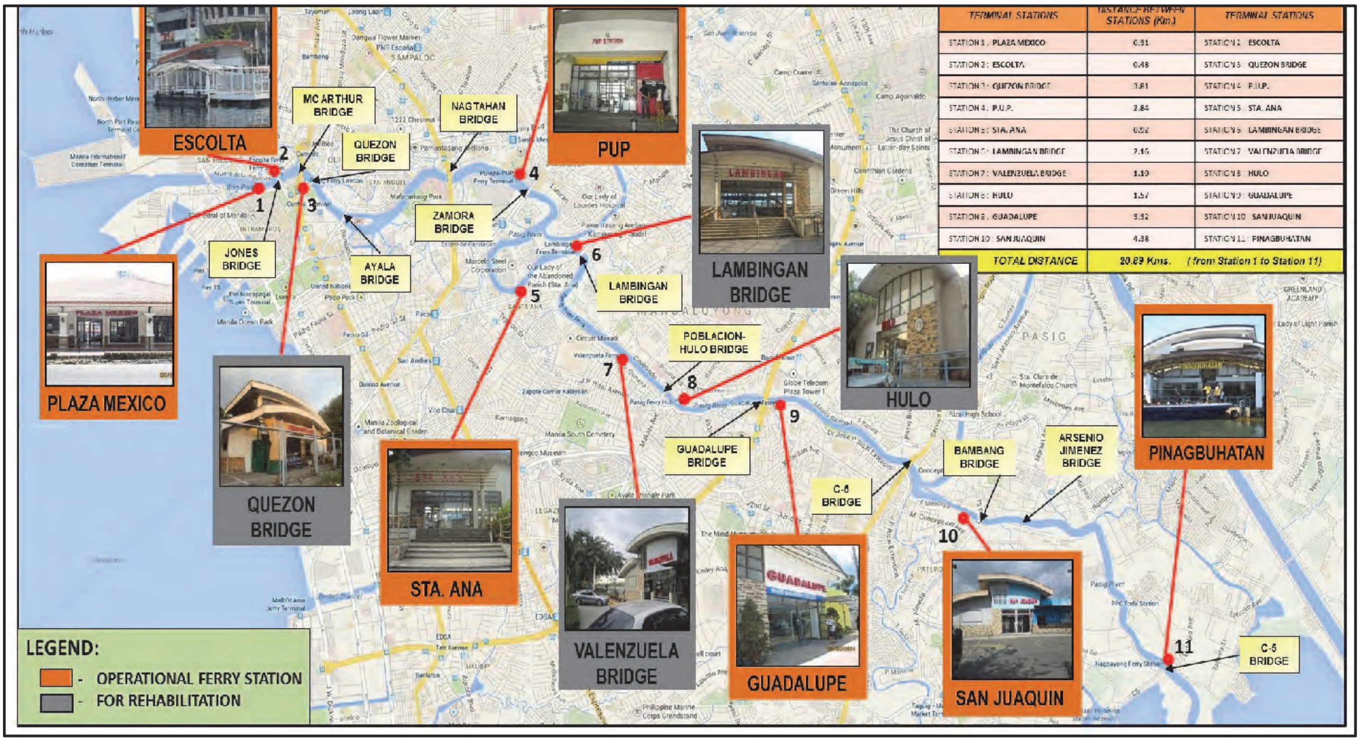
Since the 1960s, several attempts have been made to revive water transportation in the Pasig River, with repeated short-lived operation for more or less one year by several players. In most cases, operators were forced to close or suspend the business mainly due to the proliferation of informal settlers along the route, as well as water lilies, garbage, and other debris clogging the waters and preventing the boats from traveling at normal speeds, aside from the foul odor permeating the environs.

Another reason why past attempts were not sustainable was the sluggish ridership which registered at 2,000 to 3,000 passengers per day. The bad environment might have partly caused the low ridership.

To estimate the potential demand for ferry transportation services, the fare was changed from zero up to half of the present level. Here, only travel time and fare level were taken into consideration, ignoring the bad environment or the uncomfortable ride.

Current operation started in February 2014 by a private company named SCC Nautical Transport Services Incorporated (see Figure 5.5). Current route is 28.4 km, operating two lines with 14 terminals. Operating speed is 10 knots (19 km/h).

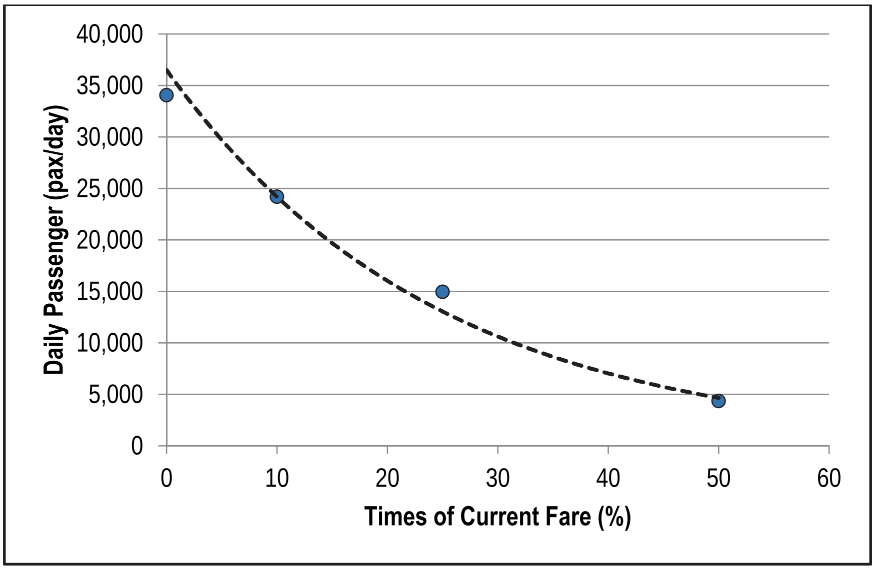
Figure 5.5: Location of Pasig River Ferry Terminals



Source: Office of the Assistant General Manager for Planning, MMDA

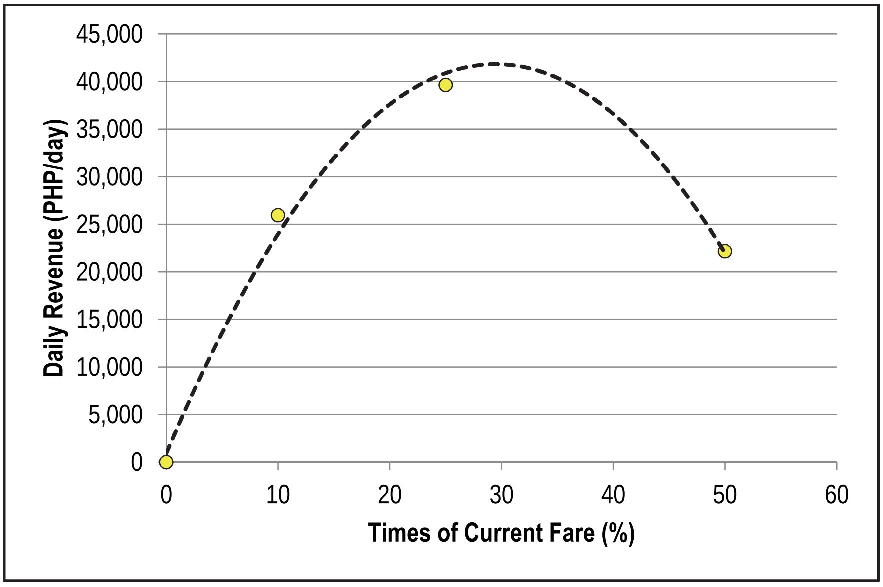
Current fare is PHP10 plus PHP1.85 per kilometer, that is, PHP24.50 for 8.0 km on board, which is slightly cheaper than bus. Daily passenger was 2,000 to 2,500. At half of the current fare, passengers are expected to double and reach 5,000. If the fare is zero, daily passengers will reach 35,000, which is significant and will alleviate road congestion (see Figure 5.6). Total revenue will peak at about 30% of the current fare, in which the number of passengers will be about 10,000 per day with a daily revenue of PHP42,000. If the government wants to use water transportation more effectively, enough to make it an alternative mode to road transportation, a "policy fare" should be planned including the provision of free rides. Otherwise, water transportation will hardly attract a sizeable demand.

Figure 5.6: Changes in Pasig River Ferry Ridership by Fare



Source: JICA Project Team

Figure 5.7: Changes in Pasig River Ferry Revenue by Fare



Source: JICA Project Team

5.4 Bus Service on C5

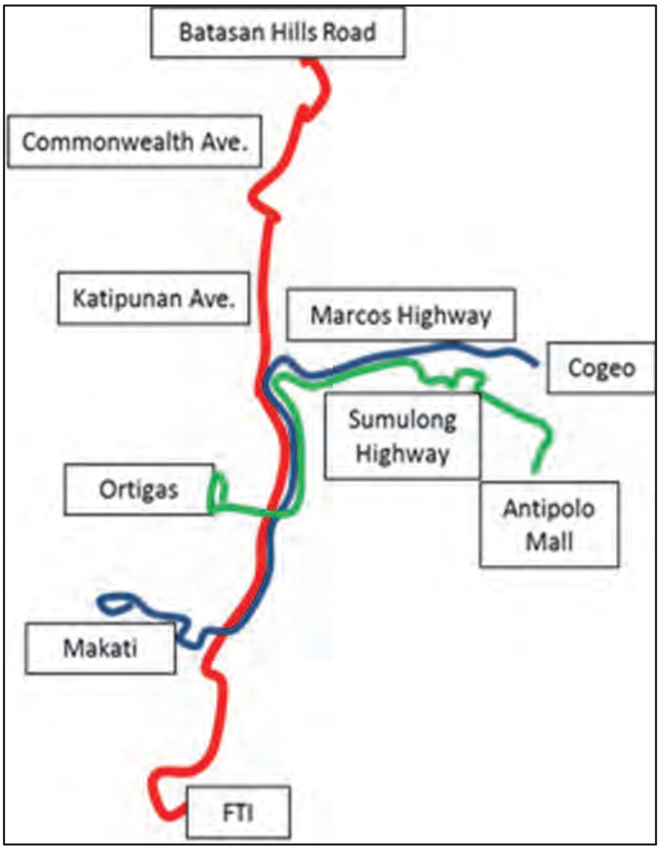
At present, there is no bus service on C5, only jeepney service. The DOTC intends to start bus operations on C5, with the route starting from Batasan Hill Road to FTI (shown in red line in Figure 5.8). It will first be an ordinary bus line, eventually converting it into a BRT line when the time is ripe for such a change. The potential present demand for this line was studied in response to the request of the DOTC.

In the base case, the same fare as that of an ordinary bus was assumed, i.e., PHP10 for the first 5 km and PHP1.85 per succeeding kilometer. The operating speed was set at a range of 5.0 to 18.0 km/h, averaging at 15.0 km/h. Under such conditions, the daily ridership was estimated at 168,000 passengers for both directions, while passenger-km was estimated at 1,058,000 for both directions. The maximum number of passengers per hour per direction was 4,000 passengers.

If the fare increases, the number of daily passengers decreases as well, as shown in Figure 5.9. If the fare is reduced to half of the base case, the demand increases to 500,000 passengers. Apparently, the demand far exceeds the transport capacity of ordinary buses, even that of a BRT. This information will be useful in developing a plan on BRT introduction or rail transit on C5.

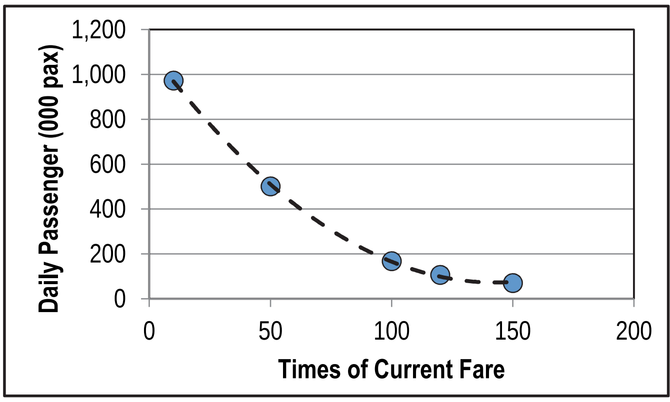
An analysis of revenues shows that the potential total revenue will be maximized if the fare is 62% of the base case fare. As seen in Chapter 3, the VOC of buses becomes lower as travel speed increases up to 40 to 50 km/h. This suggests the possibility of providing BRT services at lower fares than those of ordinary buses to increase passenger numbers and total revenue.

Figure 5.8: New Bus Route on C5



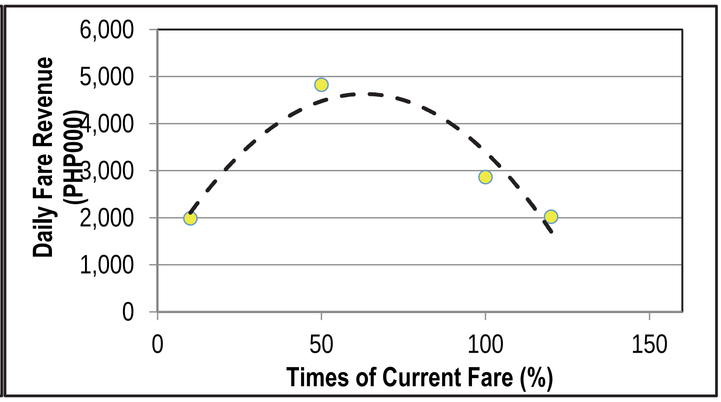
Source: DOTC

Figure 5.9: Changes in C5 Bus Ridership by Fare



Source: JICA Project Team

Figure 5.10: Changes in C5 Bus Revenue by Fare



Source: JICA Project Team

6 FARE AFFORDABILITY IN HOUSEHOLD EXPENDITURE

6.1 Family Expenditure

The Philippine Statistics Authority conducted a survey on family incomes and expenditures in 2012, the results of which were released in July 2014. According to the special release, the average household income was PHP379,000 while the national average was PHP235,000. Average expenditure in the NCR was PHP325,000 and the national average was PHP193,000. In both income and expenditure, NCR the average is higher than the national average by 1.6 times. The difference between income and expenditure is savings.

Figure 6.1 illustrates the composition of the average expenditure in the NCR by component. The largest portion is accounted for by food (36.5%), followed by housing and utility. These two items accounted for almost two-thirds of the total. The third largest component is transportation expenditure at 7.5%.

Figure 6.2 shows the average composition of expenditure in the Tokyo Metropolitan Region in Japan for reference. Food expenditure in Japan is also the largest (25%) cost item and if added to housing and utility, their combined share is about 40% of the total. Meanwhile, transportation expenditure has a share of 2.6%. There is a reason for this low share: In Japan, commuting expenses of most company employees are paid for by the company and regarded as part of company expenses. Therefore, the commuting cost is deductible from taxable profit and are not included in family expenditure.

6.2 Transportation Expenditure

Based on the said 2012 Family Income and Expenditure Survey, the shares of major expenditure components are summarized by income group, as shown in Table 6.1 and Figure 6.3. As incomes increase, the share of food expenditure apparently becomes smaller. This fact is known as the Engel's law. The share of housing expenditure also becomes smaller as income increases, and this is called the Schwabe's law.

It is strange that the share of transportation expenditure increases as income level goes up. This may be because families with incomes of PHP100,000 per year belong to very poor households and their demand for mobility is suppressed. On the other hand, families with incomes of over PHP250,000 may already own a car; thus their mobility is high and their transportation expenditure is also high, as a result.

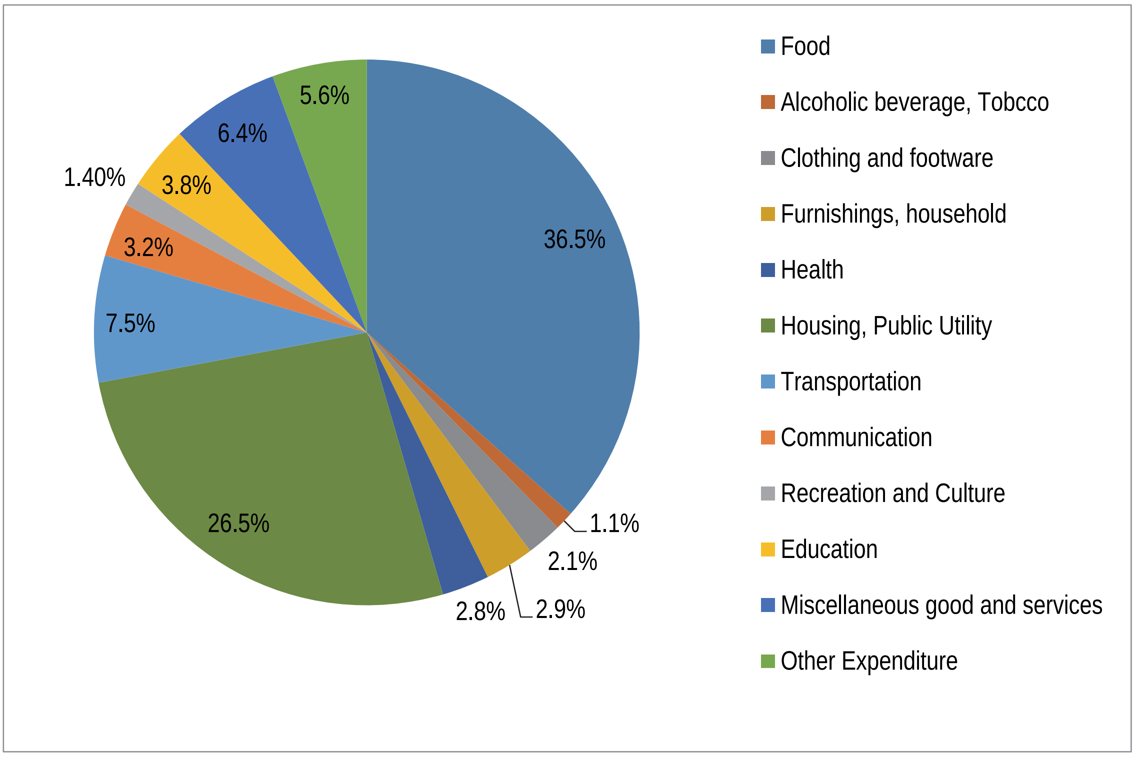
Table 6.1: Composition of Household Expenditure in Metro Manila in 2012

(Unit: %)

Expenditure Component	Annual Income (PHP000)					
	All Income	Under 40	40–60	60–100	100–250	250–over
Food	36.5	50.9	50.5	50.0	48.1	33.2
Housing	26.5	30.3	34.6	30.3	26.4	26.5
Transportation	7.5	0.5	2.3	3.7	5.9	9.0
Communication	3.2	0.1	1.3	1.2	2.1	3.6
Others	29.5	18.3	12.6	16.0	19.6	31.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

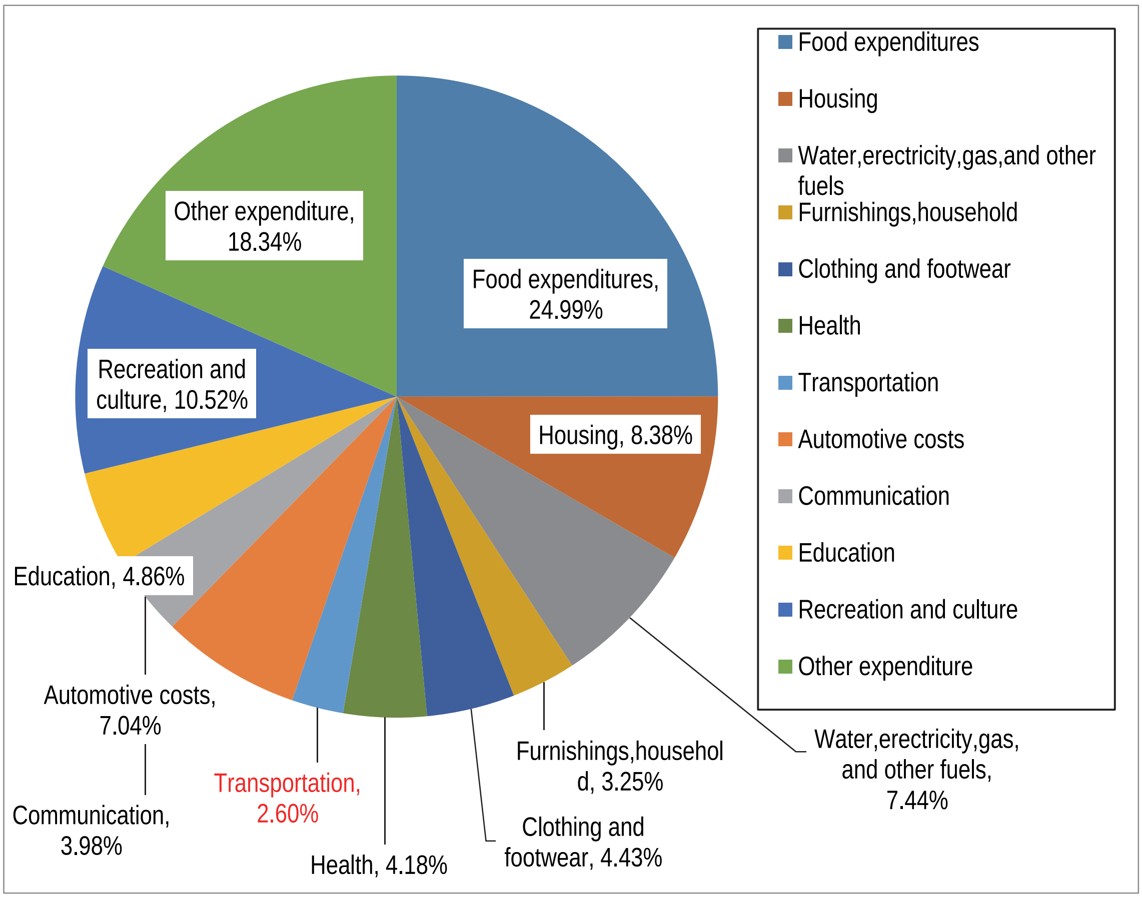
Source: Household Income and Expenditure Survey, 2012

Figure 6.1: Composition of Household Expenditure in Metro Manila, 2012



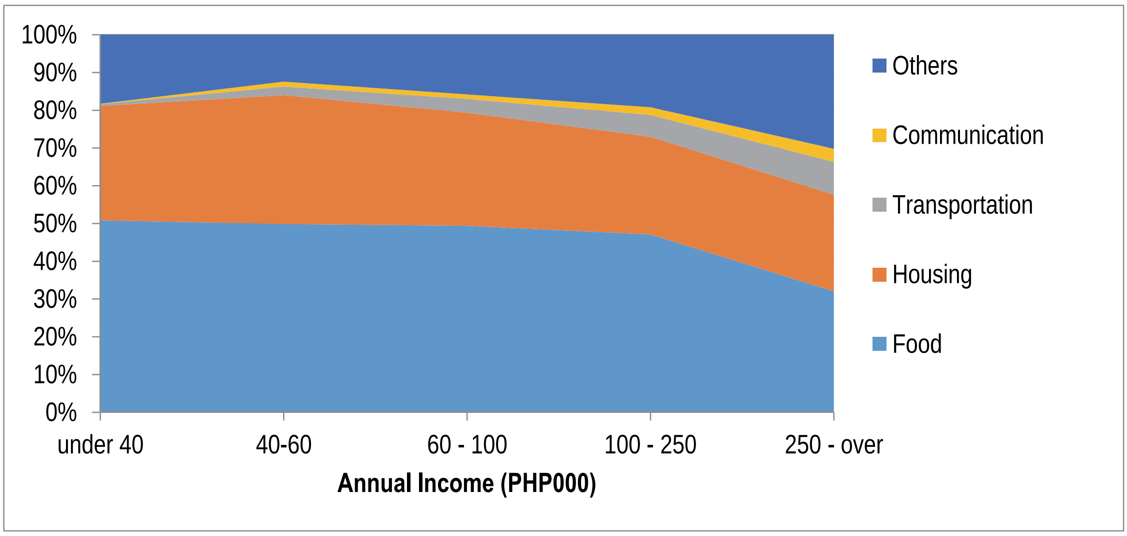
Source: Family Income and Expenditure Survey 2012, Philippine Statistics Authority

Figure 6.2: Composition of Household Expenditure in Tokyo Metropolitan Area, 2014



Source: Household Income and Expenditure Survey, 2014, National Statistics Bureau of Japan

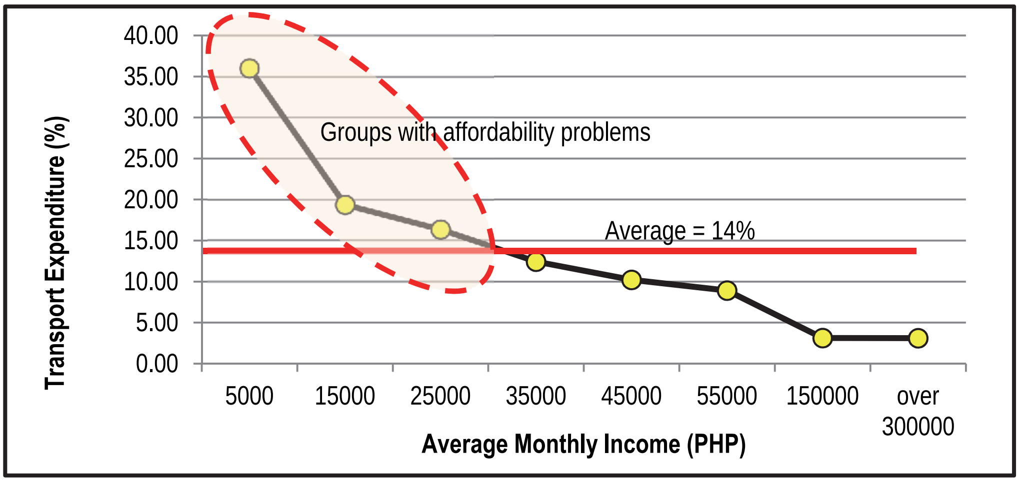
Figure 6.3: Composition of Household Expenditure by Income Level



Source: JICA Project Team based on PNSA data

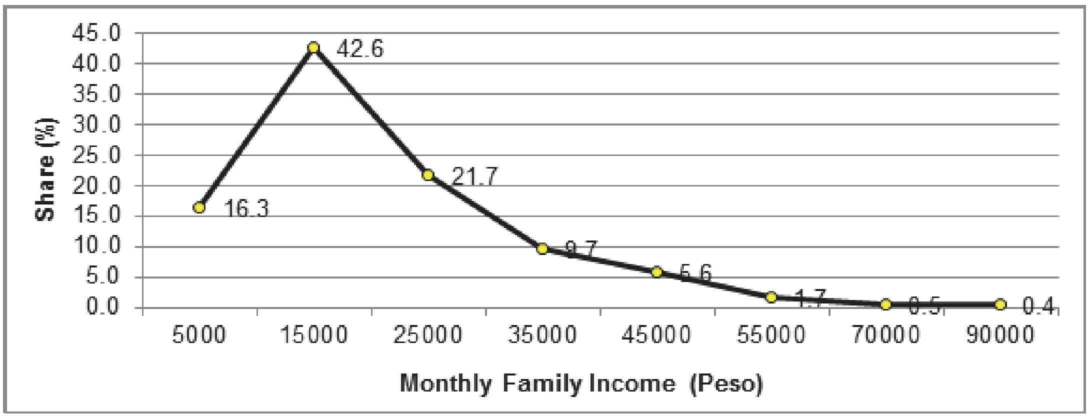
The MUCEP household interview survey (HIS) has questions about the respondents' incomes and also costs of every trip. Therefore, the share of transportation expenditure can be estimated based on the MUCEP HIS database, although the reliability is lower than that of the income and expenditure survey carried out by the Philippine Statistics Authority. Figure 6.4 shows the results of the estimates based on the MUCEP database.

Figure 6.4: Share of Transportation Expenditure by Income Level based on HIS Data



Source: JICA Project Team

Figure 6.5: Family Income Distribution based on HIS Data



Source: JICA Project Team

In Figure 6.4, the share of transportation expenditure falls as incomes increase. Apart from households with monthly incomes of PHP5,000 pesos, those with monthly incomes lower than PHP25,000 may find it difficult to allocate more than PHP4,000 for transportation alone. Families in these strata seem unable to afford to pay current public transportation fares. Because these families comprise the majority of households in Metro Manila, there is a need to plan some measures to support them.

6.3 Comparison of Fare and Passenger's Benefit

As with any public transport fare, it is an unwritten rule that the fare should not exceed the economic benefit accruing to a passenger by using public transport. This rule is especially important in cases when transport services are provided by a monopoly and therefore there is no other option available to the passenger. This section examined if current fares on public transport modes in Metro Manila are in the lower range of the user's economic benefit.

1) Time Value

Figure 6.5 in the previous section showed the household income distribution in MUCEP project area. It shows that the average household income is PHP20,250.00 per month. According to the MUCEP HIS data, there are 1.3 persons with income per household. Therefore, the average monthly income per worker is PHP15,577.00, which is equivalent to PHP89.00 per work hour (see Table 6.2).

The time value estimated based on this income approach is applied only to trips with productive purposes, namely, business trips (accounting for 5.1% of total trips), work commutes (15.6%), and home trips from work (15.6%), while the travel time of school commutes, private trips, and home trips from non-work purposes is regarded to have no economic values. Travel time of business trips is assumed to have 100% of time value and commuting trips to/from work have 50% time value. Accordingly, 20.7% (= 5.1% +15.6% x 0.5 x 2) of the time value of PHP1.47 is assigned to travel time. Thus, the average travel time value is estimated at PHP0.30 per minute.

Table 6.2: Average Travel Time Value

Item	No.	Unit
Average Household Income	20,250	PHP/ Month/ HH
Average Number of Workers	1.3	Person/ Household
Average Income per Worker	15,577	PHP/ Month/ Worker
Number of Working Hours	176	Hours/ Month
Average Hourly Income	89	PHP/ Hour
Average Value of One Minute	1.47	PHP/ Minute
Travel Time Value	0.30	PHP/ Minutes

Source: JICA Project Team

2) Jeepney Riding and Walking

A trip using a jeepney is compared with a trip.by walking, Because a jeepney is considered to move faster than walking, the value of travel time saved by using a jeepney is regarded as the economic value accruing to jeepney passengers. In this analysis, no other factors such as fatigue and calories lost by walking, were considered.

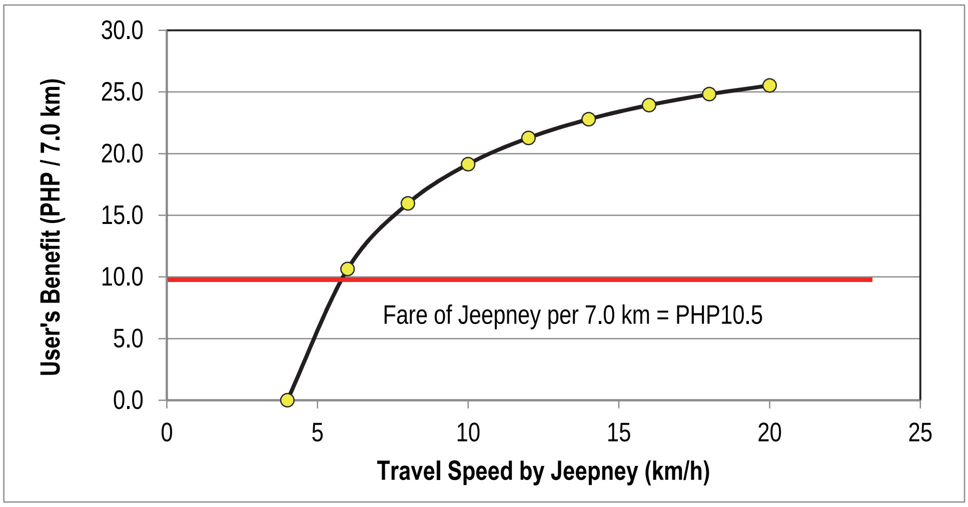
The average trip length by jeepney is about 7.0 km. The average walking speed is assumed at 4.0 km/h and travel time by walking 7.0 km is 105 minutes. On the other hand, jeepney speed depends on traffic congestion. If a jeepney can move at a speed of 7.0 km/h, travel time for 7.0 km is 60 minutes. In this case, saved time by using jeepney is 45 minutes, the time value of which is PHP13.50. This passenger's benefit is higher than the jeepney fare of PHP10.50 for 7.0 km. Figure 6.6 shows the passenger's benefit corresponding to jeepney speed from 4.0 km/h to 20.0 km/h. If the jeepney can move at a higher speed of 6.0 km/h, passengers can get a benefit higher than the fare. In most cases, this can be achieved.

3) Rail Transit and Bus

In the same way as mentioned above, trips using the LRT/ MRT are compared with those using buses. The overall speed of rail transit is about 30 km/h, while bus speed depends on road congestion. As the bus can run at higher speeds, the benefit will be less and at the speed of 30 km/h, which is the same as that of rail transit, the benefit will be zero.

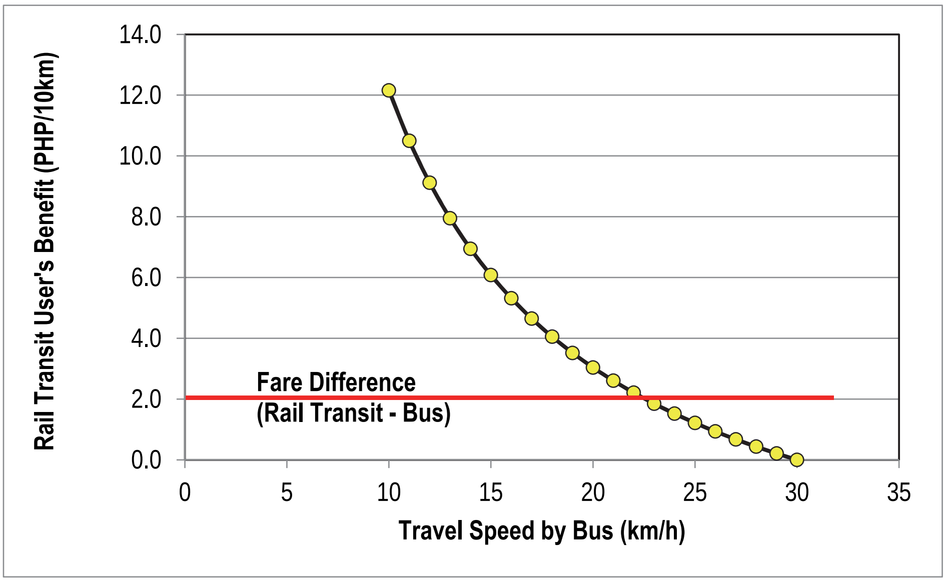
The average trip length is about 10.0 km. For this trip, rail fare is PHP21.00 and bus fare is PHP19.00. The time saved by using rail transit deserves the difference of PHP2.00 if the bus speed is lower than 22 km/h. In most cases, buses run at lower speeds than 20 km/h in the urban area and therefore the fare difference is justified from the viewpoint of passengers' benefit.

Figure 6.6: Jeepney User's Benefit by Travel Speed



Source: JICA Project Team

Figure 6.7: Rail User's Benefit by Travel Speed of Bus



Source: JICA Project Team

7 INTERNATIONAL COMPARISON OF URBAN BUS FARES

7.1 Methodology

Current fares on urban buses in Metro Manila were compared with those in major Asian cities. The base fare (cheapest fare at boarding) of regular buses were used, not that of special or premium buses such as air-conditioned and deluxe buses nor that of para-transits such as mini-buses and HOVs. Bus fare information was collected on the internet.

Citizens' income levels are different by country or by city. Therefore, an international comparison of bus fares was on the horizontal axis of income. Because it was difficult to collect the income information of a city, the gross domestic product (GDP) per capita was used as a substitute variable for income.

International agencies, such as the World Bank and the International Monetary Fund (IMF), have estimated the GDP per capita (purchasing power parity or PPP) and the nominal GDP every year. PPP takes into account the relative cost of living and inflation rate, rather than using only the exchange rate. So, both the GDP per capita and GDP (PPP) per capita were used in this analysis.

7.2 Base Bus Fares in Major Cities in Asia

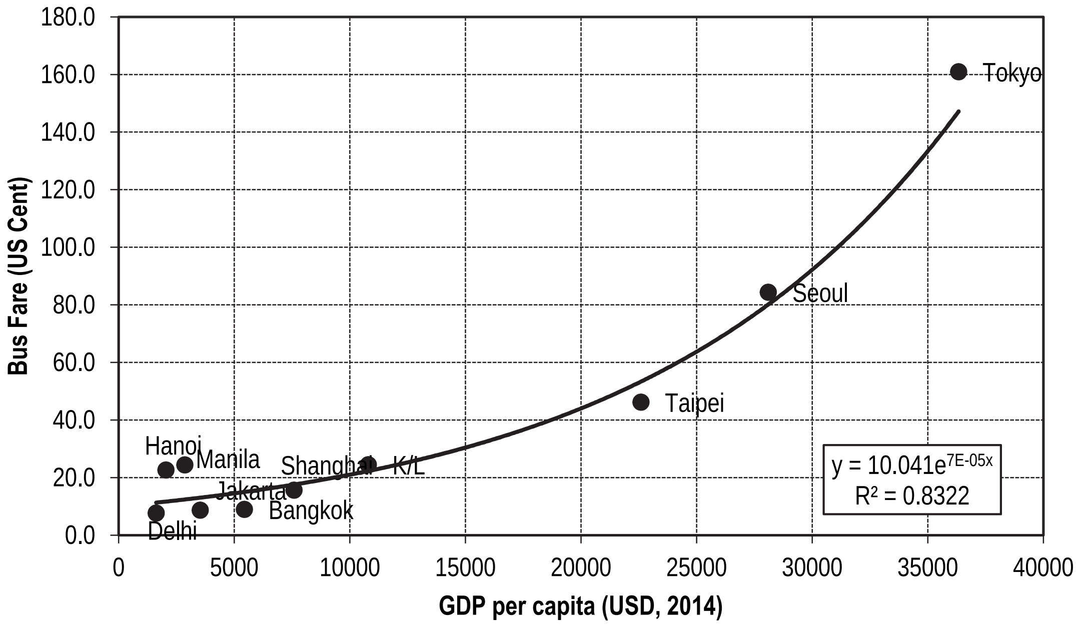
Both the GDP per capita and collected bus fares in 10 cities are shown in Table 7.1 and illustrated in Figure 7.1 and Figure 7.2. The relationship between bus fares and nominal GDP per capita shows a fit (see Figure 7.1), while there is no fit when using the GDP (PPP) per capita (see Figure 7.2). In both figures, bus fares in Manila are located above the regression curve.

Table 7.1: Bus Fares and GDPs per Capita in Major Asian Cities

City	GDP per Capita (USD)		Base Fare of Urban
	GDP / Capita	Adjusted PPP	Bus (US Cent)
1. Manila	2,865	6,974	24.4
2. Tokyo	36,331	37,519	160.9
3. Bangkok	5,444	15,579	9.0
4. Jakarta	3,533	10,651	8.7
5. Kuala Lumpur	10,803	25,145	24.5
6. Hanoi	2,052	5,656	22.6
7. Seoul	28,101	35,379	84.4
8. Delhi	1,626	5,808	7.7
9. Shanghai	7,589	13,224	15.6
10. Taipei	22,597	46,036	46.2

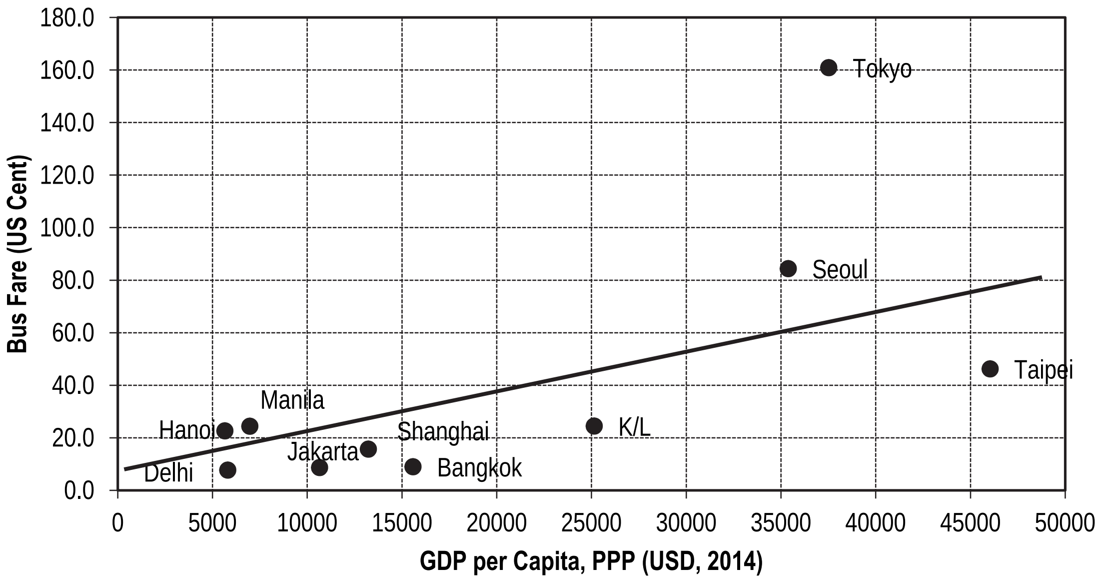
Sources: IMF Annual Financial Statistics, 2014; bus fares were sourced from websites.

Figure 7.1: Minimum Bus Fares and GDPs per Capita in Major Asian Cities



Source: Bus fares were sourced from websites and GDP per capita from the IMF.

Figure 7.2: Minimum Bus Fares and GDPs per Capita (PPP) in Major Asian Cities



Source: Bus fares were sourced from websites and GDP per capita from the IMF.

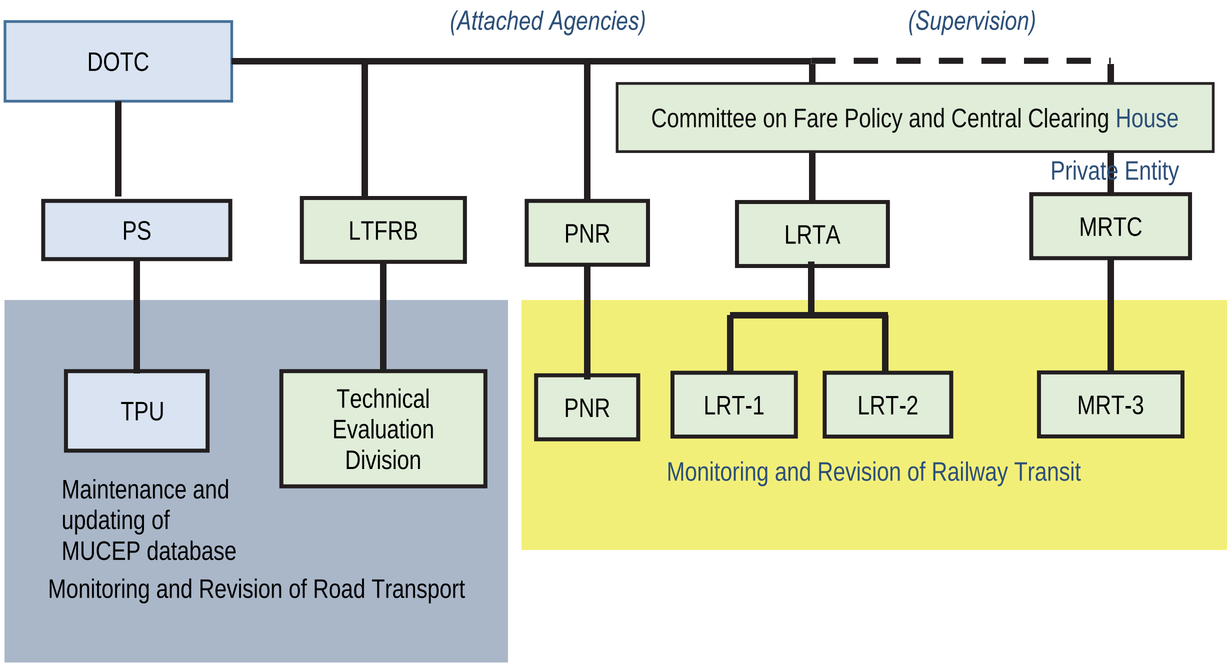
8 REVIEW AND REVISION OF PUBLIC TRANSPORTATION FARES

8.1 Institutional Arrangement

Fare setting for road-based public transportation is currently under the jurisdiction of the Technical Evaluation Division (TED) of the LTFRB, while the fares of urban rail transit are decided individually by each rail transit operator. After the introduction of electronic tickets, called stored-value tickets, a committee was established with the purpose of adjusting the fare policy among railway operators and clearing of fares for users riding more than two lines.

In view of the above, it is strongly recommended that the Transport Planning Unit (TPU) remain under the Planning Service department (PS) of the DOTC. In order to monitor and evaluate public transportation fares effectively, MUCEP recently completed the MUCEP database, of which the TPU is now one of the units most familiar with the database and can retrieve necessary information from it. (In the next section, several examples of MUCEP database information are given.) Although the TPU can provide useful information to railway operators as well, it should always work closely together with the LTFRB's TED.

Figure 8.1: Organizations related to Public Transportation Fare Setting



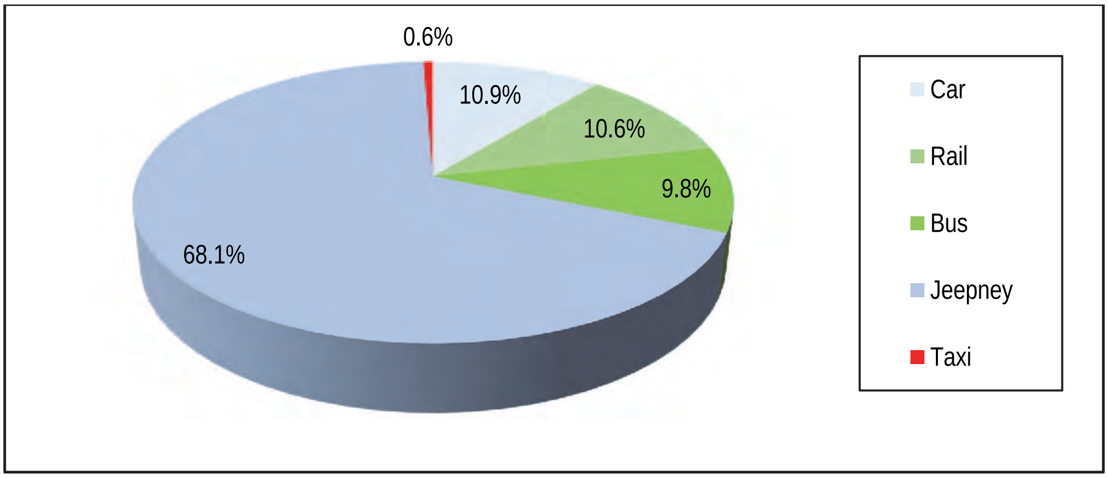
Source: JICA Project Team

8.2 Preparatory Works

Public transportation fares cannot be determined through discussions alone. An extensive and careful preparatory work is essential. The MUCEP database, which was recently completed, is a reservoir of information on transportation demand. Analyzing the database is probably one of the best steps in setting PT fares. The figures below show some of the information that can be obtained from the MUCEP database.

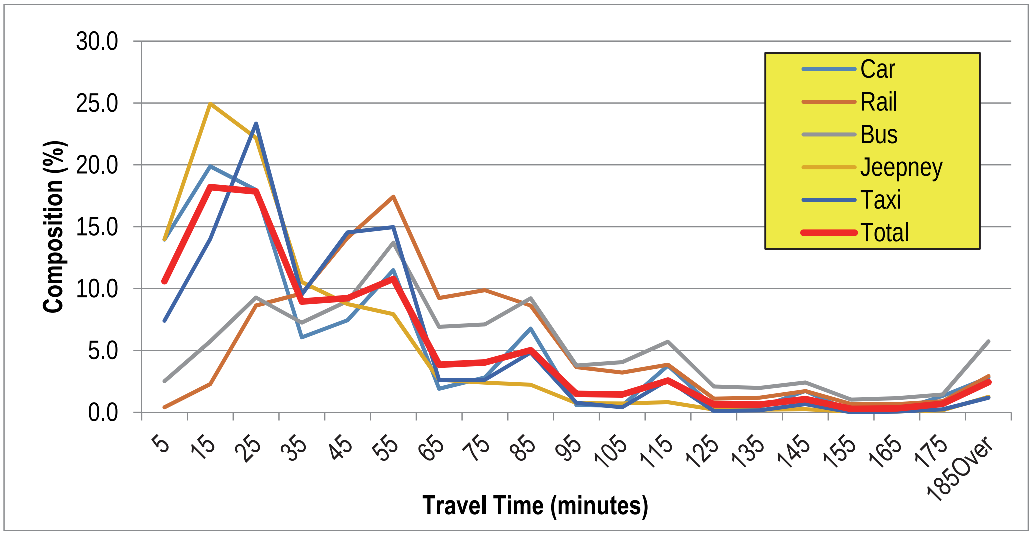
Figure 8.2 presents the modal composition of linked trips. Public utility jeepneys (PUJs) have an overwhelming share at 68% and the rest is split almost equally among car, rail, and bus.

Figure 8.2: Modal Composition of Linked Trips



Source: JICA Project Team

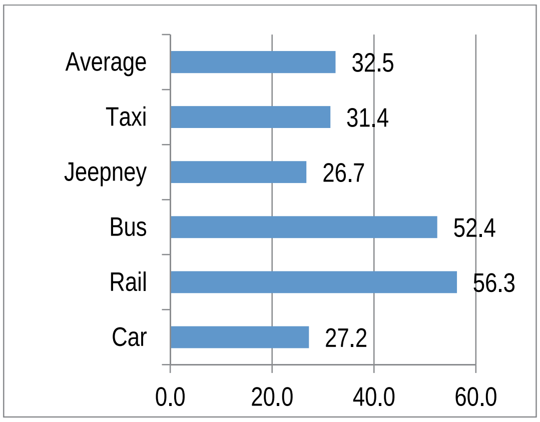
Figure 8.3: Trip Lengths by Mode



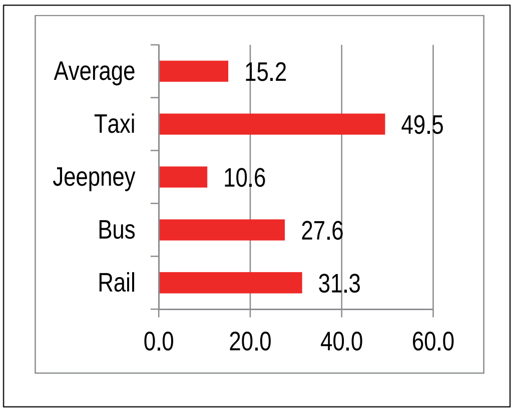
Source: JICA Project Team

Figure 8.4: Average Trip Lengths and Trip Costs

(1) Trip Length (minutes)

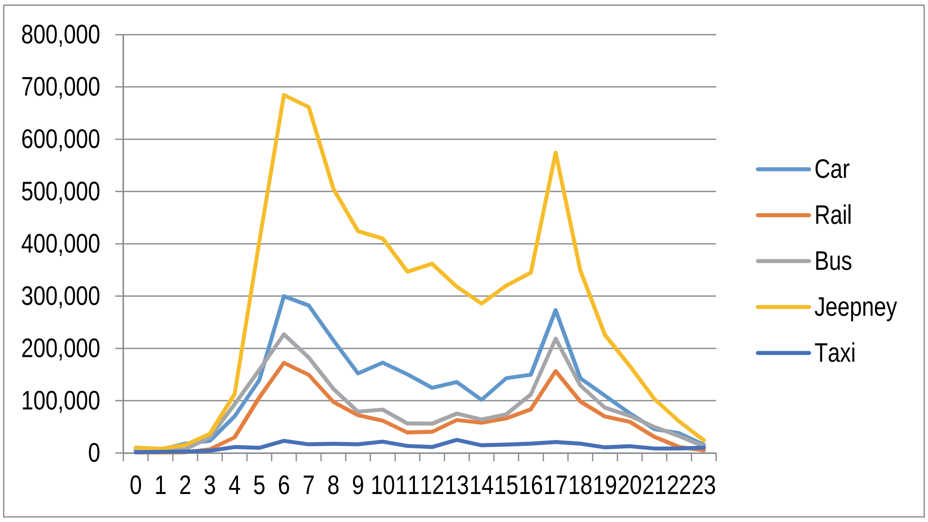


(2) Trip Cost (PHP)



Source: JICA Project Team

Figure 8.5: Distribution of Starting Time in a Day by Mode



Source: JICA Project Team

8.3 Review and Revision

1) Procedure

The recommended procedure to review and revise public transportation fares is shown in Figure 8.6.

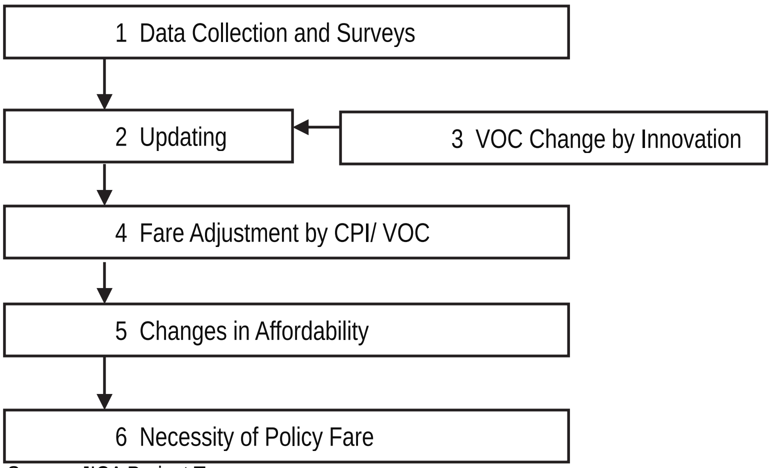
2) Data Collection and Surveys

Firstly, such data necessary for fare revision as inflation rate, vehicle prices, fuel prices, and tire prices should be collected. In this case, it is desirable to use official data estimated by the government. Besides the existing data, some surveys have to be carried out to create such data as average seat occupancy and average travel speed of bus and jeepney. These surveys are desirable to be implemented in the same fixed points every year.

3) Updating VOC and VOC Change by Innovation

Using the collected data, vehicle operating costs have to be updated. When updating, any innovation which occurred in the most recent one year which will affect the VOC has to be taken into account. Newly developed diesel engines, hybrid engines, and air conditioners would change the fuel consumption rate as well as initial cost.

Figure 8.6: Procedure for Fare Review and Revision



Source: JICA Project Team

4) Fare Adjustment by CPI and VOC

CPI and VOC adjustments have to be carried out following the formulas below. If there is a difference between the two adjustments, the higher one should be adopted.

(1) CPI Adjustment

$$g_{rev}(x) = g_{t0}(x) * (CPI_t) / (CPI_{t0}) = (ax + b) * (CPI_t) / (COI_{t0})$$
$$= (ax+b) * \prod_{t0}^{t}(1 + ti)$$
$$f_{rev}(x) = f(g_{rev}(x))$$

where:

$f_{rev}(x)$: Fare rate of present year t after rounding
$g_{rev}(x)$: Fare rate of present year after fare revision
$g_{t0}(x)$: Fare rate of year t_0 when rate was revised last time
CPI_t : CPI in year t
CPI_{t0} : CPI in year t_0
r_i : CPI increasing rate in year i

(2) VOC Adjustment

$$g_{rev}(x) = g_{t0}(x) * (VOC_t) / (VOC_{t0}) = (ax + b) * (VOC_t) / (VOC_{t0})$$
$$= (ax+b) * \prod_{t0}^{t}(1 + ti)$$
$$f_{rev}(x) = f(g_{rev}(x))$$

where:

$f_{rev}(x)$: Fare rate of present year t after rounding
$g_{rev}(x)$: Fare rate of present year after fare revision
$g_{t0}(x)$: Fare rate of year t_0 when rate was revised last time
VOC_t : VOC in year t
VOC_{t0} : VOC in year t_0
r_i : VOC increasing rate in year i

5) Changes in Affordability

The growth rate in public transport users' affordability for fare payment has to be checked using the family income and expenditure survey. If such survey data is not available every year, the growth rate of GDP per capita can be used as a substitute for the growth rate of family incomes.

6) Necessity of Policy Fare and Subsidy

In case the affordable fare does not reach the revised fare level, the latter has to be lowered to the affordable level. Such a policy fare has to be examined together with the needed subsidy and the sources of such subsidy. Whether such a policy fare is adopted or not will be decided finally by appropriate decision makers.

9 TOWARD TRANSPORTATION DEMAND MANAGEMENT

9.1 Necessity of TDM

It may be necessary to shift the principle from “beneficiaries pay” to “causers pay” (see Figure 9.1) in transportation planning, especially in transportation demand management (TDM). Some large-scale TDM measures will be needed not only for demand management but to develop new financial resources for transportation improvement. It is desirable to pool all the revenues from TDM measures into a “transportation development fund” instead of including them in the general budget as shown in Figure 9.2.

Table 9.1 compares the number of passengers per 1.0 PCU. The table shows that a bus carries 13.6 passengers or 8.5 times that of a car (1.6 passengers). Apparently, car users are causers of road congestion. If all car users stop using cars and take the bus, road congestion will be solved at once.

In Figure 9.3, the share of buses was examined under various bus fares. In the horizontal axis, 100% refers to the current fare and zero is free of charge. If fare is zero, buses will have a share of 65% of the total number of passengers and 70% of the total passenger-km. In such a case, about PHP3.4 billion will be needed to compensate all bus operators. In the following examples of large-scale TDM measures, it is shown that this subsidy amount can have reality.

Table 9.1: Comparison of Passenger per PCU

Mode	PCU	Average Occupancy (Person)	Passenger/ PCU
Car	1.0	1.58	1.6
taxi	1.0	1.81	1.8
Jeepney	1.5	8.84	5.9
Bus	2.5	34.19	13.6

Source: JICA Project Team

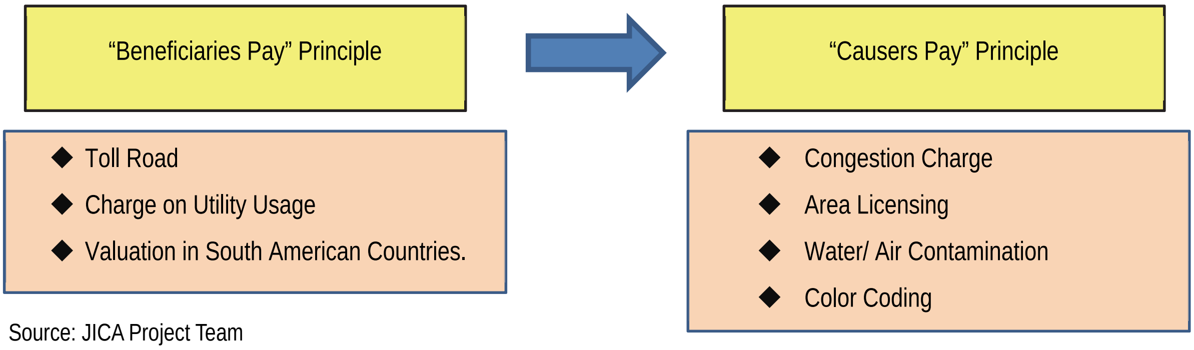
9.2 Car Commuting Tax

As stated in the previous section, the main cause of road congestion is car users who make trips in peak hours. Therefore, they are the ones most responsible for road congestion. By this reason, car commuters to the central business district should pay a “car commuting tax.” If they do not like to pay this, they should commute using public transport.

It may be very difficult—but not impossible—to collect tax from individuals going to specific areas. The tax can be imposed indirectly on fees for parking lots located in designated areas, although short-time parking can be tax-free. Parking on weekend sand national holidays is also exempted from tax.

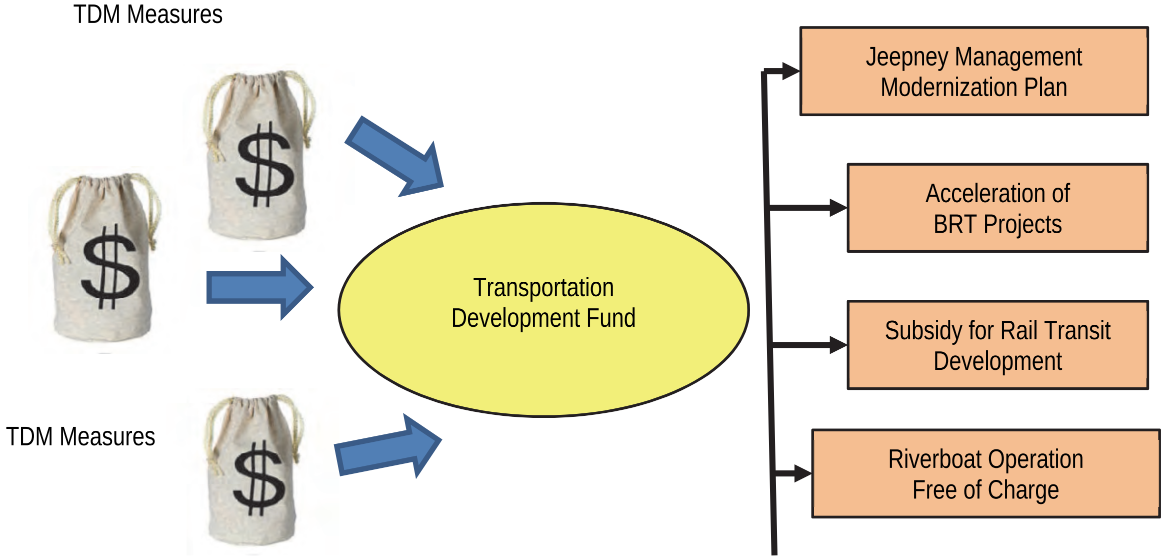
Based on the MUCEP database, a total of 13,474,000 trips are commuting trips and 22% of the total use cars. Assuming that 30% of car commuters are imposed PHP100 a day, the total tax revenue would reach PHP27 billion a year if no car commuters change their mode to public transportation.

Figure 9.1: Changes in the Principle of Shouldering Costs



Source: JICA Project Team

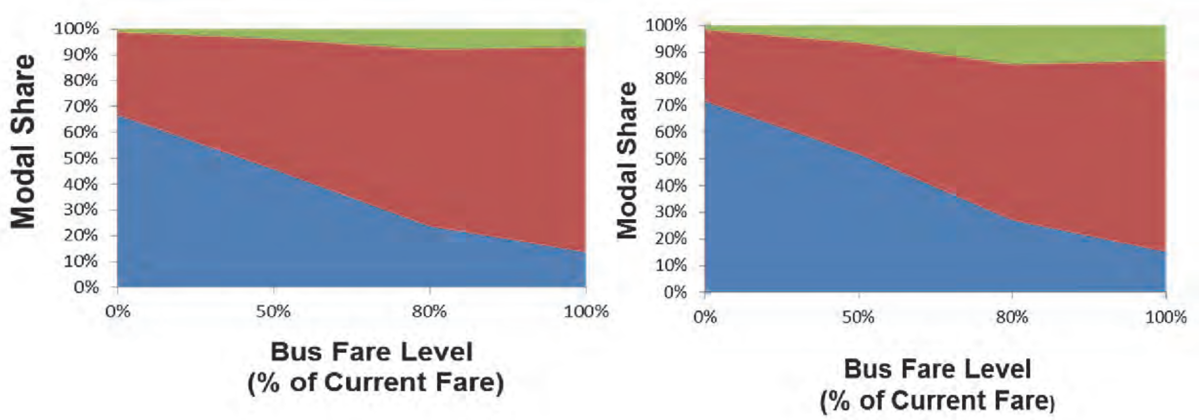
Figure 9.2: TDM and Transportation Development Fund



Source: JICA Project Team

Figure 9.3: If Bus Service is Free of Charge

(1) Modal Share by Bus Fare Level **(2) Pax-km Share by Bus Fare Level**



Needed Subsidy according to Bus Fare

Item	Bus Fare		
	0%	50%	80%
Subsidy (PHP mil/y)	3,361.40	996.90	207.60

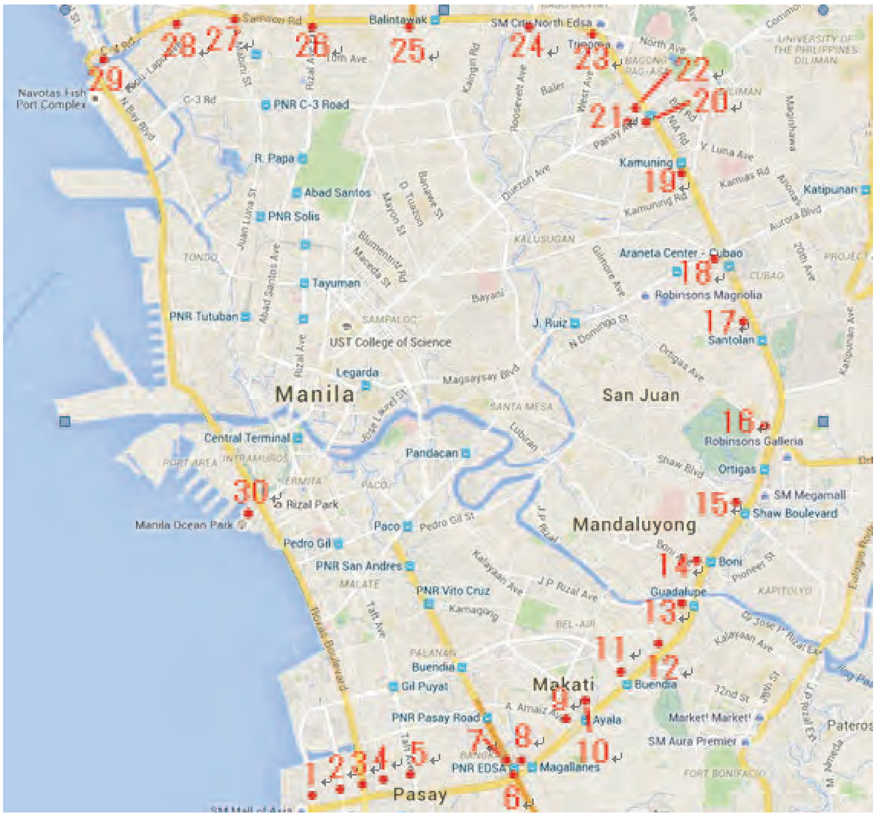
Source: JICA Project Team

9.3 Area Licensing Inside EDSA

It is worthwhile to plan the area licensing scheme inside EDSA. Someone may consider that the area surrounded by EDSA is too large and as there are too many roads crossing EDSA, it is impossible to control and manage all cars entering the area. However, there are at most 30 points where check gates can be installed, including a car ferry port (see Figure 9.4). In this scheme, congestion charge is imposed only on private vehicles (cars and motorcycles) entering EDSA area. Entrance and exit can be free on Saturdays, Sundays, and national holidays. Assuming a one-time charge of PHP100 on a car and PHP40 on a motorcycle, the total revenue is estimated to reach PHP7.1 billion in one year.

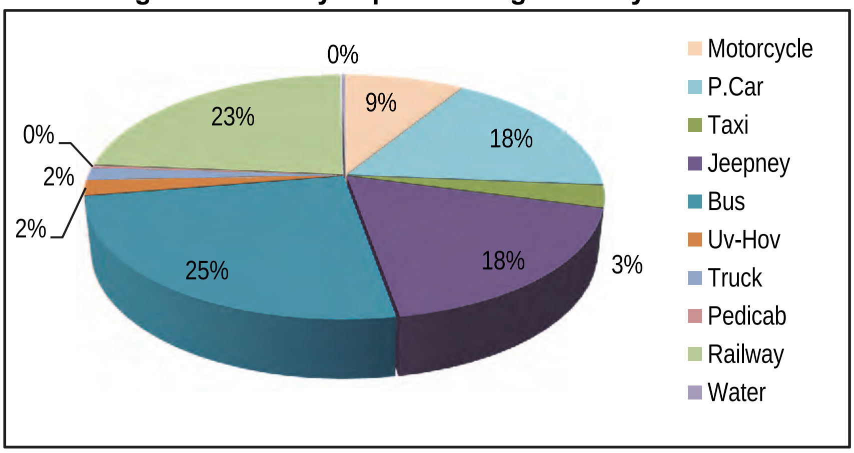
Figure 9.5 shows the composition of trips crossing EDSA. Total daily passenger trips using motorcycles number 331,000 and cars, 657,000. Converting them into vehicle units, motorcycles account for 276,000 trips and cars, 365,000 trips.

Figure 9.4: Area Licensing Checkpoints for Vehicles Entering EDSA Area



Source: JICA Project Team

Figure 9.5: Daily Trips Crossing EDSA by Mode



Source: JICA Project Team

10 RECOMMENDATIONS

The MUCEP JICA Project Team recommends the following based on the foregoing discussions.

1) Review the Present Public Transportation Fares

(i) The fare should be reviewed and amended, if necessary, by the Technical Division of the LTFRB (together with the TPU) for road-based public transportation and by the Railway Operators Council for rail transportation.

(ii) To support the discussion mentioned above, the TPU should provide the following information beforehand by conducting needed surveys and analyses:

- Updated VOCs by collecting input data;
- Average load factors through observation surveys at constant locations; and
- Average operating speeds through on-board surveys on selected routes.

(iii) The following points should be taken into account when reviewing public transportation fares:

- Changes in VOCs, including the impact of technological innovations;
- Inflation and changes in consumer price indices (official CPI, Transportation Sector); and
- Improved affordability (changes in household income).

(iv) Public transportation fares should be reviewed once a year in principle. In the case of unusual situations, such as an economic crisis, however, the review should be carried out at the earliest.

2) Related Recommendations

(i) Widen the usage of stored-value cards to bus and jeepney;

(ii) Study the introduction of TDM schemes to accelerate modal shift from private car to public transportation and to raise funds for PT development (DOTC+DPWH+MMDA). TDM measures include:

- Parking charging in designated areas to discourage car use;
- Area licensing (inside EDSA, for example); and
- Improvement of the number-coding scheme (charging rather than restricting).

(iii) Study the reorganization of jeepney operation, for example, by grouping operators into a unified management body. This will facilitate the rationalization and modernization of operations. The government should provide incentives such as the provision of subsidies for servicing routes that are unprofitable but needed as a public service.

Part 3

PUB AND PUJ FRANCHISING

1 INTRODUCTION

1.1 Background and Objectives

In recent years, traffic congestion in Metro Manila has been increasing in severity, and the need for efficient PT system is further increasing. The three existing urban railway lines are quite insufficient in meeting the strong demand, and many residents rely on road PT modes such as bus and jeepney. The current situation of the road PT system is not efficient as shown by the large gap between supply and demand in each route and district, as well as its inconvenience and uncertain service.

The DOTC formulates transportation policies for, and manages, road public transportation. The current basic policy for road public transportation modes is a “passive franchise.” In order to introduce industrial development and service improvement along with transportation policies, it is important to adopt a scientific approach in issuing public utility bus (PUB) and PUJ franchises.

In this manual, along with the direction of current public transportation policy in the MUCEP area, the methodology for evaluating PUB and PUJ franchise applications is examined and actual case studies are shared.

1.2 Structure of the Manual

This manual is composed of four parts, namely:

(i) Current franchising process
- Route measured capacity (RMC)
- Types of transactions and process flow
- Applications/Petitions received
- Issues on franchising

(ii) Evaluation of PUB/PUJ franchise application
- Rationale
- Current requirements of the proponents
- Verification method

(iii) Case studies
- Case studies analyzing PUB/PUJ franchise applications

(iv) PUB/PUJ route network planning
- Basic considerations and planning tools
- Route restructuring

2 CURRENT FRANCHISING PROCESS

2.1 Introduction

On 19 June 1987, Executive Order 202 was promulgated paving the way for the creation of the Land Transportation Franchising and Regulatory Board (LTFRB). Its primary mission is to ensure that the commuting public has adequate, safe, convenient, environment-friendly, and dependable public land transportation services at reasonable rates through the implementation of land-based transportation policies, programs, and projects responsive to an investment-led and demand-driven industry.

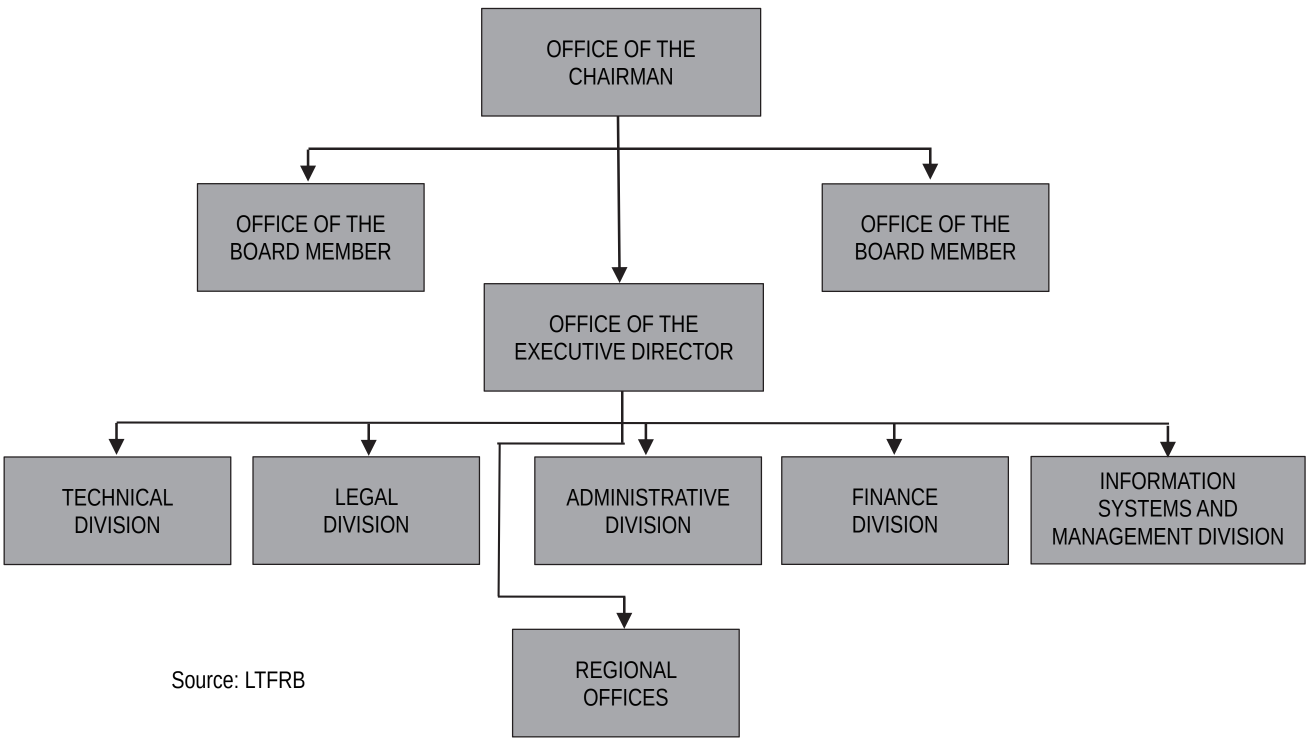
One of the primary functions of the LTFRB is to prescribe and regulate routes of service, economically viable capacities, and zones or areas of operation of public land transportation services provided by motorized vehicles in accordance with the public land transportation development plans approved by the DOTC.

The current policy of the DOTC and the LTFRB on applications for franchises to operate public utility vehicles is contained in Memorandum Circular 2003-028 and related amendments which impose a nationwide moratorium on the acceptance of new applications or petitions for the issuance of a Certificate of Public Convenience (CPC), except for trucks for hire, school transport service, and tourist buses.

By virtue of Department Order 2015-011, franchises are now open to operate premium bus airport service, transportation network vehicle service (e.g., Uber and Grab cars), and premium taxis.

Figure 2.1 showing the organizational structure of the LTFRB is presented to show the bigger picture and appreciation of the flow of every transaction in the agency in relation to franchising.

Figure 2.1: LTFRB's Organizational Chart



Source: LTFRB

2.2 Route Measured Capacity

As an exemption to the moratorium provided in Memorandum Circular 2003-028, applicants for new CPC applications to operate a bus, jeepney, or taxi service, a route measured capacity (RMC) to be determined by the DOTC has been required by the LTFRB (a sample of the requirement form is illustrated in Figure 2.2 below).

An RMC is used to determine the required number of vehicles to meet a given demand for a certain route. The DOTC is currently using this method to estimate public transportation supply. To reiterate, applications for new CPC on bus, jeepney, or taxi service will not be accepted and processed by the LTFRB unless there is an RMC conducted by the DOTC.

Figure 2.2: Requirement Form of LTFRB

RF-New

REQUIREMENT FORM

New Certificate of Public Convenience[1]

Notes:

1. *Use orange-colored folder and secure photocopies/CTC of all required documents (Please note that original copies of the same should be presented during the hearing).*
2. *Tab every document corresponding to numbers on this form.*

☐	1. 5 copies of Verified Application Form
☐	2. Original and Copy of Valid Government-Issued Identification Card with photograph of Applicant/Petitioner (Driver's License, SSS, PAG-IBIG, BIR, Phil Health, Postal, Voter's ID, or Philippine Passport).
☐	3. 2 copies of Operator's Data Sheet with recent 2x2 photograph.
☐	4. Route Measured Capacity (RMC) Certification from the Department of Transportation and Communications (DOTC) – *except for Truck-for-Hire, Shuttle Service and School Transport Service*
☐	5. Evidence of Filipino Citizenship *For individual applicant:* -Authenticated Birth Certificate from National Statistics Office (NSO) issued within the past 3 months prior to submission of application or valid Philippine Passport *For juridical entity:* - Articles of Partnership/Incorporation and By Laws for Partnership or Corporation -Articles of Cooperation and By Laws for Cooperatives
☐	6. Accomplished Statement of Financial Capability Form

Source: LTFRB

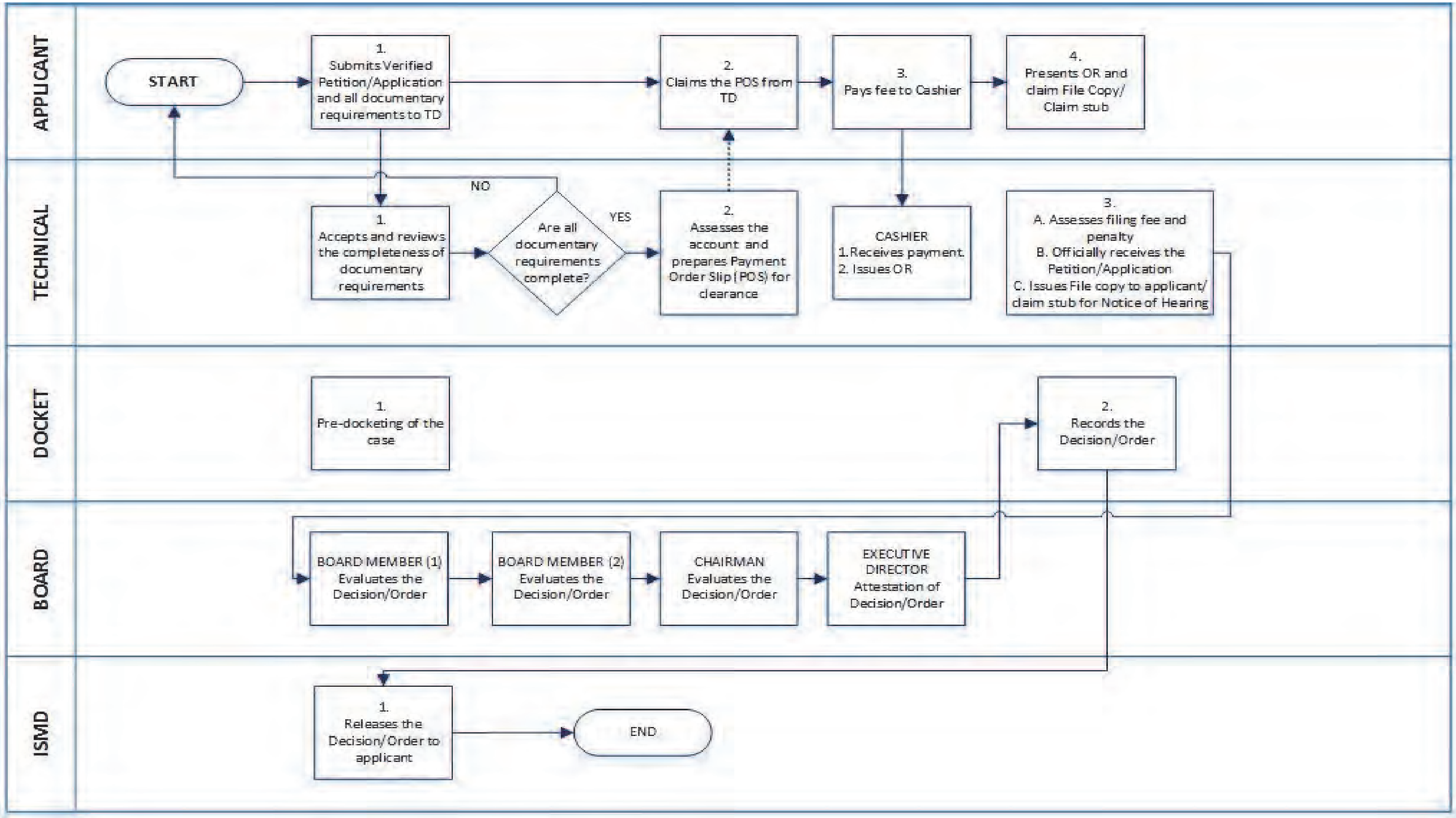
2.3 Types of Transactions

Transactions related to franchising have been classified into three types: simple applications, transactions without hearing, and transactions with hearing.

An example of a simple transaction is Confirmation of Unit wherein the operator will transact directly with the Information Systems Management Division. An example of a transaction without hearing is Adoption of a Trade Name; this can be availed of by holders of a valid CPC who intend to change their adopted registered trade name. An application for a new CPC is an example of a transaction with hearing. This can be availed of by any person or juridical entity with intention to secure a new CPC to operate a public utility vehicle.

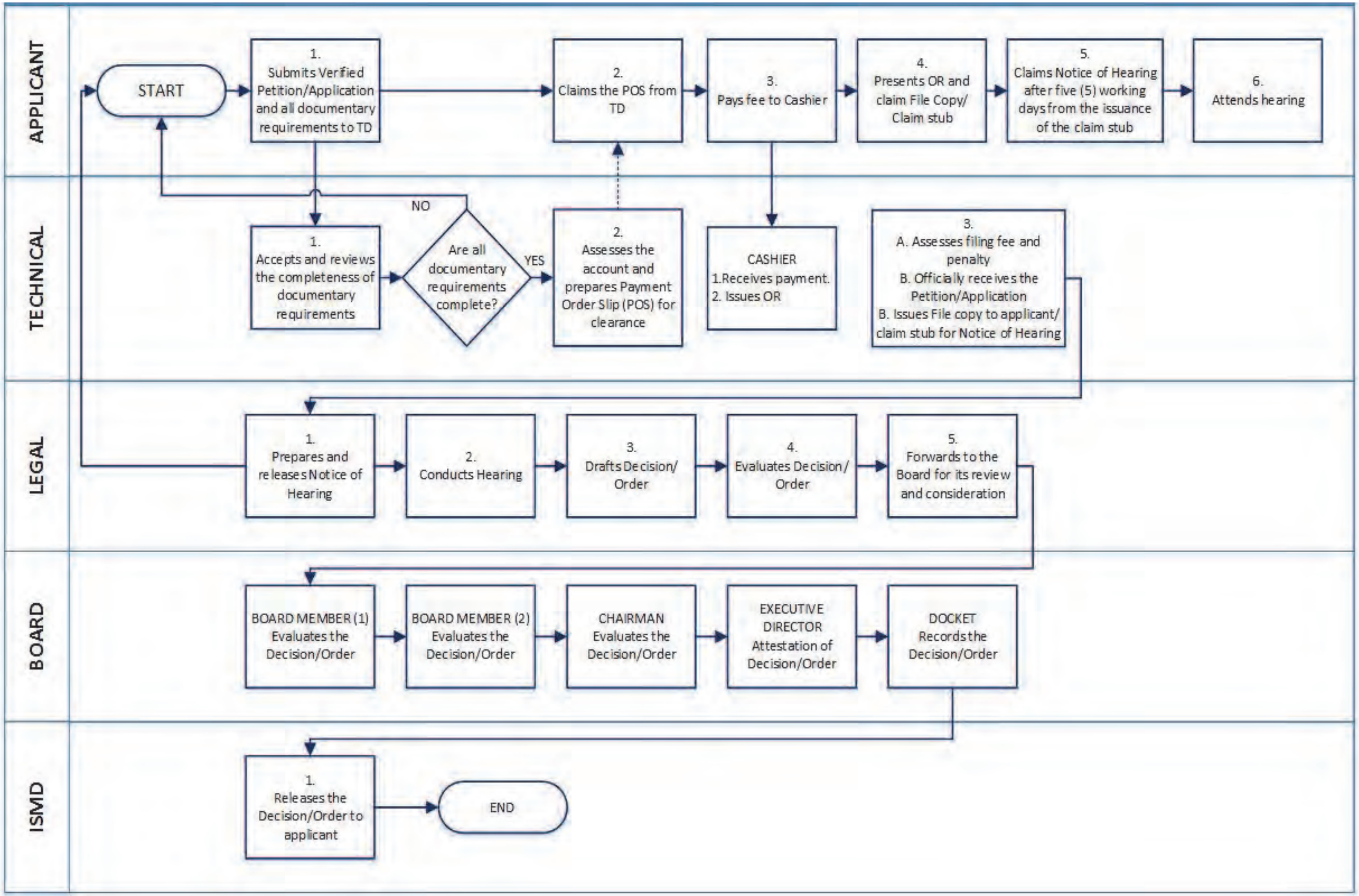
2.4 Process Flow of Transactions

Figure 2.3: Flowchart for Transactions without Hearing



Source: LTFRB

Figure 2.4: Flowchart for Transactions with Hearing



Source: LTFRB

2.5 Remedy for the Aggrieved Party/Operator

Section 11, Rule 13 of the 2011 Revised Rules of Practice and Procedure before the LTFRB provides that, “a party adversely affected by the decision, resolution or order may, within 15 days from receipt of a copy thereof, file a Motion for Reconsideration. However, the Board en banc or the Regional Director may allow the filing of the motion beyond the 15-day period as may be permitted by the Board en banc or the Regional Director, when public interest so require.”

The final decisions, resolutions, or orders of the Board can be appealable to the DOTC, through the Franchising Review Staff within 15 days from receipt of the said decision, resolution, or order.

2.6 Applications and Petitions Received

Table 2.1: Year 2014 – Total 23,098

Item	PUB	TTS/ TB/TC	TH	TX	PUJ	UVE	STS	SHS	VFH/G /Filcab	Total
WITH HEARING										
New CPC	2	27	12,029	17	1	0	20	22	0	12,118
Extension of Validity	311	62	426	2,666	1,588	323	8	14	0	5,398
Sale & Transfer	50	1	12	214	10	48	0	2	0	337
Sale & Transfer with E/V	3	1	5	402	137	52	1	0	0	601
Sale & Transfer with D/S	7	2	0	120	3	65	0	0	0	197
Sale & Transfer with E/V with D/S	2	0	0	114	5	24	0	0	0	145
Change of Grantee by inheritance or donation	2	0	0	0	0	2	0	0	0	4
Amended Application	8	3	9	65	26	20	0	2	0	133
Modification / Amendment of Line / Extn of Route	177	3	20	1	0	0	1	1	0	203
Change Party Applicant with E/V	0	1	4	8	13	1	0	0	0	27
Consolidation of Cases	0	0	582	6	0	0	0	0	0	588
Increase of units	0	0	1	0	0	0	0	0	0	1
Total	562	100	13,088	3,613	1,783	535	30	41	0	19,752

WITHOUT HEARING										
Dropping & Substitution	459	144	45	799	60	160	6	4	0	1,677
Dropping & Substitution with upgrading of unit	27	0	0	0	1	0	0	0	1	29
Dropping	26	19	128	53	20	24	14	5	12	301
Register in Lieu	4	1	1	5	0	3	0	0	0	14
Change Engine	20	1	23	10	29	4	0	0	0	87
Dropping & Substitution with downgrading of unit	6	0	0	0	0	0	0	0	0	6
Installation of Ads	107	1	0	80	0	0	0	0	0	188
Correction	69	21	115	105	120	18	7	3	0	458
Interchange of Units	49	0	0	0	0	0	0	0	0	49
Special Permit with petition	471	0	0	0	0	0	0	0	0	471
Petition for change of Trade Name	1	2	3	33	0	0	0	0	0	39
Change venue of registration	1	0	12	1	0	0	0	0	0	14
Storage	0	0	0	0	0	0	0	0	0	0
Adopt Trade Name & Color Scheme	6	0	0	2	0	0	0	0	0	8
Petition to Re-register / Extn. of time to register	0	0	1	0	0	0	0	0	0	1
Petition for Cancellation of units	0	0	2	2	0	0	0	0	0	4
Total	1,246	189	330	1,090	230	209	27	12	13	3,346

Source: LTFRB

Table 2.2: September 2015 – Total 9,349

Item	PUB	TTS /TB/TC	TH	TX	PUJ	UVE	STS	SHS	VFH/G /Filcab	Total
WITH HEARING										
New CPC	2	30	3,054	1	0	0	39	13	0	3,139
Extension of Validity	170	24	312	1,086	1,021	223	19	7	0	2,862
Sale & Transfer	51	12	15	191	29	56	0	0	0	354
Sale & Transfer with E/V	5	3	9	295	167	13	0	0	0	492
Sale & Transfer with D/S	6	0	0	114	5	48	0	0	0	173
Sale & Transfer with E/V with D/S	2	0	0	77	0	6	0	0	0	85
Change of Grantee by inheritance or donation	0	0	0	0	0	0	0	0	0	0
Amended Application	7	0	5	20	12	4	0	0	0	48
Modification / Amendment of Line / Extension of Route	3	3	9	0	0	0	0	0	0	15
Change Party Applicant with E/V	0	1	1	3	4	1	0	0	0	10
Consolidation of Cases	0	0	0	0	0	0	0	0	0	0
Increase of units	0	0	1	0	0	0	0	0	0	1
Total	246	73	3,406	1,787	1,238	351	58	20	0	7,179
WITHOUT HEARING										
Dropping & Substitution	445	69	55	526	46	79	3	1	0	1,224
Dropping & Substitution with upgrading of unit	8	2	0	4	0	0	0	0	0	14
Dropping	21	19	237	53	18	15	22	10	7	402
Register in Lieu	6	0	4	5	0	1	0	0	0	16
Change Engine	0	0	0	0	0	0	0	0	0	0
Dropping & Substitution with downgrading of unit	4	0	0	0	0	0	0	0	0	4
Installation of Ads	68	3	0	30	5	0	0	0	0	106
Correction	30	3	118	60	32	9	1	2	0	255
Interchange of Units	84	0	0	0	0	0	0	0	0	84
Special Permit with petition	7	0	0	0	0	0	0	0	0	7
Petition for change of Trade Name	1	0	7	14	0	1	0	0	0	23
Change venue of registration	10	0	4	3	0	0	0	0	0	17
Storage	0	0	0	2	0	0	0	0	0	2
Adopt Trade Name & Color Scheme	0	0	0	2	0	0	0	0	0	2
Petition to Re-register / Extension of time to register	0	0	0	0	0	0	0	0	0	0
Petition for Cancellation of units	1	0	11	1	1	0	0	0	0	14
Total	685	96	436	700	102	105	26	13	7	2,170

Source: LTFRB

Table 2.3: Number of Franchises and PUVs Nationwide, June 2015

PUB		Minibus		PUJ		Taxi		UV Express		Tourist Trans.		Shuttle Trans.		Filcab		School Trans.		Truck For Hire		Total	
• Air-con • Regular • Interregional		• Air-con • Regular • Dual • Interregional		• Air-con • Regualr • Dual •		• Air-con Sedan • Regular Sedan • Coupon Airport Taxi		• UV Express		• Car • Bus • Coaches • TTS		• Bus • AUV		• Regular • Express • Limited • Multicab		• Bus • PUJ,AUV		• Trailer • Trucks • Tractor Head			
Franch.	Units	Franch.	Units	Franch.	Units	Franch.	Units	Franch.	Units	Franch.	Units	Franch.	Units	Franch.	Units	Franch.	Units	Franch.	Units	Franch.	Units
593	2,772	48	86	414	552	23,417	37,558	10,314	10,969	1,318	3,508	641	2,565	16,246	17,774	867	993	1,108	4,337	0	0
4,202	11,837	3,021	4,120	145,856	159,449	257	396	155	220	313	1,307	1,630	1,964	1,551	1,638	8,054	8,250	19,612	70,550	0	0
1,172	8,473	648	743	19,263	20,653	55	216	0	0	7	17	0	0	1	1	0	0	508	4,535	0	0
0	0	32	62	0	0	24	77	1,224	1,419	929	2,308	3	8	273	285	0	0	0	0	0	0
0	0	0	0	0	0	368	682	7,515	8,160	170	623	6	43	2	2	0	0	0	0	0	0
5,967	23,082	3,749	5,011	165,533	180,654	24,121	38,929	19,208	20,768	2,737	7,763	2,280	4,580	18,073	19,700	8,921	9,243	21,228	79,422	271,817	389,152

Source: LTFRB

2.7 Franchising Issues

The following are the issues and concerns raised by stakeholders pertaining to the franchising processes of the LTFRB:

(i) Congestion of applications/transactions;

(ii) Lack of database that would provide for an easier facilitation of transactions;

(iii) Limited number of personnel;

(iv) Unavailability of signatories, mainly because they are also doing other tasks in relation to their functions; and

(v) Too many required documents, the veracity and authenticity of which cannot be determined by the personnel.

3 EVALUATION OF PUB AND PUJ FRANCHISE APPLICATIONS

3.1 Rationale

Franchising and regulation of public utility jeepneys and buses are the responsibility of a national agency with regional presence; that is the LTFRB, a DOTC-attached agency. Of particular interest which has a direct effect on local transport situation is the issuance of a franchise or permit to jeepney and bus operators. The LTFRB currently issues franchises on the basis of the RMC.

RMC is defined as the “optimum” number of public transportation units that can be assigned to a given route. This was used by the then Ministry of Transportation and Communications for the granting of franchises in line with its route rationalization policy. It is considered optimum because it is supposed to address the concerns of the two players in public transportation, i.e., the riding public and the private operators. RMC satisfies two basic parameters, namely, passenger demand and financial viability.

Being reliant on data that are dynamic in nature (passenger demand and financial viability), the estimation of RMC implies regular review and updating. There are so many variables involved, some of which are simply assumed as they are very difficult to obtain.

The following formulas are used in estimating the RMC:

(i) RMC = NU / UR

(ii) NU = PD / (VLF*ASC*NRT)

Where: RMC= route measured capacity
NU = number of units per route
UR = utilization rate
PD = passenger demand in pax/day
VLF = viable load factor
ASC = average seating capacity
NRT = number of round trips per day

(iii) VLF = (CPK + PPK) / (ASC*FRK)

Where: CPK = cost per km
PPK = reasonable profit per km
FRK = fare rate per km

(iv) NRT = NOH / TAT

Where: NOH = number of operating hours per day
TAT = turn-around time per round trip

There are also issues on the multiplicity of modes and routes plying a corridor. RMC is a simple formula that is appropriate for simple situations. In metropolitan areas, however, realities are much more complicated. It is common to see different public transportation modes operating on the same route. In addition, several public transport routes (with different route origins and destinations) overlap on a certain portion of a corridor. Thirdly, there are public transportation modes that do not have fixed routes. Lastly, there is no indication whatsoever on the level of congestion brought about by the number of public utility vehicles. These factors create complications, difficulties, and questions for the estimation and consequent use of the RMC. These factors have been raised in other studies, and improvements of the RMC methodology have been proposed.

The aforementioned DOTC study proposes different public transportation systems to service various levels of passenger demand. In terms of passenger demand, routes and modes may be classified and prioritized as follows:

(a) **Routes with High Passenger Demand:** Routes with about 100,000 to 160,000 passengers per day will be served by high-capacity vehicles such as rail-based transit or bus rapid transit system (BRT);

(b) **Routes with Medium Passenger Demand:** Routes with about 10,000 to 100,000 passengers per day will be served by PUVs with 60 or less passengers/seats but not less than 22 passengers excluding the driver such as buses, CLRVs with more than 22 passengers/seats including the driver, or with 90 passengers/seats in the case of double deckers or articulated buses; and

(c) **Routes with Low Passenger Demand:** Routes with passengers not exceeding 10,000 per day will be served by public utility vehicles (PUVs) with less than 22 passengers/seats including the driver such as jeepneys and paratransit modes.

The proposed idea seems to be appropriate but it is difficult to survey and estimate passenger demand and there is no consideration of impacts to other competitive PUB/PUJ routes.

3.2 Current Requirements for Proponents

The DOTC has set the requirements to proponents as follows:

(a) **Map of proposed routes** indicating their alignments and route structure descriptions, citing specific street and barangay names, as well as specific location of stops, pick-up and drop-off points from origin to destination, and vice versa. The map should also indicate the road classification and link attributes such as distance, number of lanes per direction, and average travel speed.

(b) **List and map of existing public transportation routes,** i.e., PUB, PUJ, UV Express, and tricycles operating in the area including route descriptions (citing specific streets and barangay name), route distances, number of operating and authorized units, operating hours per route, route turnaround time, estimated travel time from origin to destination, and average frequency/headway per route per day.

(c) **Population** in the proposed route alignments (by barangay).

(d) **Estimated number of passenger demand,** i.e., time value between identified stops identified above along the entire stretch of the proposed route and describing clearly the methodology and assumptions used in the generation of passenger demand.

(e) **Estimates of financial and operational requirements** of the proposed service.

(f) **Transportation costs** incurred per regular passenger, for travelling the whole stretch of the proposed route under the current public transportation services, and the projected cost for the same travel via the proposed service.

In addition to the above items, based on the discussions with the TPU members and the MUCEP CPT, it was suggested that a certification from concerned local government units (LGUs) be included to attest to the need for the proposed service, a certification on the availability of sufficient area that will serve as an off-street terminal for the service, number of proposed units, and information on land use and urban development plans along the proposed route.

3.3 Verification Method for Routes Inside MUCEP Area

In the evaluation of PUB/PUJ franchise applications for the issuance of the CPC, the following basic criteria are to be clarified:

(i) Local public need;

(ii) Conformity to the existing transportation policy/regulation; and

(iii) Impact to existing PUB/PUJ routes.

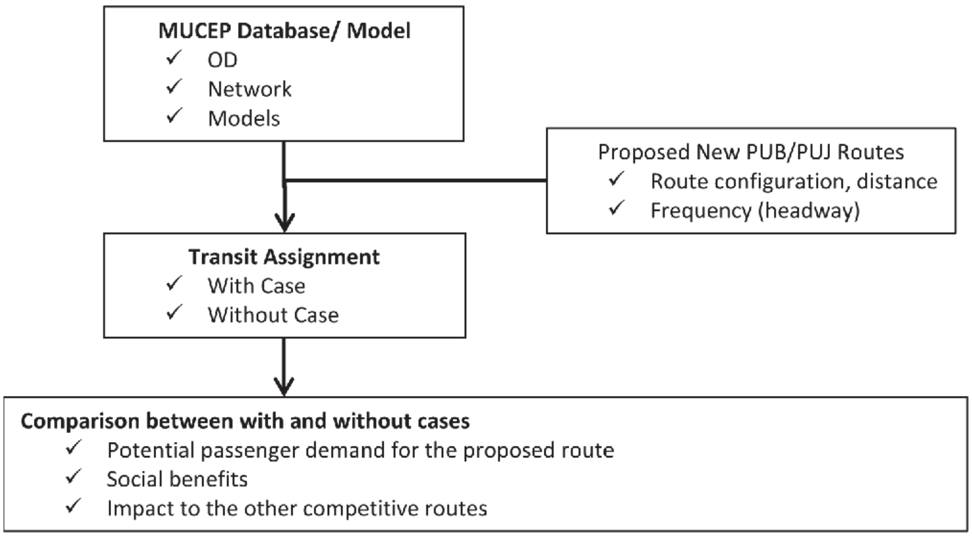
For Mega Manila, the MUCEP database and models are available and can be utilized in analyzing the applications. Figure 3.1 shows the flow of analysis. As a result, the following items are estimated for both cases with/without the proposed route and compared:

(i) Potential passenger demand for the proposed route;

(ii) Social benefits; and

(iii) Impact to the other competitive routes.

Figure 3.1: Flow of Analysis of PUB/PUJ Franchise Applications



Source: JICA Project Team

Utilizing the results of analysis, the checklist for the verification is determined as follows:

(i) All the necessary documents are properly submitted.

(ii) PUBs and PUJs will operate almost on each designated road type (see Table 3.1);

(iii) Potential passenger demand and social benefit in terms of reduction of passenger-hours are estimated to be positive;

(iv) There is no existing route where the passenger-distance is reduced to more than the reasonable extent (for the same service type only).

(v) The proposed number of units and service frequency are within the reasonable extent of the estimated demand.

Table 3.1: Hierarchical Public Transportation Network

Corridor/Road	Rail	PUB	PUJ	Tricycle
1. Mass Transit Corridor[1]	○	○		
2. 4 Lanes or More for Both Directions	○	○	Δ	
3. 2 Lanes for Both Directions		Δ	○	
4. Provincial/ City/Municipal/ Barangay Roads			Δ	○

Source: JICA Project Team
[1] 15 routes designated by RTRS.

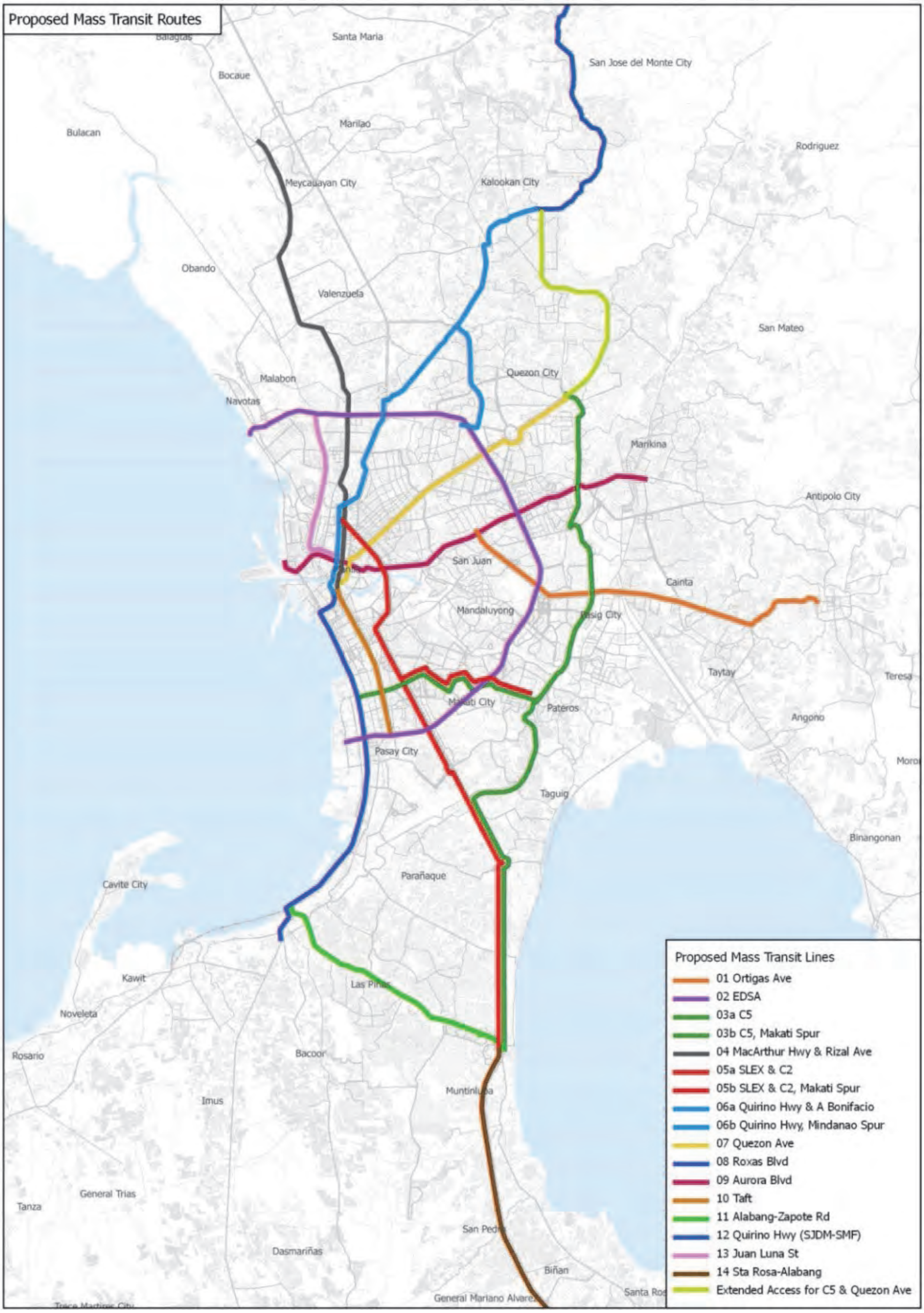
Mass Transit Corridor: The DOTC has conducted the Metro Manila Road Transit Rationalization Study (RTRS) which recommended that 15 mass transit routes be developed in order to accommodate existing PUV passenger demand and better serve them (see Table 4.2 and Figure 4.2).

Table 3.2: Mass Transit Corridors Identified in the RTRS

Corridor	Variations	Route Start & End
1. Ortigas Avenue		Antipolo
2. EDSA		Navotas–Mall of Asia
3. C5	3a C5 & SLEX 3b C5 & Makati	Tandang Sora–Alabang (via (FTI) Tandang Sora–Buendia/Roxas Boulevard
4. MacArthur Highway & Rizal Avenue		Marila–Lawton/MCH
5. SLEX & C2	5a SLEX & C2 5b Makati, SLEX & C2	Alabang–Tayuman Bonifacio Global City–Tayuman
6. Quirino Highway	6a Quirino Hwy & A Bonifacio 6b Quirino Hwy & Mindanao	SM Fairview–Lawton/MCH SM Fairview–SM North/Trinoma
7. Quezon Avene		Philcoa–Lawton/MCH
8. Roxas Boulevard		Sumulong Highway–North Harbour
9. Aurora Boulevard		Sumulong Highway –North Harbour
10. Taft Avenue		Taft Avenue Extension–Lawton/MCH
11. Alabang–Zapote Road		Alabang–Zapote
12. Quirino Hwy (SJDM-SMF)	SJDM–SM Fairview	
13. Juan Luna Street		Gen. San Miguel Street–Lawton/MCH
14. Santa Rosa–Alabang		Santa Rosa–Alabang
Extended Access up Commonwealth for C5 and Quezon routes		

Source: Metro Manila Road Transit Rationalization Study (RTRS)

Figure 3.2: Mass Transit Corridors Identified in RTRS



Source: Metro Manila Road Transit Rationalization Study (RTRS)

3.4 Verification Method for Routes Outside MUCEP Area

Outside of Mega Manila, there is no available transport database and models. Therefore, the following items and activities are to be considered and further discussed:

- **In the Short Term:** Additional requirements such as the ratio of physical duplication with existing routes, etc.
- **In the Medium and Long Term:** Conduct surveys and develop simple models to estimate potential demand and impact of the proposed route (by typical area such as urban, suburban, and rural).

4 CASE STUDIES

As part of the capacity enhancement training to plan the public transportation network of Metro Manila, the members of the DOTC TPU had several exercises using available data at the DOTC. These data are based on the requests of several public transportation operators/cooperatives or LGUs seeking for a favorable recommendation from the department to allow the operation of additional PUV units to ply in a certain route. An activity on how to add a new link in the road network was also undertaken (see ***Appendix A***).

In determining the feasibility or viability of their requests, the TPU used the software application Cube; the different steps in the process in some of the cases undertaken have been captured below.

4.1 Case Study 1

Type of Request: Additional jeepney units

Affected Route: Location A–Location B

Scenario: Added jeepneys to the existing route (3-minute headway)

Objectives:

(i) To validate the data provided by the proponents;
(ii) To determine if there is an existing demand in the particular route; and
(iii) To estimate the number of passengers and jeepney units required in the route.

The table below shows the results of Case Study 1.

Table 4.1: Results of Case Study 1

Item	Scenario 1 (Without Project)	Scenario 2 (With Project)	Difference (With-Without)
1. No. of Passengers/day on the Proposed Route	18,458	20,455	1,997
2. Total Pax-hours/day	21,658,327	21,658,075	-252
3. Total Pax-distance/day	161,777,601	161,776,410	-1,191
4. No. of Existing Jeepney Routes where pax-distance is reduced to more than the reasonable extent.	-	0	-
5. No. of Required Units	62 (Current)	106	44

Source: JICA Project Team

Evaluation results are shown in Table 4.2. Items 1 and 5 are not met due to the incomplete submission of the requirements. Had these requirements been complied with, the proposal would have been accepted.

Table 4.2: Evaluation of Case Study 1

1. All the necessary documents are properly submitted.	?
2. PUB and PUJ will operate almost on each designated road type.	✓
3. Potential passenger demand and social benefit in terms of reduction in pax-hours and pax-km are estimated to be positive.	✓
4. There is no existing route where the pax-distance is reduced to more than the reasonable extent (for same service type only).	✓
5. Proposed number of units and service frequency are within the reasonable extent of the estimated demand.	?

Source: JICA Project Team

4.2 Case Study 2

Type of Request: Additional jeepney units

Affected Route: Location C–Location D

Scenario: Added jeepneys to the existing route (2.5-minute headway)

Objectives:

(i) To validate the data provided by the proponents;

(ii) To determine if there is an existing demand in the particular route; and

(iii) To make an estimate number of passengers and jeepney units required in the route.

The table below shows the results of Case Study 2.

Table 4.3: Results of Case Study 2

Item	Scenario 1 (Without Project)	Scenario 2 (With Project)	Difference (With-Without)
1. No. of Passengers/day on the Proposed Route	30,421	32,988	2,567
2. Total Pax-hours/day	21,641,931	21,641,811	-121
3. Total Pax-distance/day	161,695,376	161,698,202	2,825
4. No. of Existing Jeepney Routes where pax-distance is reduced to more than the reasonable extent.	-	0	-
5. No. of Required Units	65 (Current)	157	92

Source: JICA Project Team

Items 2, 3, and 4 are met, as shown in the table below. Items 1 and 5 are not met due to the incomplete submission of requirements. Had these requirements been complied with, the proposal would have been accepted.

Table 4.4: Evaluation of Case Study 2

1. All the necessary documents are properly submitted.	?
2. PUB and PUJ will operate almost on each designated road type.	✓
3. There is no existing route where the pax-distance is reduced to more than the reasonable extent.	✓
4. Proposed number of units and service frequency are within the reasonable extent of the estimated demand (for same service type only).	✓
5. Proposed number of units and service frequency are enough to transport the estimated demand.	?

Source: JICA Project Team

4.3 Case Study 3

Type of Request: Additional jeepney units

Affected Route: Location E–Location F

Scenario: Added jeepneys to the existing route (1.5-minute headway)

Objectives:

(i) To validate the data provided by the proponents;
(ii) To determine if there is an existing demand on the particular route; and
(iii) To estimate the number of passengers and jeepney units required on the route.

The results are shown in the table below.

Table 4.5: Results of Case Study 3

Item	Scenario 1 (Without Project)	Scenario 2 (With Project)	Difference (With-Without)
1. No. of Passengers/day on the Proposed Route	8,675	20,716	12,041
2. Total Pax-hours/day	21,604,060	21,602,683	-1,377
3. Total Pax-distance/day	161,451,763	161,436,932	-14,831
4. No. of Existing Jeepney Routes where pax-distance is reduced to more than the reasonable extent.	-	2	-
5. No. of Required Units	15 (Current)	72	57

Source: JICA Project Team

Based on the evaluation results, this proposal should not be accepted because it did not satisfy item 4. Even if the proponent complied with items 1 and 5, the proposal would still be denied.

Table 4.6: Evaluation of Case Study 3

1. All the necessary documents are properly submitted.	?
2. PUB and PUJ shall operate almost on each designated road type	✓
3. There is no existing route/s wherein the pax-distance is reduced to more than the reasonable extent.	✓
4. Proposed number of units and service frequency are within the reasonable extent of the estimated demand (for same service type only).	x
5. Proposed number of units and service frequency are enough to transport the estimated demand.	?

Source: JICA Project Team

5 PUB AND PUJ ROUTE NETWORK PLANNING

5.1 Rationale for the Route Redesign

The existing bus and jeepney routes need to be re-designed to provide existing users with better services and to tap potential users. Additionally:

(i) In comparison with cities with more mature public transportation systems, the Mega Manila case lacks route hierarchy, i.e., clearer distinctions between major and feeder services, as well as between provincial and intra-urban bus services;

(ii) Generally, there is a gap between supply and demand in each route and area, affecting operating efficiency and user's convenience; and

(iii) Service characteristics have not completely shaken off provincial (inter-urban) routes, where buses wait for passengers at designated loading points, rather than adjusting to a mass commuting pattern where passengers wait for buses at designated bus stops.

The purpose of this section is to suggest basic factors that should govern the process of designing a better bus and jeepney route network. A network is understood to refer to a set of routes which re-enforce each other, where the whole is more than the sum of its parts.

5.2 Basic Methodology for Route Design

The simplest method is to start with the existing bus and jeepeny routes, followed by an evaluation of re-routing options to improve coverage and maximize vehicle productivity. This may be called the "bottom-up" approach to planning. Most literature on bus route design assumes an existing network with sufficient data about transfers, travel time, trip cost, and load profiles by route. In addition, the existing route configuration is only a good starting topology if it resulted from continuous adjustments in response to market demands.

A more complicated method is to assume that all trips can be made through buses. Under ideal conditions, a minimum path algorithm can be applied to determine the most appropriate route from origin to destination. When thousands of such "paths" are aggregated to a manageable number of origin–destination (OD) zones, a spider network of desire lines will emerge. The desire lines can then be re-shaped (and assigned) to existing road networks. These modified desire lines constitute a first approximation of the route network. The resulting number of direct routes, however, will still be too large and many would be impractical for bus services. Where the city has been divided into 300 zones for analytical purposes, the theoretical number of OD pairs could reach 90,000! Many of them could be combined for having similar topologies. Pattern recognition programs, however, are not yet available to produce a reduced set of routes with topologies sufficiently different from each other. Another problem is the criterion for minimum paths: It could either be travel time, cost, or some other factor.

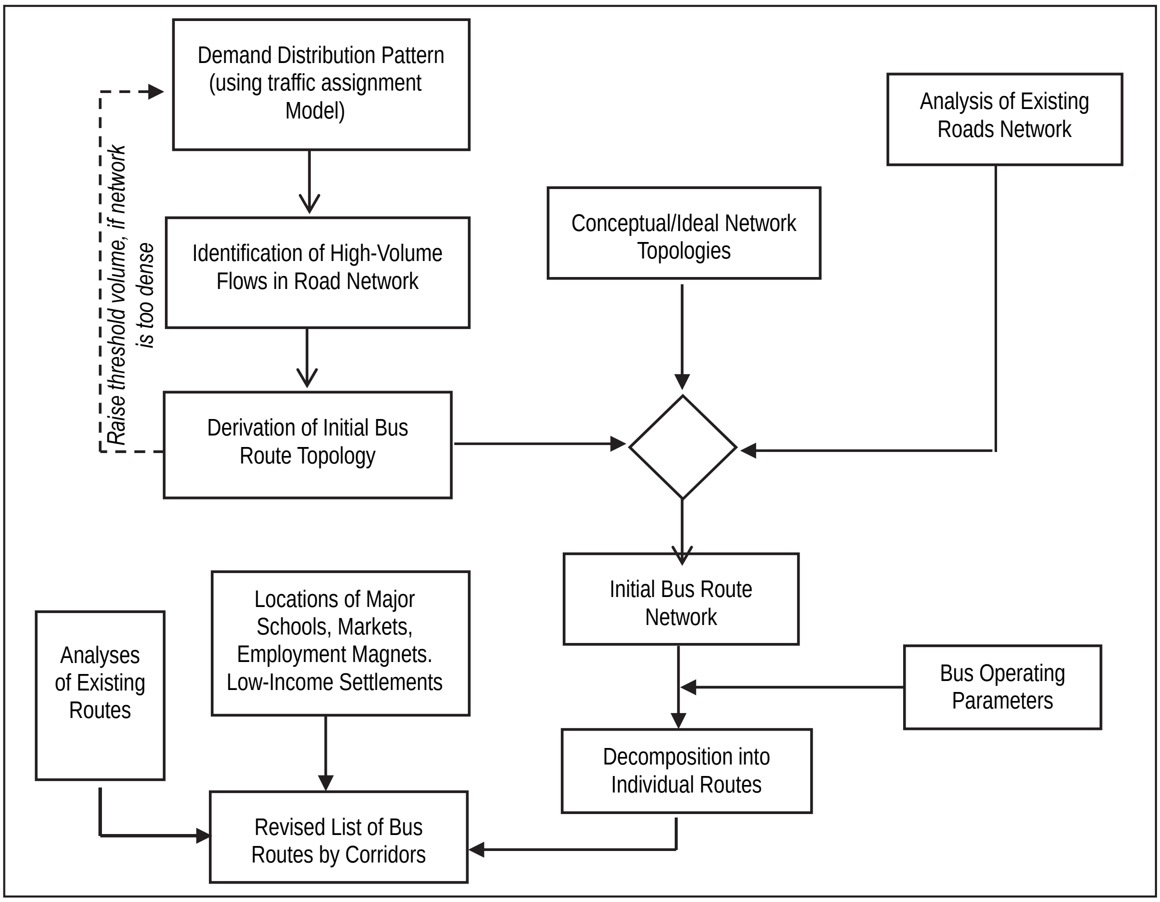
Demand forecasting model (such as the one developed in MUCEP) can only yield generalized routes. It needs expertise and local knowledge, validated by occasional trial-and-error methods to translate these route schematics from a mathematical model into routes of practical use by operators. The model uses a general utility function—which measures cost as well as time—to distribute and assign trips to the future road network. By excluding small-volume trips on the network, say, a threshold of 50,000 per day that may be unsuitable for high-occupancy vehicles, a reduced set of candidate routes would emerge.

These high-volume corridors are currently served by various transportation modes, and constitute a viable target for mass transit to reduce traffic congestion.

The two approaches should be combined, since the city is not starting from a vacuum. The result of the "top-down" approach needs to be disaggregated into individual routes, while the result of the "bottom-up" approach need to be combined into a network. A route alignment can then be finalized by considering road widths, directional flows, choice of vehicles, and locations of major schools, markets, employment magnets, and low-income settlements. Once the route alignment is fixed, the corresponding support facilities like bus stops, waiting sheds, signages, and markings can be planned.

The procedure for bus route design is illustrated in Figure 5.1

Figure 5.1: Approach to Public Transportation Route Design



Source: JICA Project Team

5.3 Network Topologies

In the attempt to design a suitable future route-network structure for Mega Manila, some general principles can be used as guidelines. It should be noted that the topologies described in the following section are not limited to bus transportation; they are "universal" and should be considered not least in combined systems, e.g., composed of rail and bus.

1) Direct Route Network

A "direct route" network is illustrated in Figure 5.2. It is a pattern common in many developing countries and is particularly suited to a low-density city with a dominant center and no sub-centers. Some general characteristics of a direct route network are:

(i) The network is based on a large number of routes attempting to provide as many direct trips as possible;

(ii) There is no hierarchy among different routes since there is no coordination between them. Therefore, even a heavy rail line if implemented in this structure will operate on its own;

(iii) Most routes are radial and lead to the central area that is often a dominating trip destination. Tangential or circular route elements are seldom provided. The system thus provides good accessibility to the central area but not between peripheral areas;

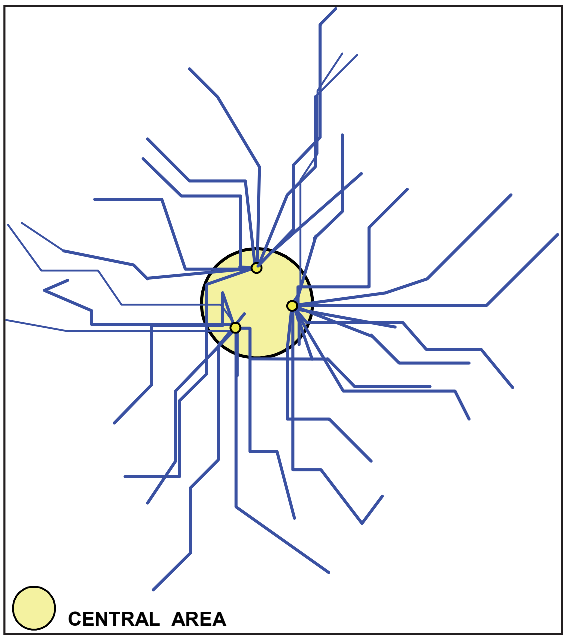
(iv) Stops are often lacking, and boarding and alighting occurs anywhere along the route. This reduces walking but increases overall travel times;

(v) Route alignments are not straight and the distances between stops are short, which means good accessibility to the system but limited commercial speed, long trip times, low vehicle performance, and high operational costs;

(vi) The route network is typically operated by a large number of small vehicles, something that tends to create congestion particularly in central areas of the city where they converge; and

(vii) The direct route network is least demanding on government resources. It is a natural result of a deregulated environment or ineffectual government institutions. And because they evolve through competition, their prices are quite low, but transfers are penalized.

Figure 5.2: Direct Route Network



Source: JICA Project Team

In summary, the direct route principle can be described as a demand-following approach where public transportation is mainly seen as a business. The system tries to identify and respond to the existing travel demand of passengers—and often does well—but does not attempt to influence and change travel patterns for the benefit of the city as a whole.

2) The Trunk and Feeder Line Network

The trunk line-feeder line network is common in more mature cities, where several sub-centers co-exist with a strong center and where a combination of modes (rail and bus, or buses of several sizes) operates. Some of the characteristics of this kind of network are:

(i) The route network is hierarchical, where many feeder and secondary routes complement a few trunk lines and each mode operates on a line according to its strengths;

(ii) Fewer but larger vehicles are deployed on the high-capacity trunk lines to provide a good frequency of service;

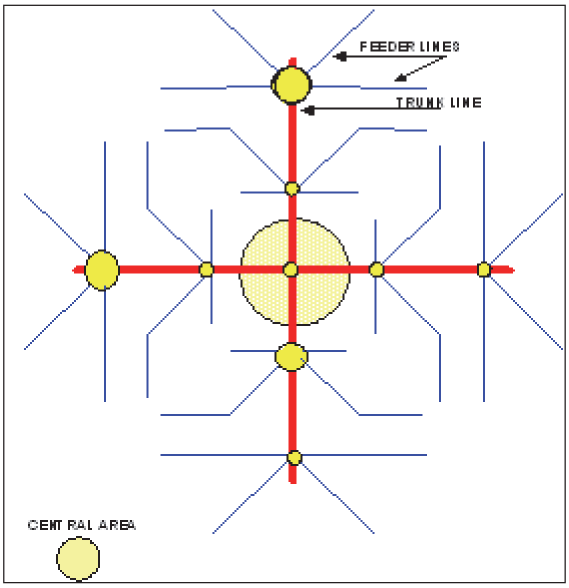
(iii) Designated stops and stations for boarding and alighting are established, especially along the trunk lines and the points of transfers;

(iv) With a few trunk line corridors, investments can be justified for corridor traffic management measures, like separate right of way, grade separation or preferential signal treatment at intersections;

(v) To minimize transfers, a carefully chosen number of passenger interchanges have to be well located and designed; and

(vi) The fare system needs to be distance-based or zonal, so as not to penalize passengers requiring multiple transfers.

Figure 5.3: Trunk Feeder Topology



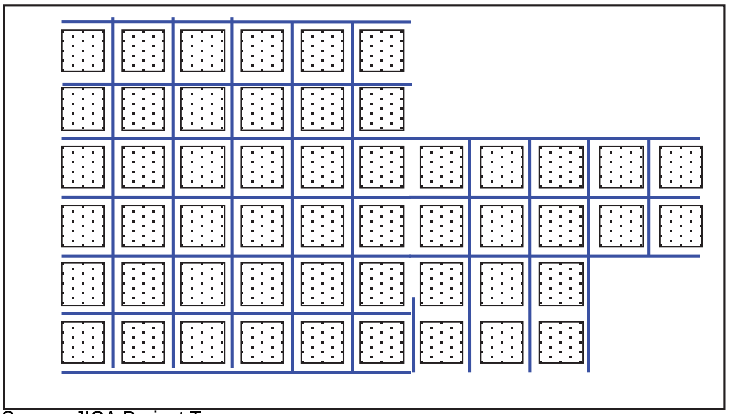
Source: JICA Project Team

The hierarchical trunk-feeder line structure requires a strong government determined to shape the travel patterns of the inhabitants in a way that is considered rational for the whole city.

3) The Grid Network

In some cities with a pronounced grid-type road structure and well-developed road hierarchy, the public transportation network is adapted to that and forms a grid route network. This structure is often introduced in planned new towns. This network type used, for instance, in the central parts of Chicago and Manhattan island in New York has the main characteristic of one corridor/street-one bus route. Often, paired streets form a one-way system. The disadvantage is that it is difficult to maximize the number of direct trips. But, on the other hand, it is possible to travel between any two points in the city with only one transfer. Some elements of this principle might be applicable in certain parts of Mega Manila, where the road network is dense and form parallel pairs.

Figure 5.4: Grid Network

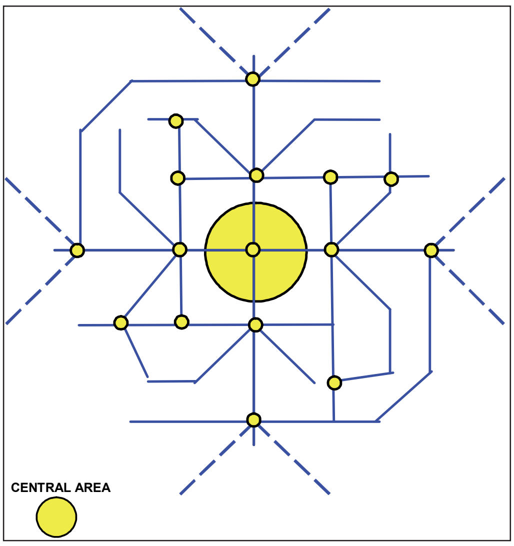


Source: JICA Project Team

4) The Grid Network

A fourth type of network structure could be called a “combination network” which combines several aspects of the preceding three types. What distinguishes it from the trunk-feeder type is the existence of several trunk routes with nearly similar levels. However, the different routes are also not individual and self-sufficient as in the direct route network but complement each other in a planned way. Overlapping routes are avoided but all parts of the city are served. As in the trunk route-feeder route network, but to a lesser extent, transfers play a role in providing accessibility to all parts of the system. This is common in cities with extensive rail and bus networks complementing each other.

Figure 5.5: Combination Network



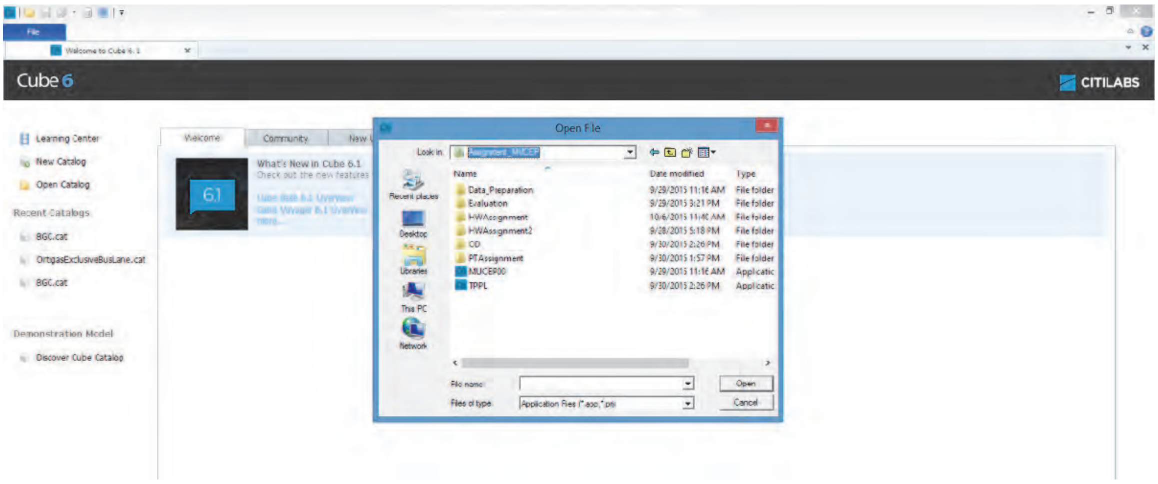
Source: JICA Project Team

APPENDIX

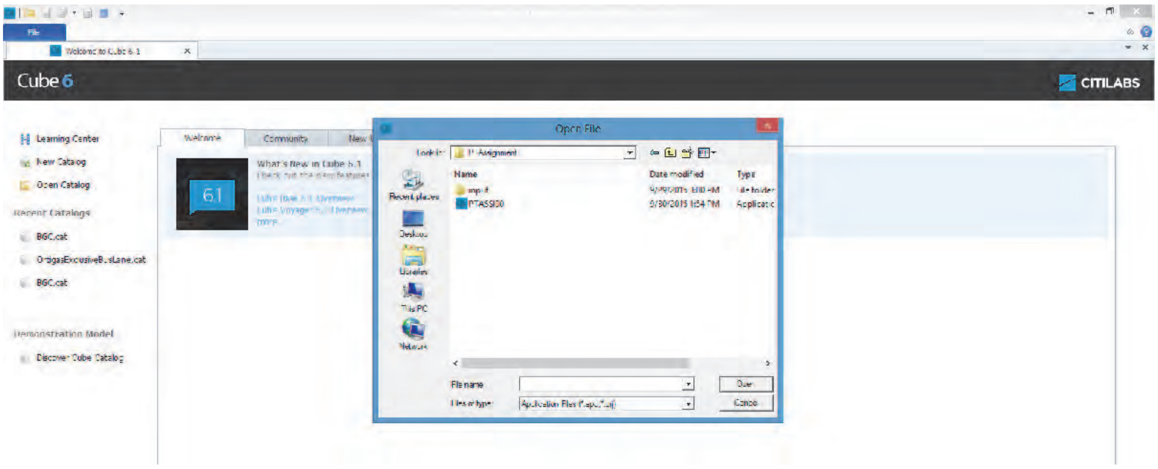
APPENDIX A

CUBE PROCESS
(Adding Jeepneys in Existing Route)

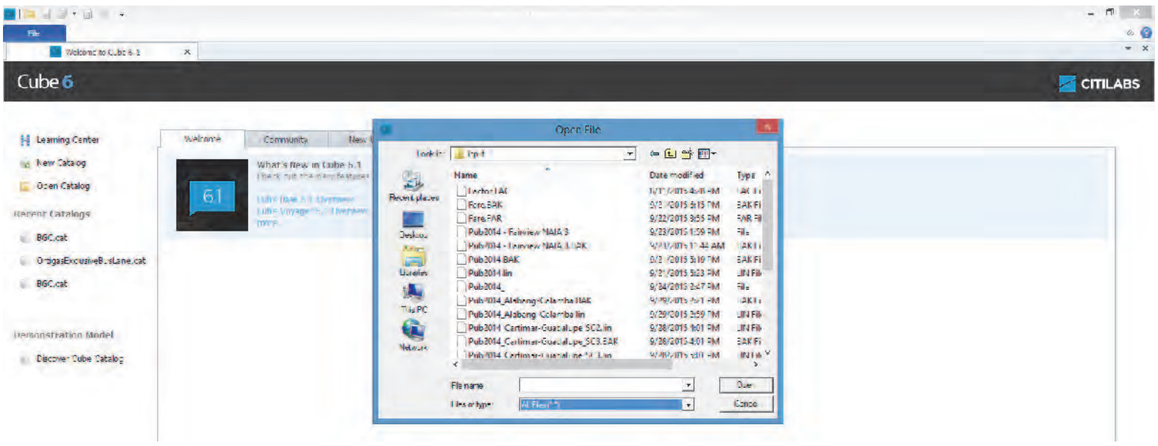
1) Open Assignment_MUCEP Folder



2) Open PT Assignment

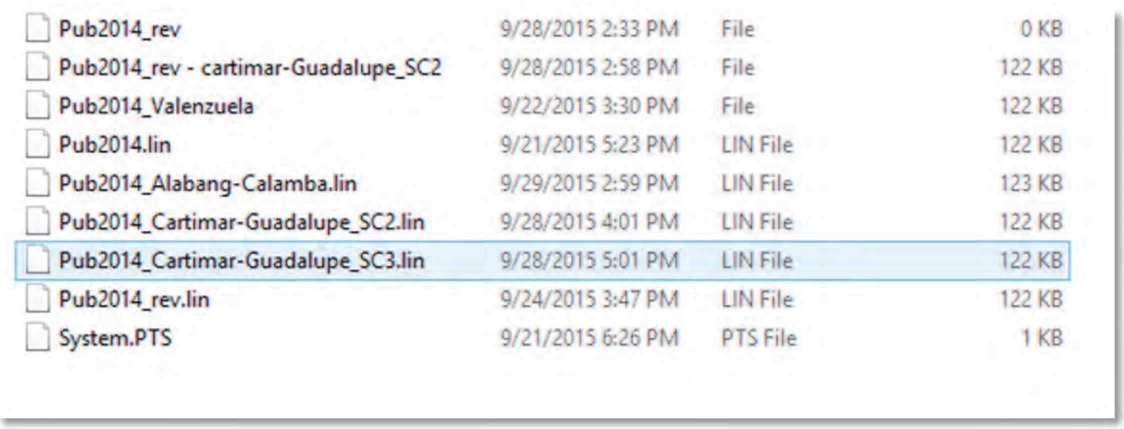


3) Go to Input and delete 00PTR.00A.RTE



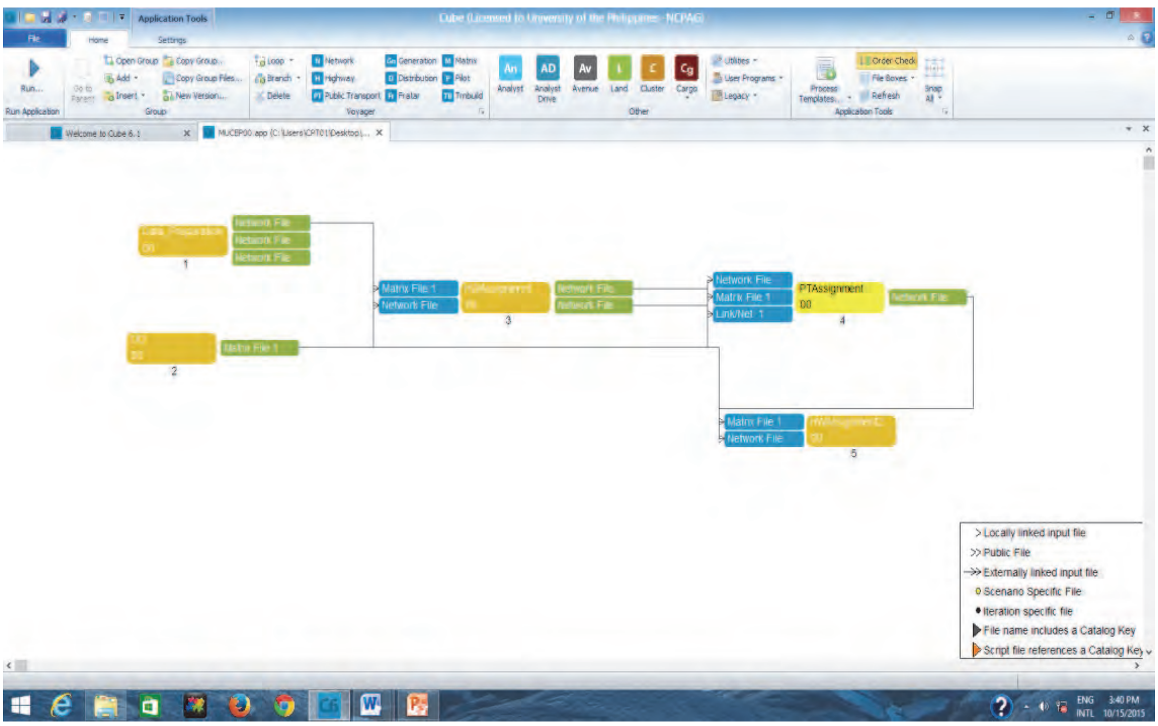
4) Copy Assignment_MUCEP folder (desktop) and change the file name (according to the name of the route requested/considered)

5) Go Assignment_MUCEP folder (desktop) and go to PT Assignment folder
   - Go to Input and look for PUB 2014_rev line file
   - Copy and paste PUB 2014_rev line file
   - Change the file name (according to the name of the route requested/considered)



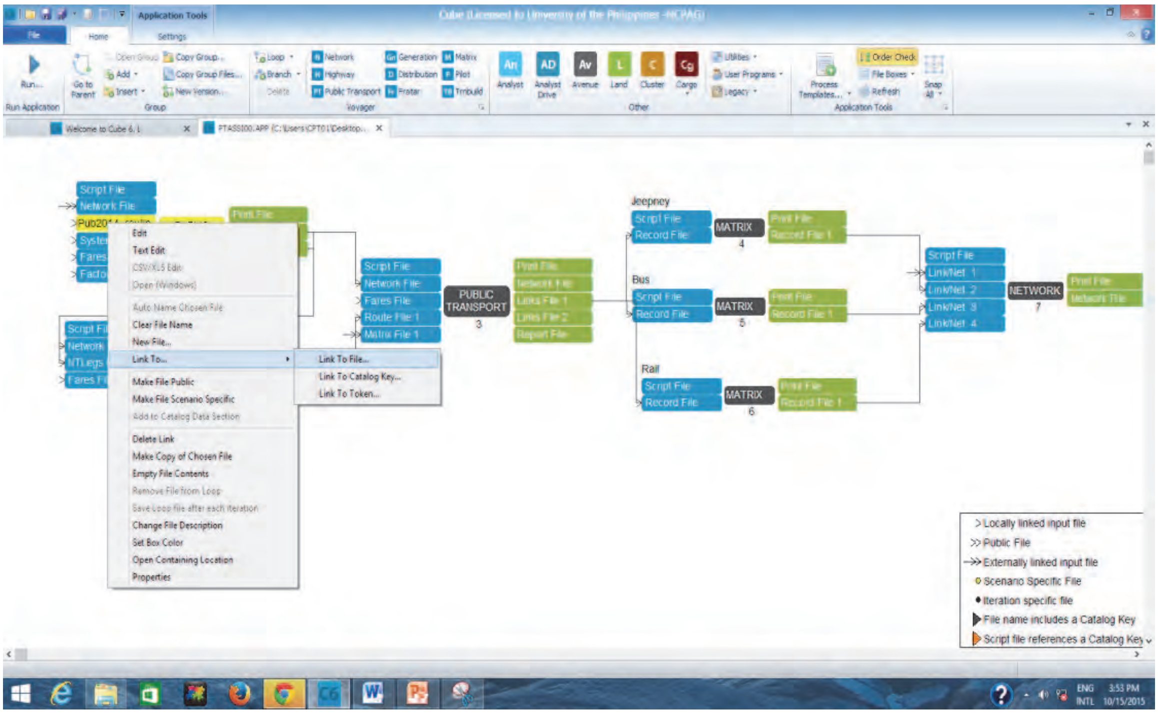
Pub2014_rev	9/28/2015 2:33 PM	File	0 KB
Pub2014_rev - cartimar-Guadalupe_SC2	9/28/2015 2:58 PM	File	122 KB
Pub2014_Valenzuela	9/22/2015 3:30 PM	File	122 KB
Pub2014.lin	9/21/2015 5:23 PM	LIN File	122 KB
Pub2014_Alabang-Calamba.lin	9/29/2015 2:59 PM	LIN File	123 KB
Pub2014_Cartimar-Guadalupe_SC2.lin	9/28/2015 4:01 PM	LIN File	122 KB
Pub2014_Cartimar-Guadalupe_SC3.lin	9/28/2015 5:01 PM	LIN File	122 KB
Pub2014_rev.lin	9/24/2015 3:47 PM	LIN File	122 KB
System.PTS	9/21/2015 6:26 PM	PTS File	1 KB

   - In Cube, click File and click Open
   - Click MUCEP00 – Application File (Model)
   - Click Open
   - The model will appear, right click and choose “Go to Parent” to direct the user to the base/parent model.

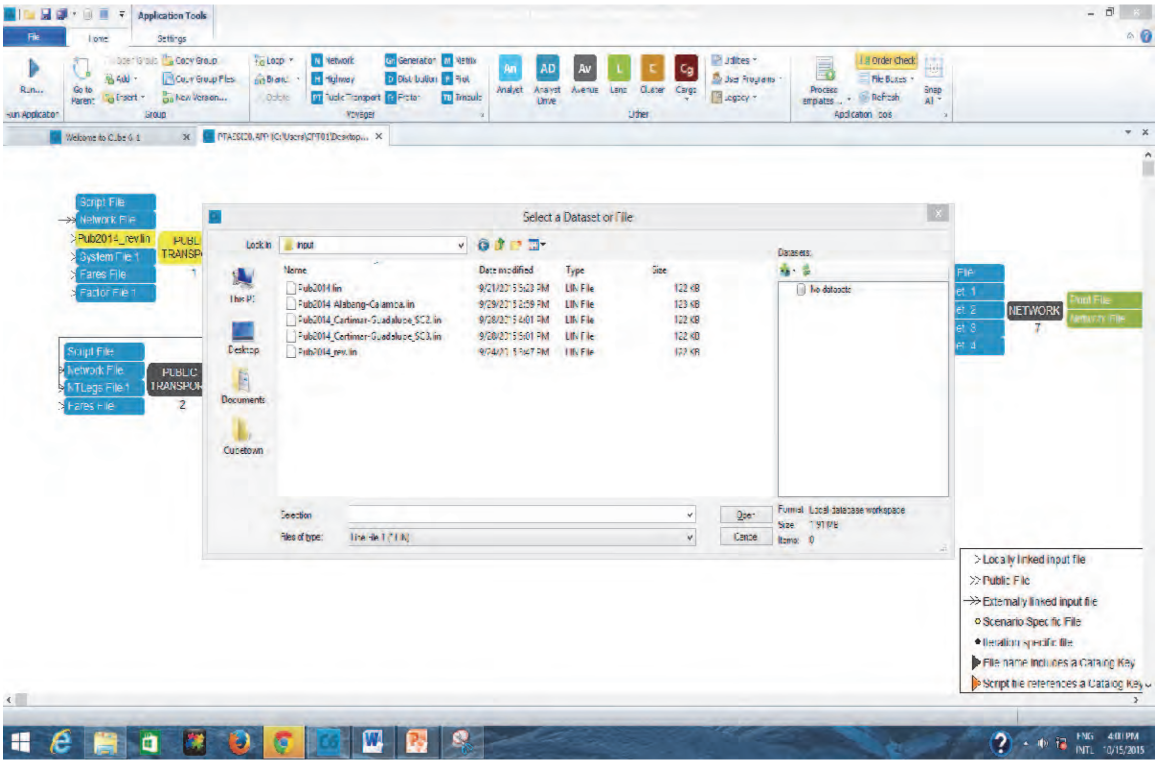


   - Click on PT Assignment

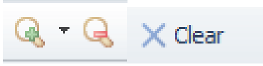
- Click Line File, right click and choose Link to File

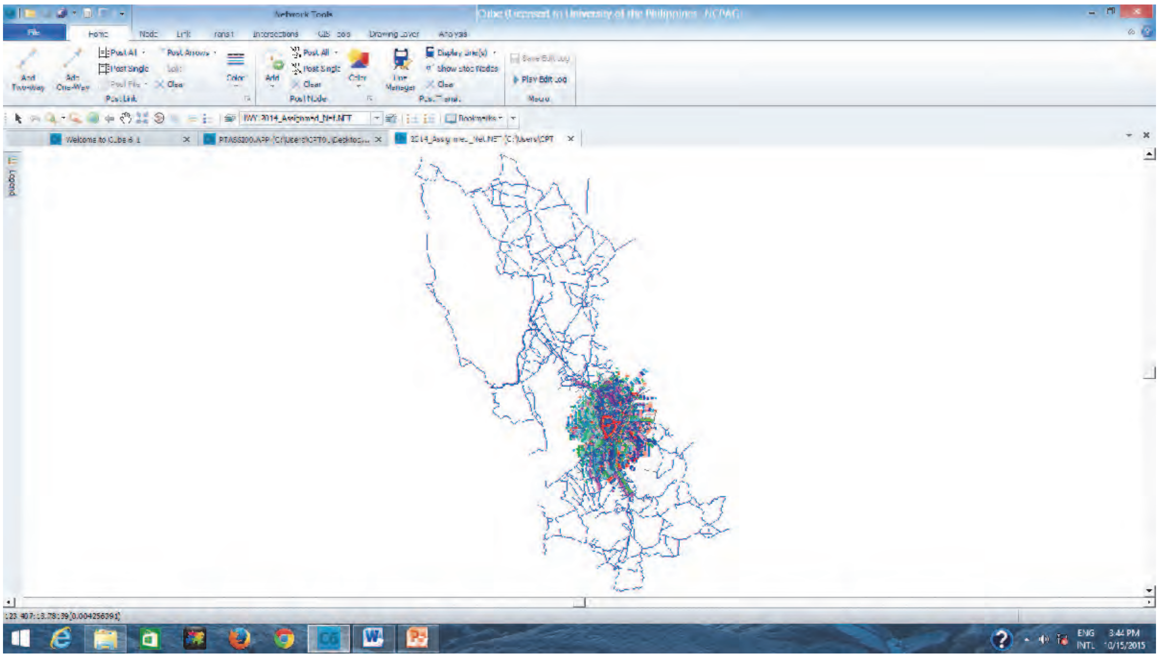


- Go to Assignment_MUCEP folder
- Click PT Assignment, go to input
- Choose Pub2014._New File Name and click Open

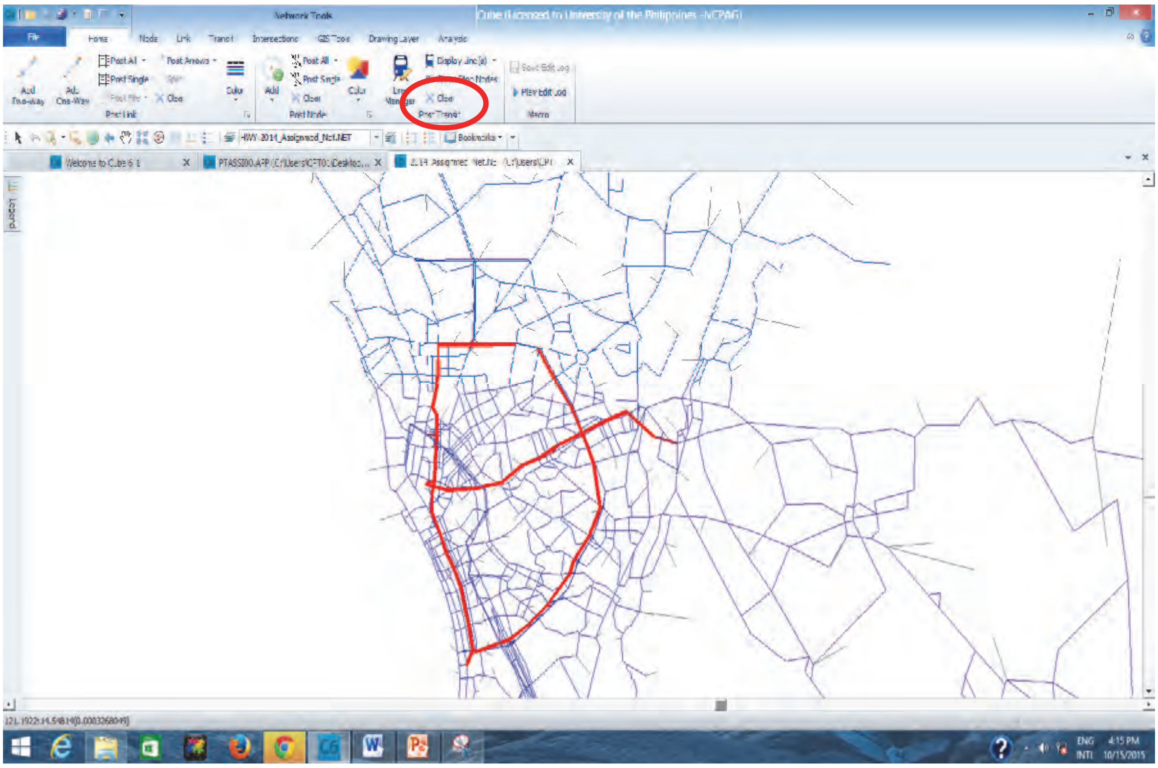


- Click on Line File 1 (Pub2014._New File Name)

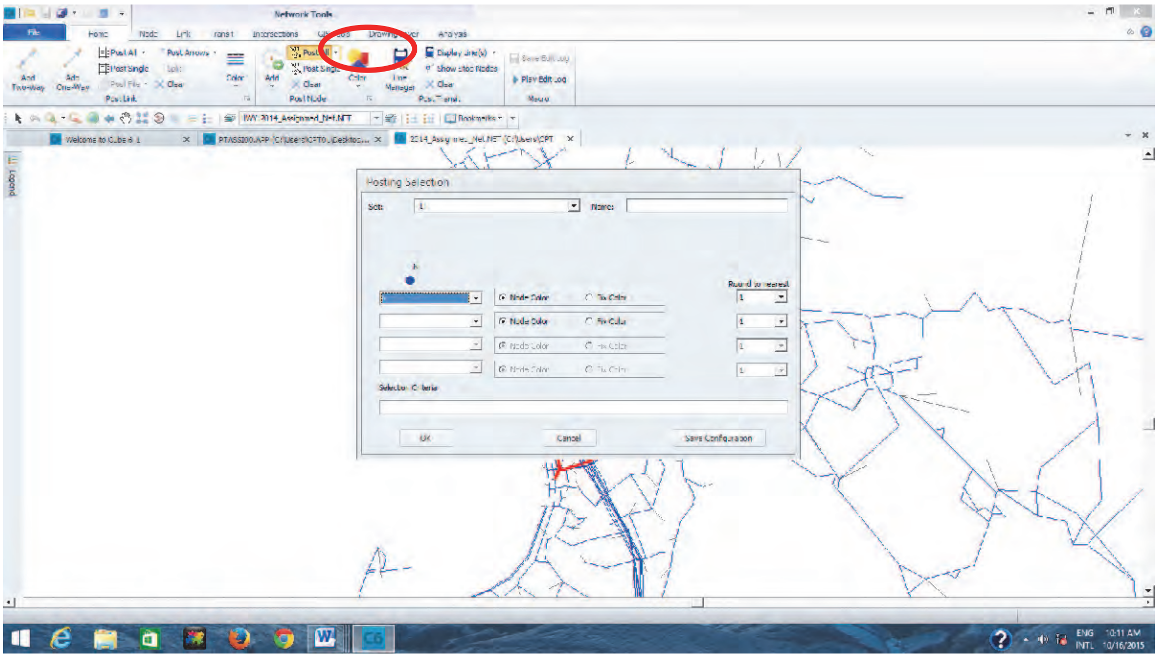
- Click Line File – to maximize or minimize the view, click on these icons to check the desired road networks 



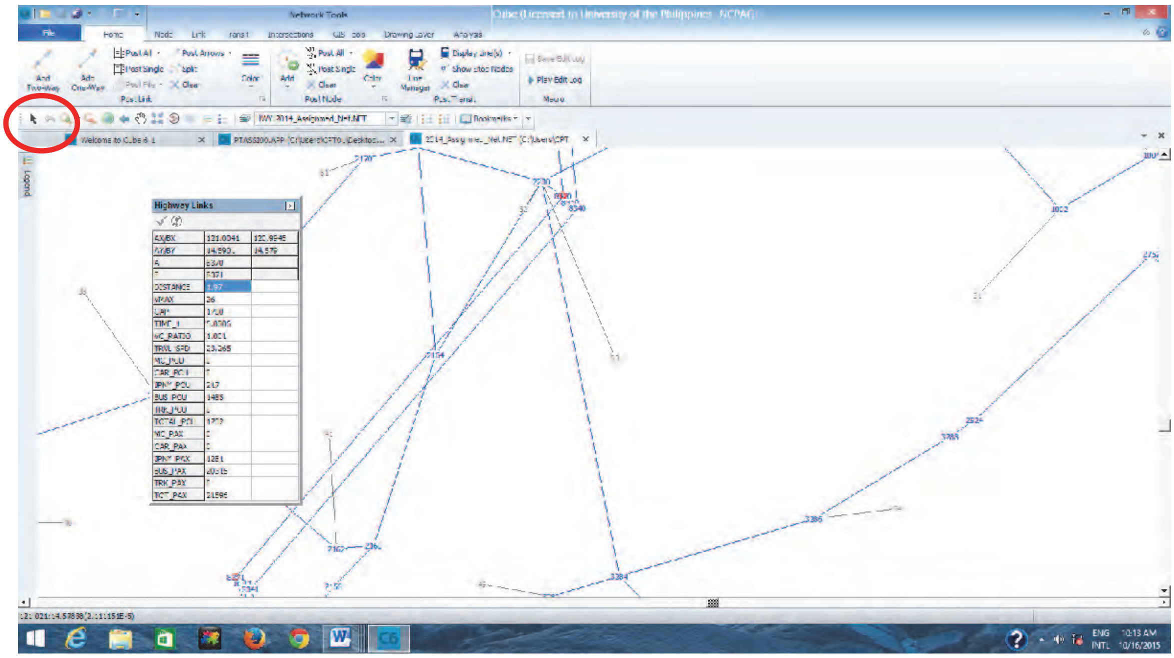
- Click to be able to check clearly the origin and destination of the route.



6) Go to Post Node then click Post All and then click OK

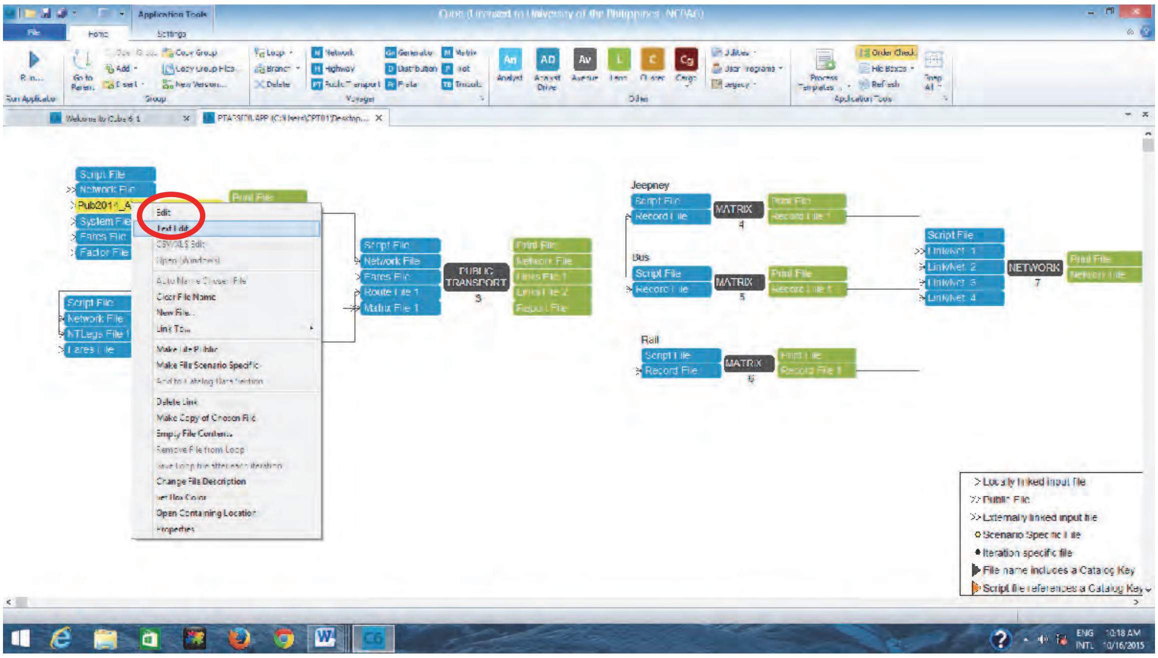


7) Determine the Origin Node and the Destination Node and then Click on the Arrow to check the details.

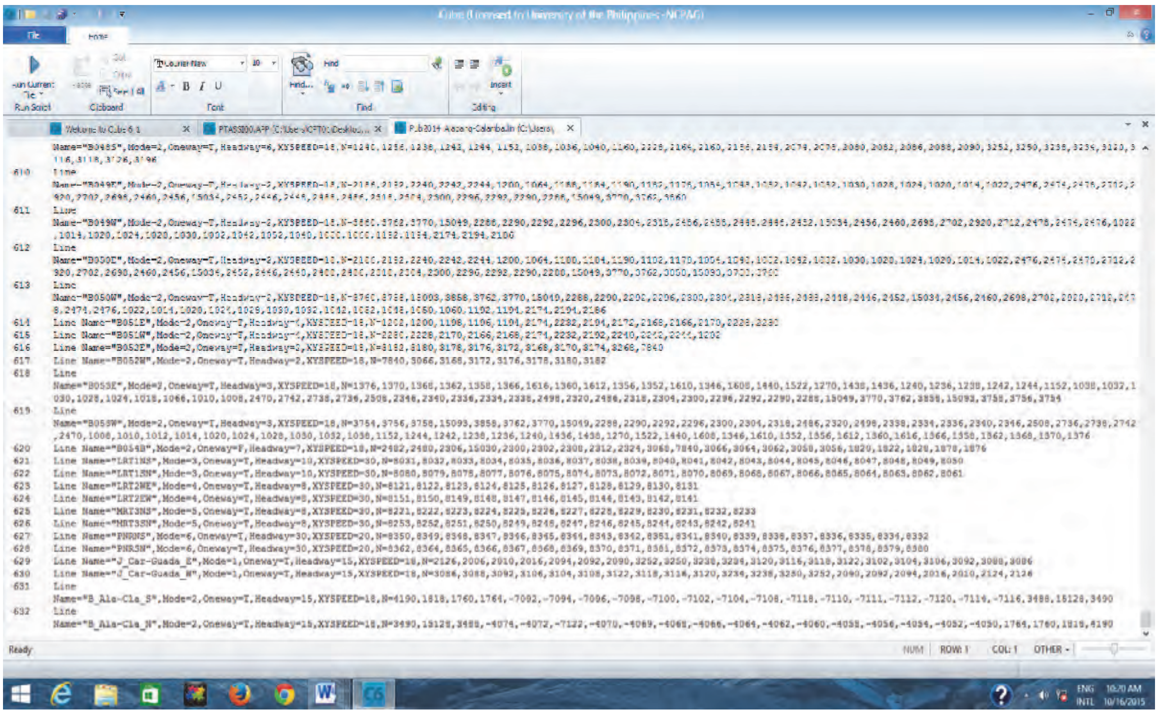


8) Go back to the Model – PT Assignment and then click Line File

- Right Click and choose Text Edit

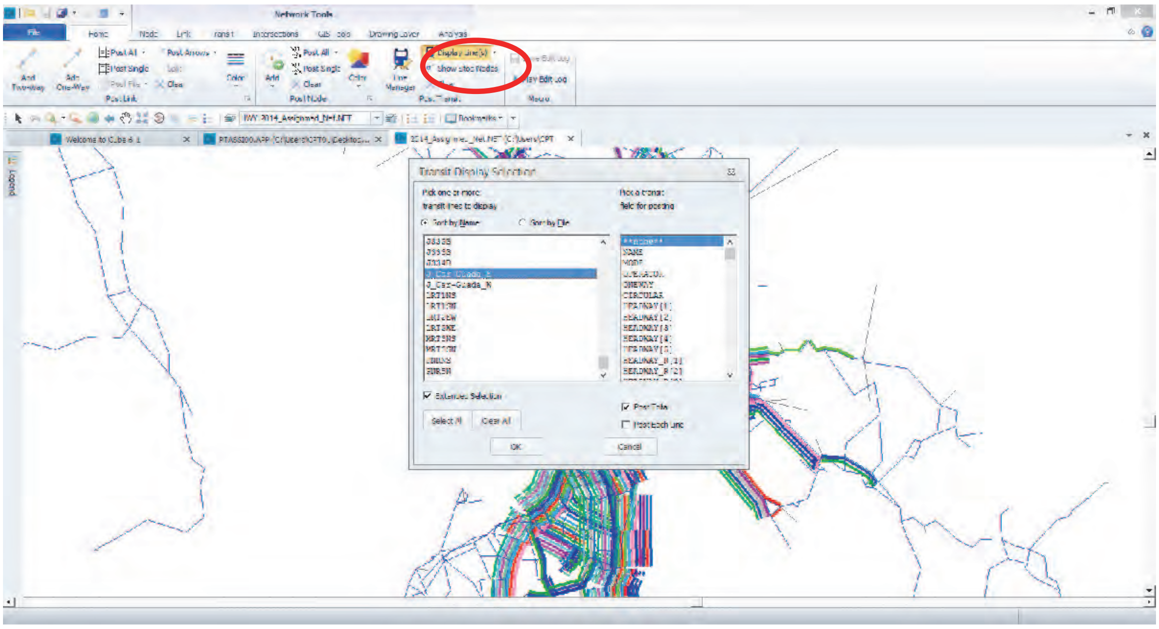


- Go to the bottom of the page
- Add – Name the route to be added, Mode=(1=Jeep;2=Bus), Oneway- (T or F), Headway (min), XYSPEED (kph), N=4004, 4134,4128,1816,1818,1760,1764
- Save and then Close

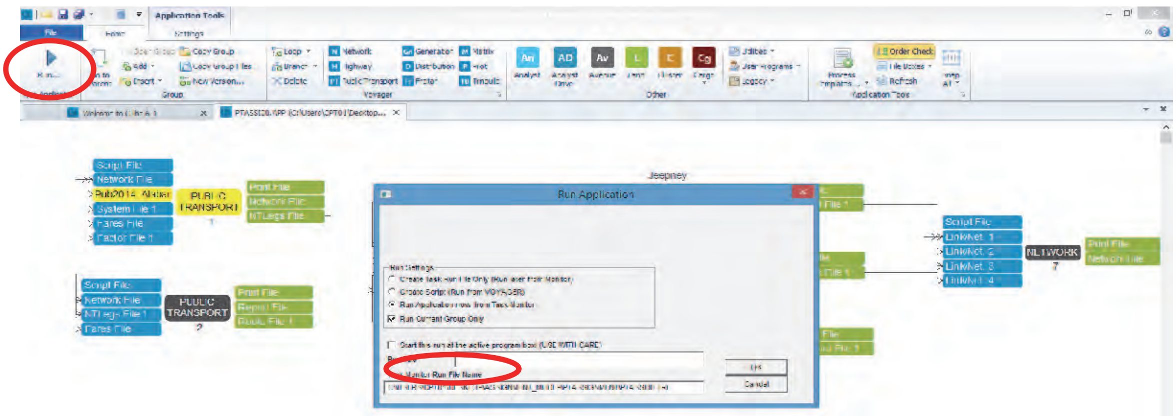


9) Go back to PT Assignment Model and then click Line file

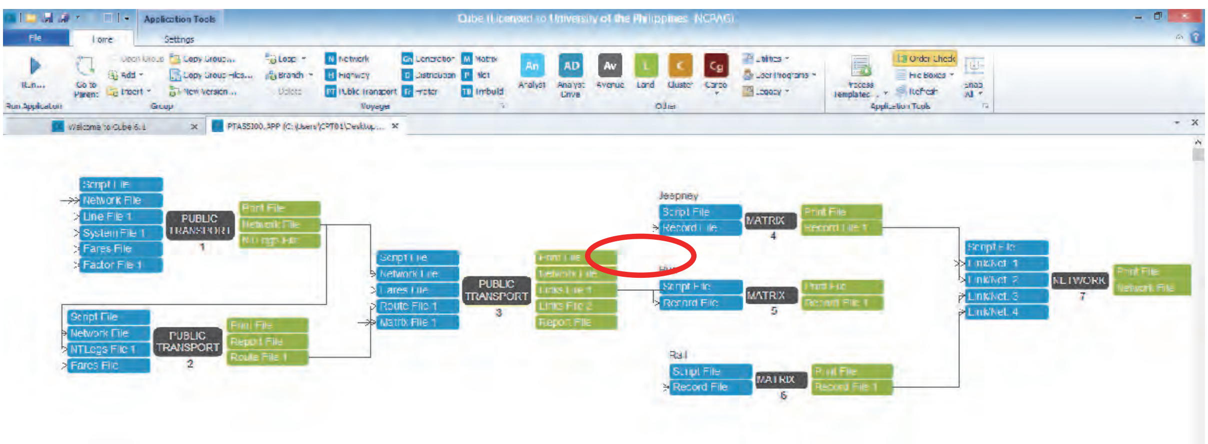
- Click Display Line.
- Scroll and look for the new route added
- Click OK and check the route alignment
- Close the window



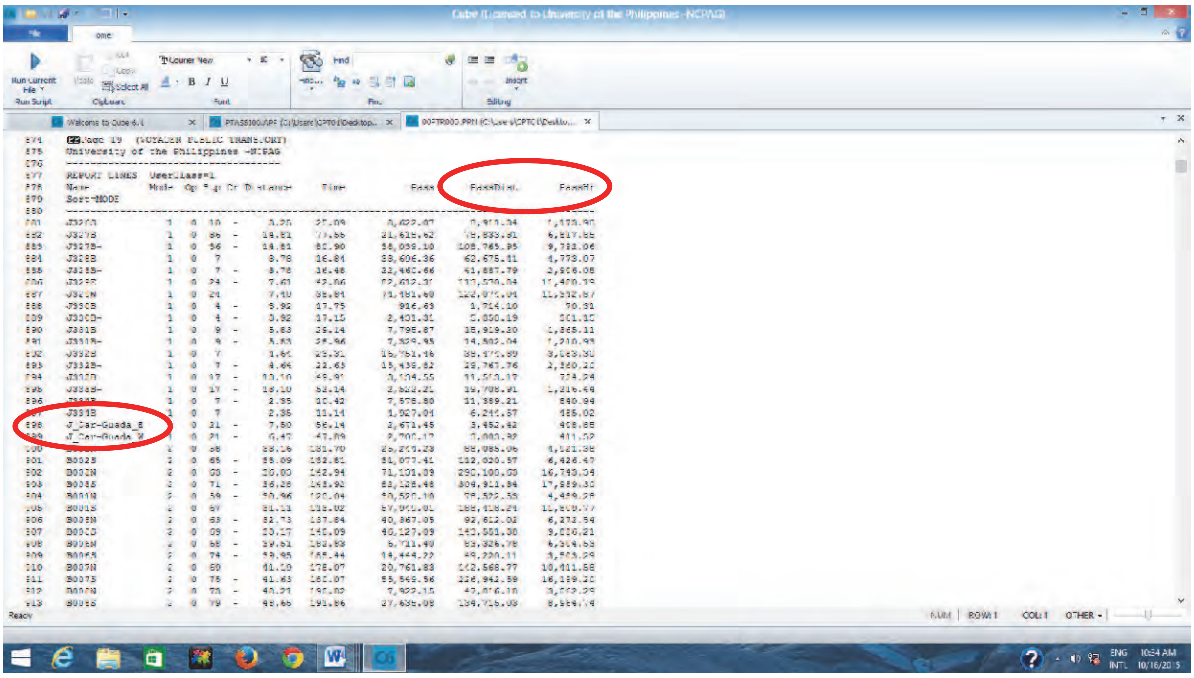
10) Click on Run and then click Run Current Group Only and click OK.



11) Open the Print File

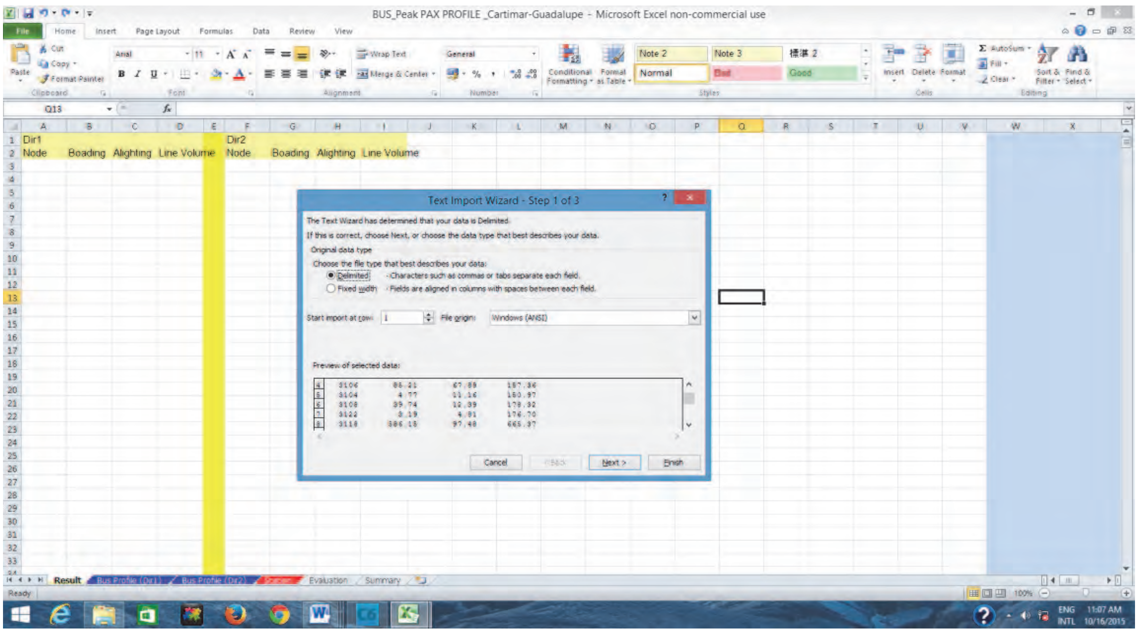


- Look for the New Route – determine the Total Number of Passengers, Passenger Distance and Passenger Hour

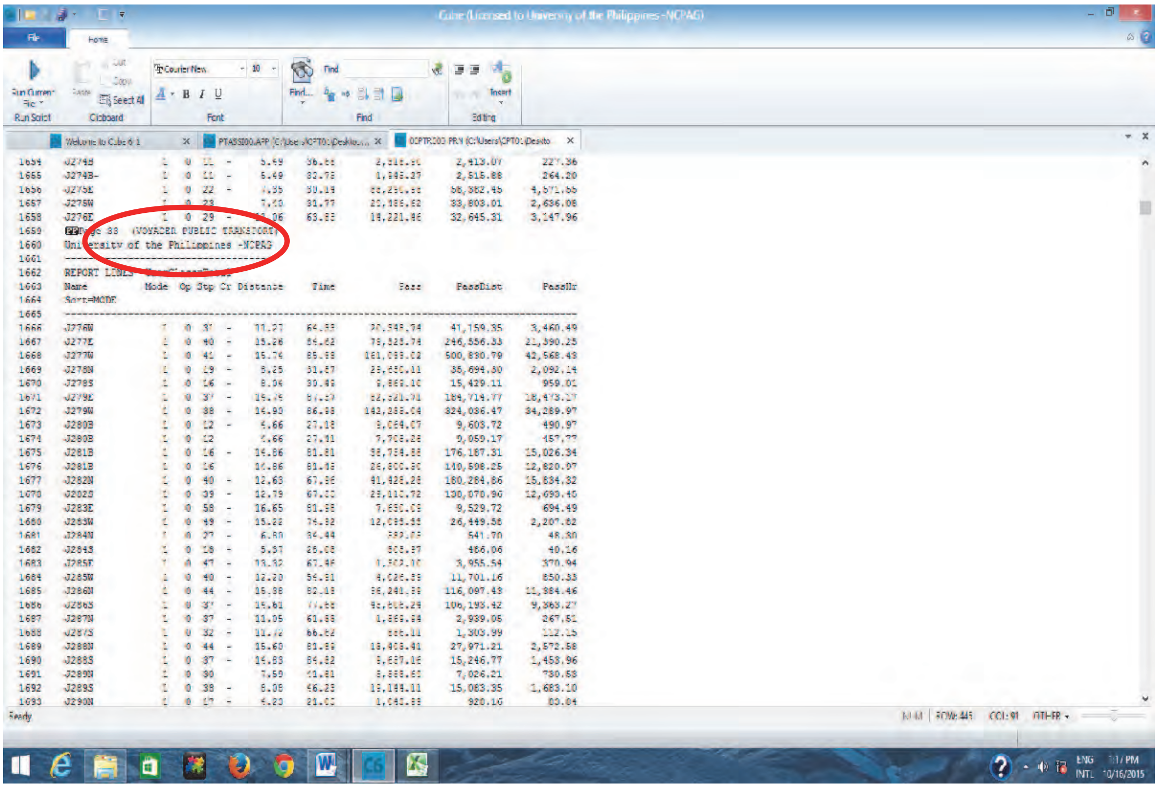


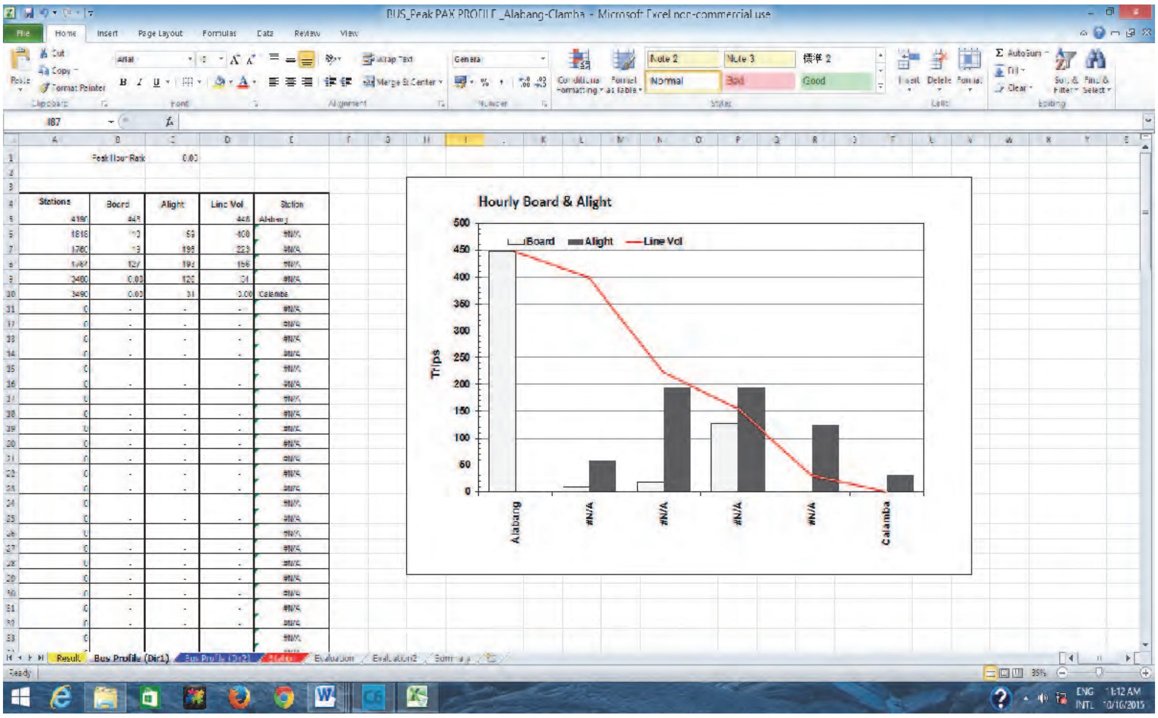
12) Go to Evaluation folder in the Assignment_MUCEP Folder

- Copy and Paste the template evaluation form and change the name into the name of the new route
- Open the file and go to Result
- Find the data in Cube and then copy
- Paste in the Result Tab – Paste – Text File Wizard, click the last button, Next, Finish
- Do the same for the opposite direction (if applicable)

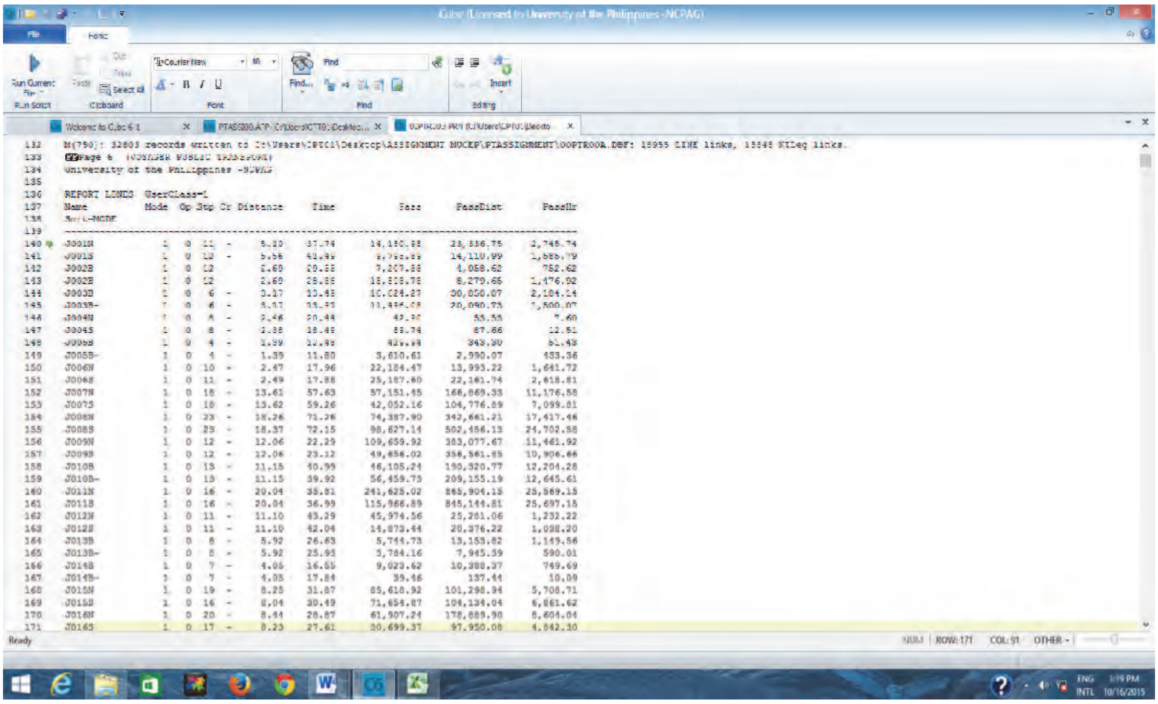


- The result will be automatically reflected in the Bus/Jeepney Profile tab (Change (-) into zero)
- Edit the data bus/jeepney profile tab –– route distance and travel time (refer print file)



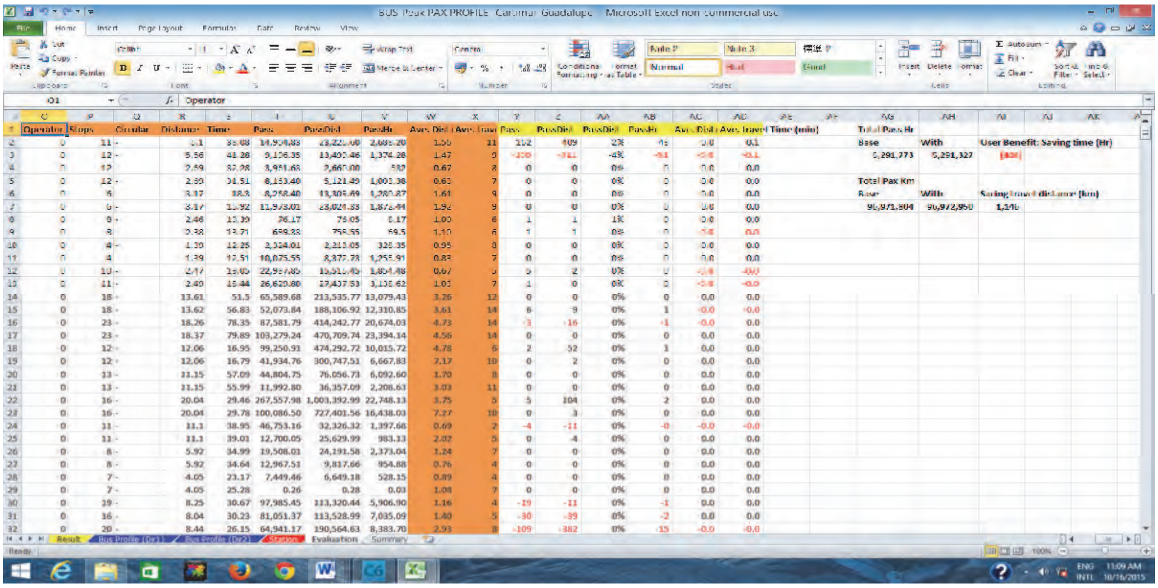


13) Go to Print File – Public Transport



14) Copy Paste the figure from (column 140 – 1029; the column to be copied varies according to the number of transit lines) in the Evaluation Tab

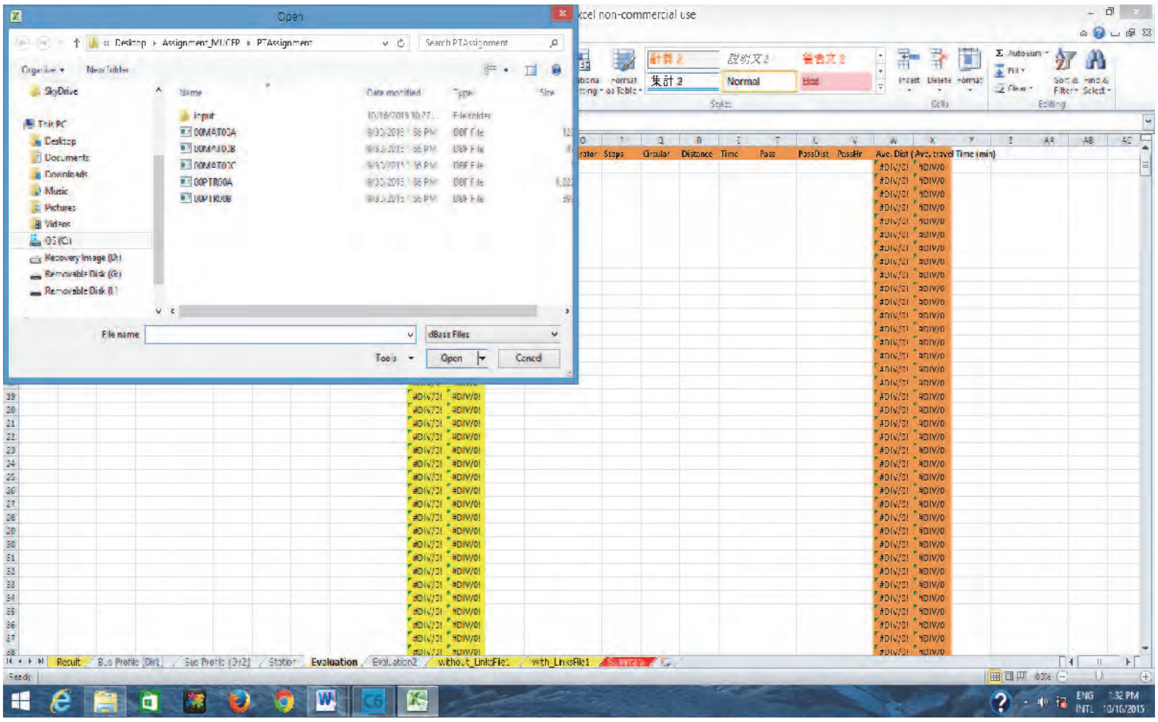
15) Paste – Text File Wizard, click the 2[nd] to the last button, Next, Finish



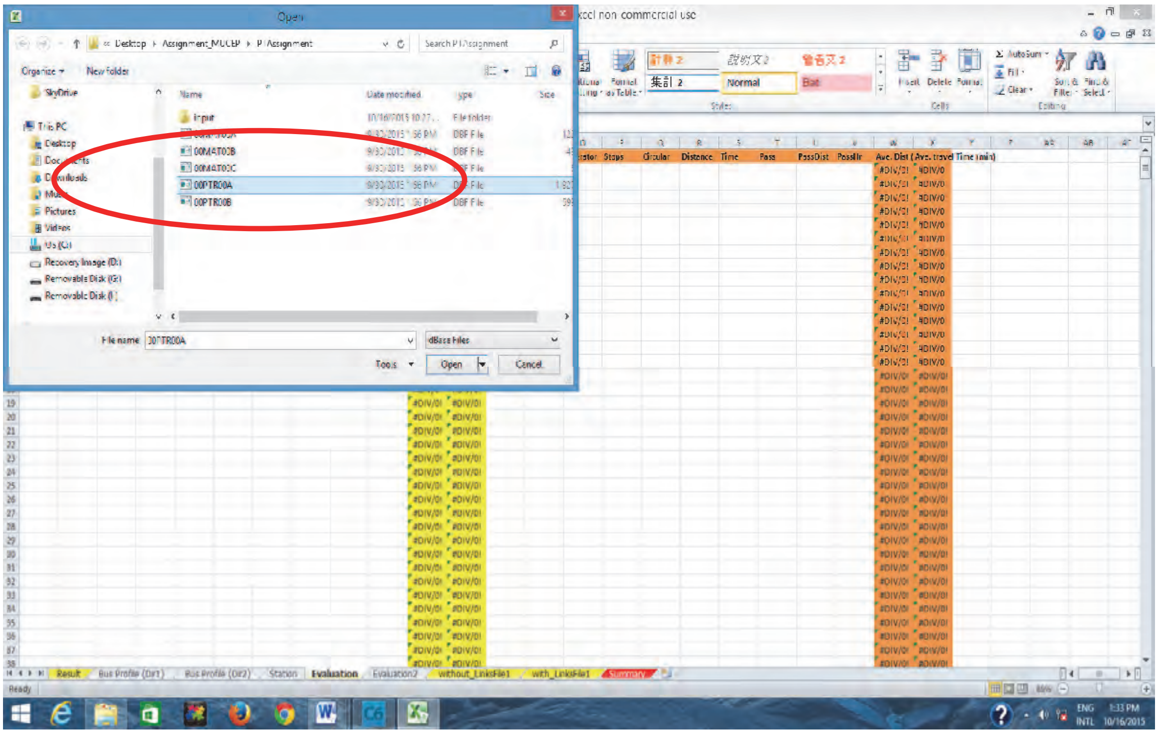
16) In the Evaluation file go to File and Click Open

17) Go to Assignment_MUCEP folder and click PT Assignment

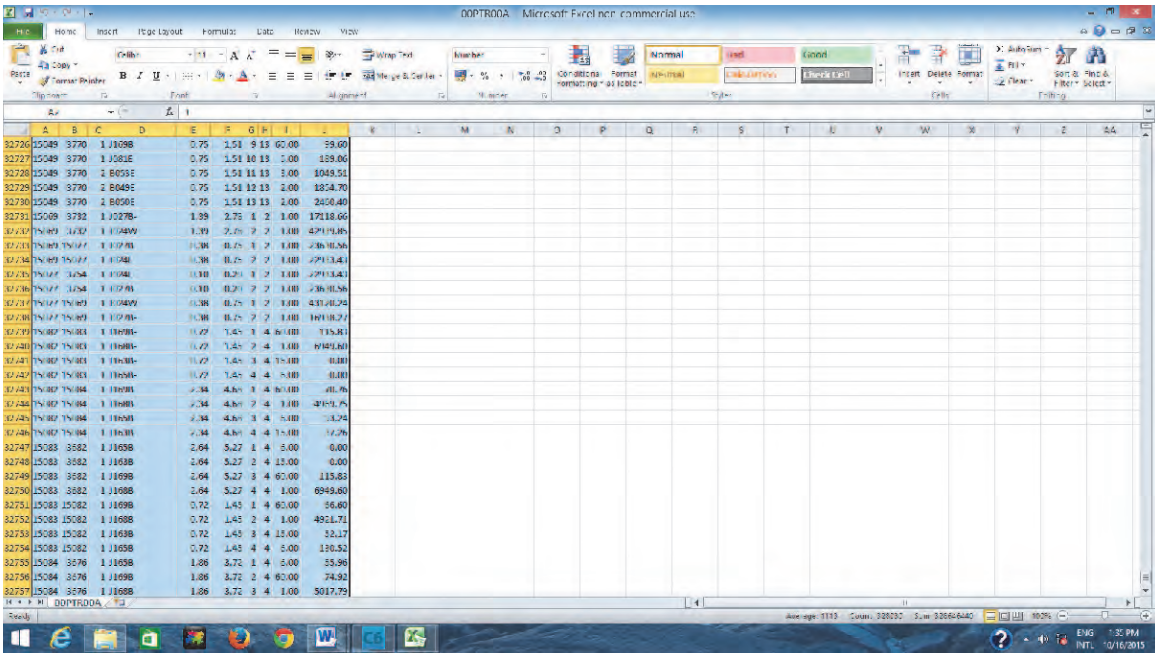
18) Choose dbase file



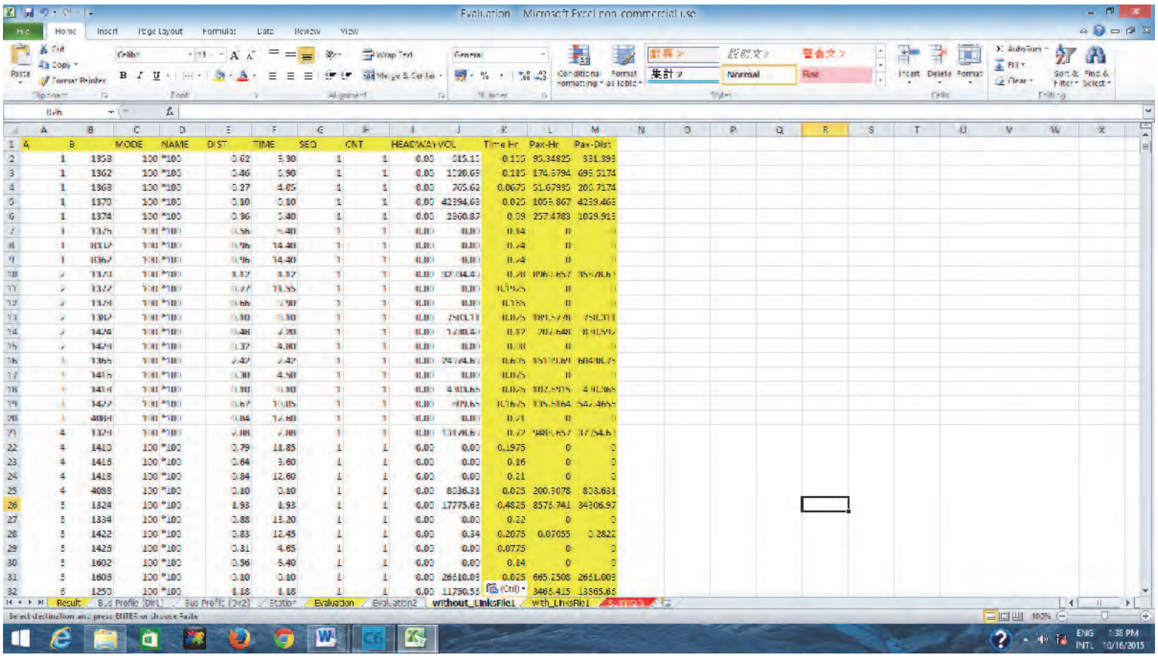
19) Choose 00PTR00A



20) Copy the data beginning on the second column



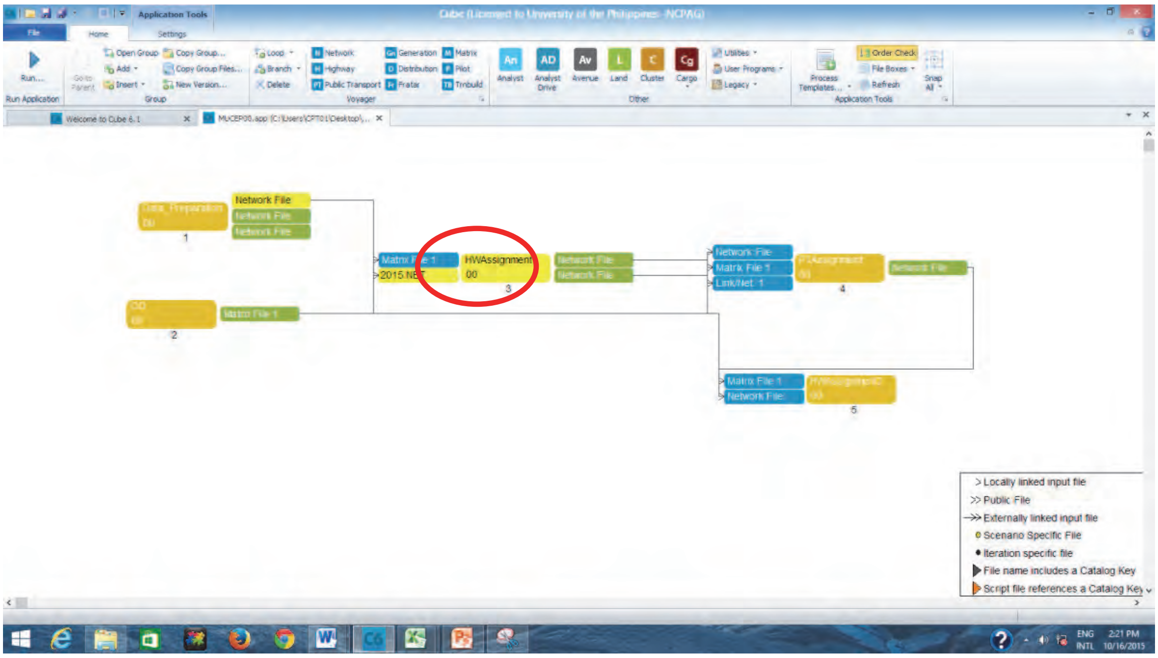
21) Paste in the with or without Linksfile1 tab



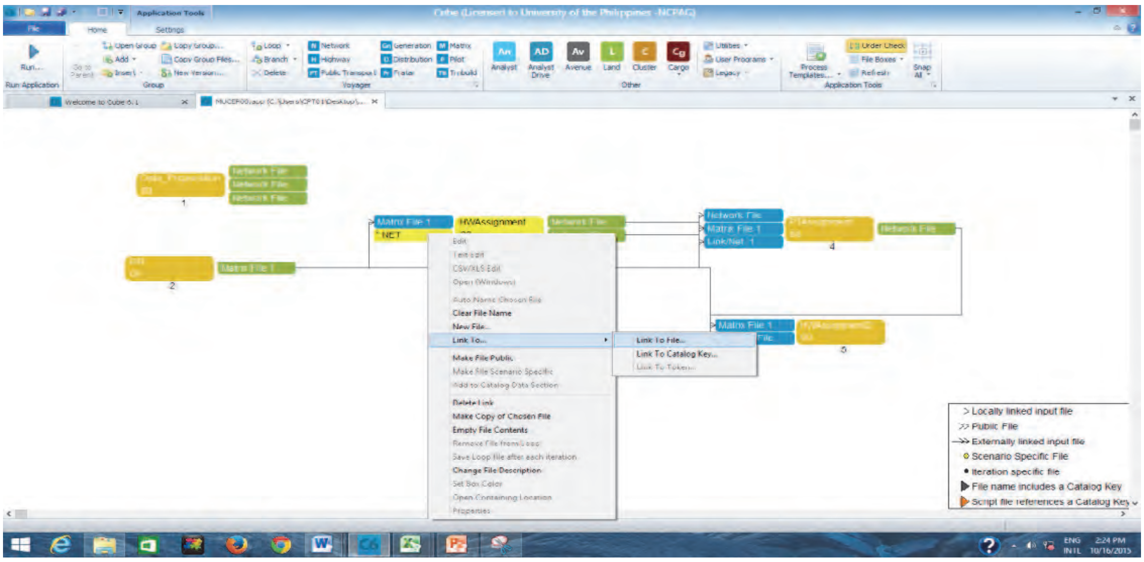
22) Calculate manually the number of passenger/day of the proposed route (based from the Print File) in the Summary tab. All the other data will appear automatically.

CUBE PROCESS
(Adding a Link)

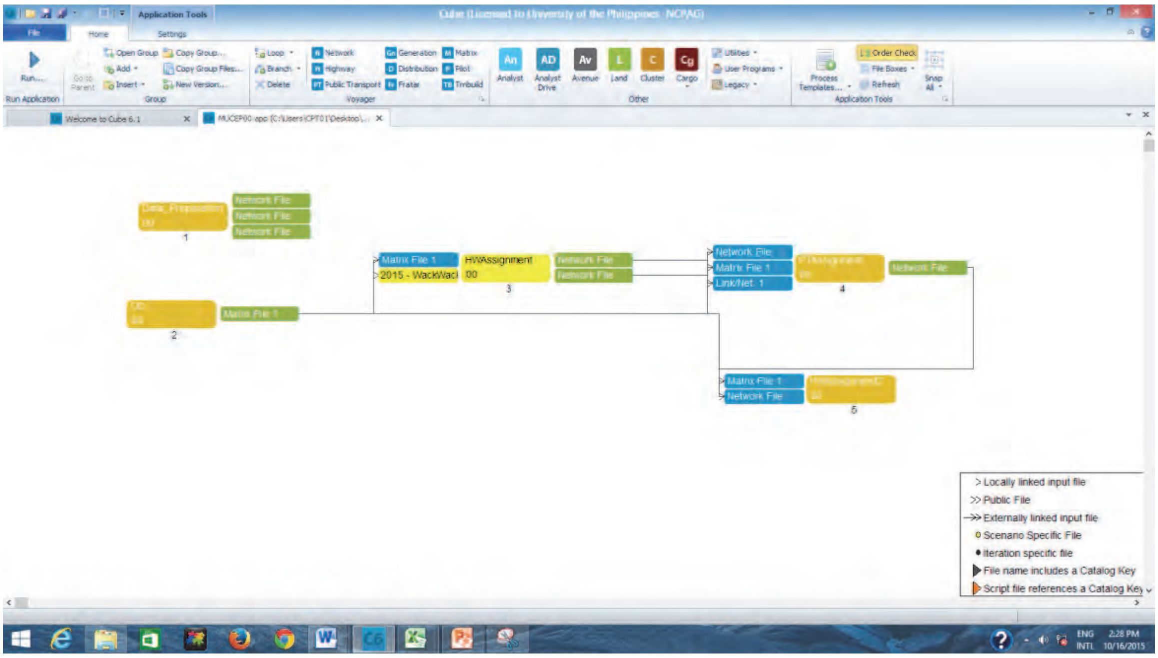
1. Go to Assignment_MUCEP folder (desktop)
    - Go to Data Preparation then go to Input
    - Copy and paste 2015.net file
    - Change the file name
2. In Cube go to Highway Assignment and right click the network file



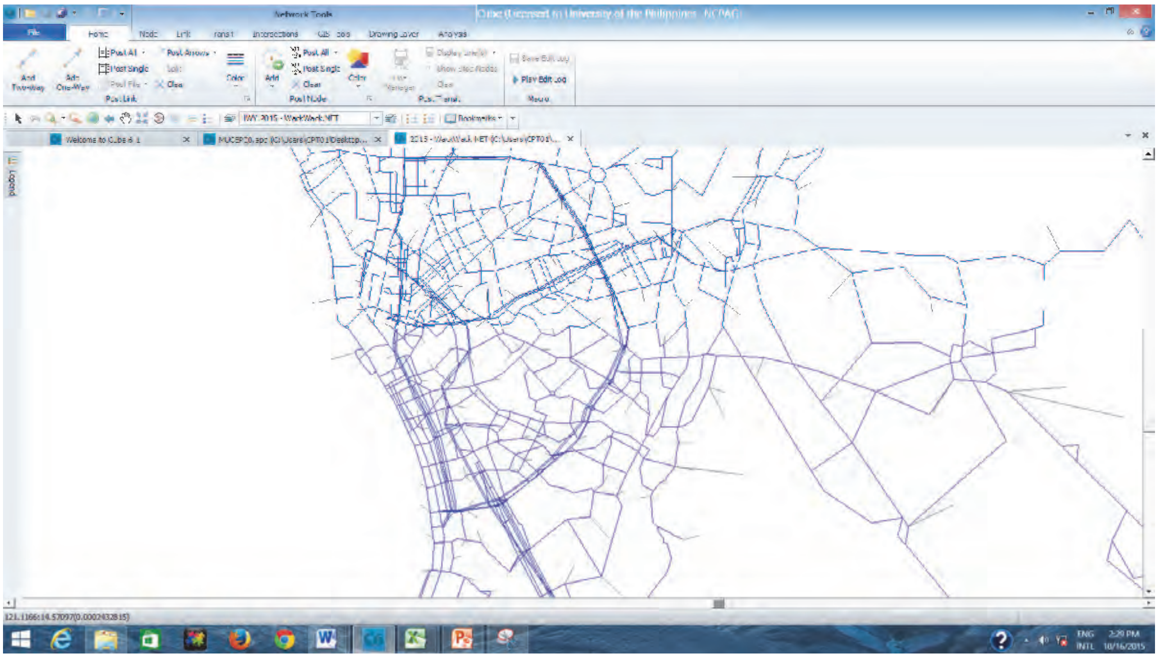
- Choose Delete link
- Choose Link to File



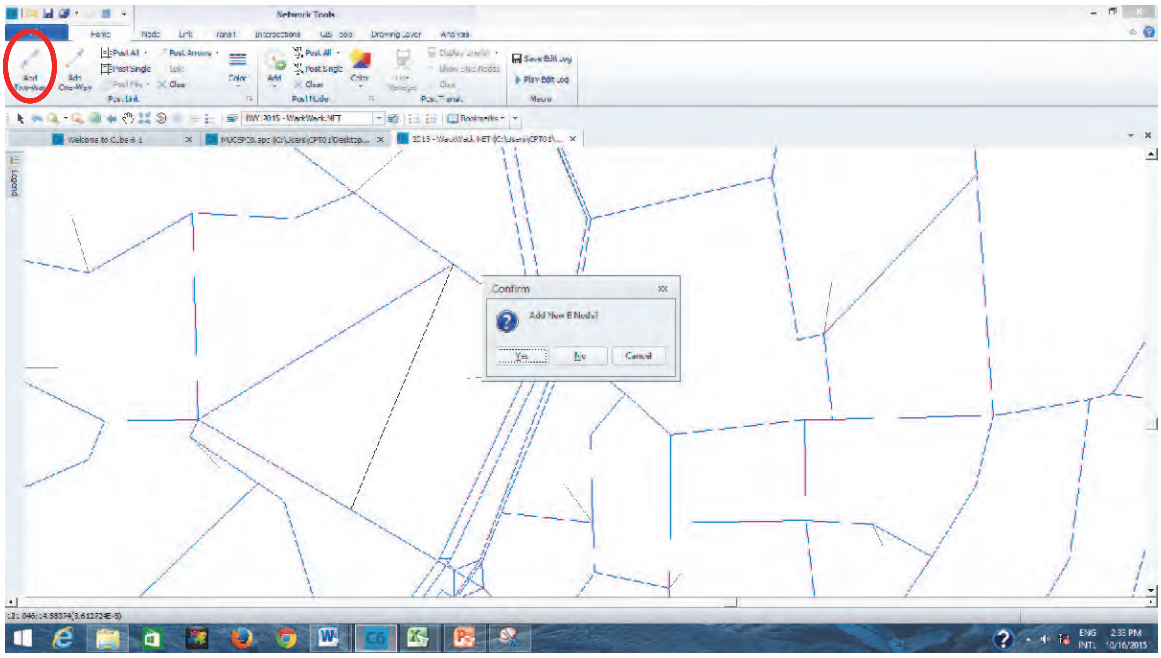
- Go to Assignment_MUCEP file
- Go to Data Preparation
- Go to Input
- Choose 2015-WackWack.NET file
- Click Open



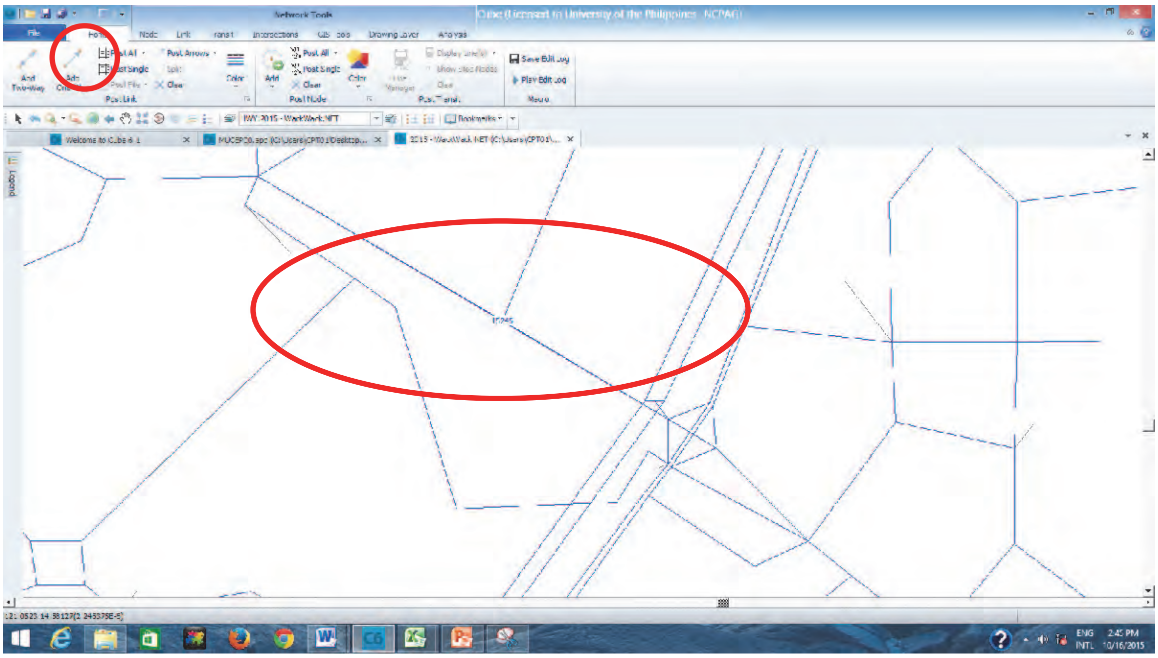
3. Open the network file



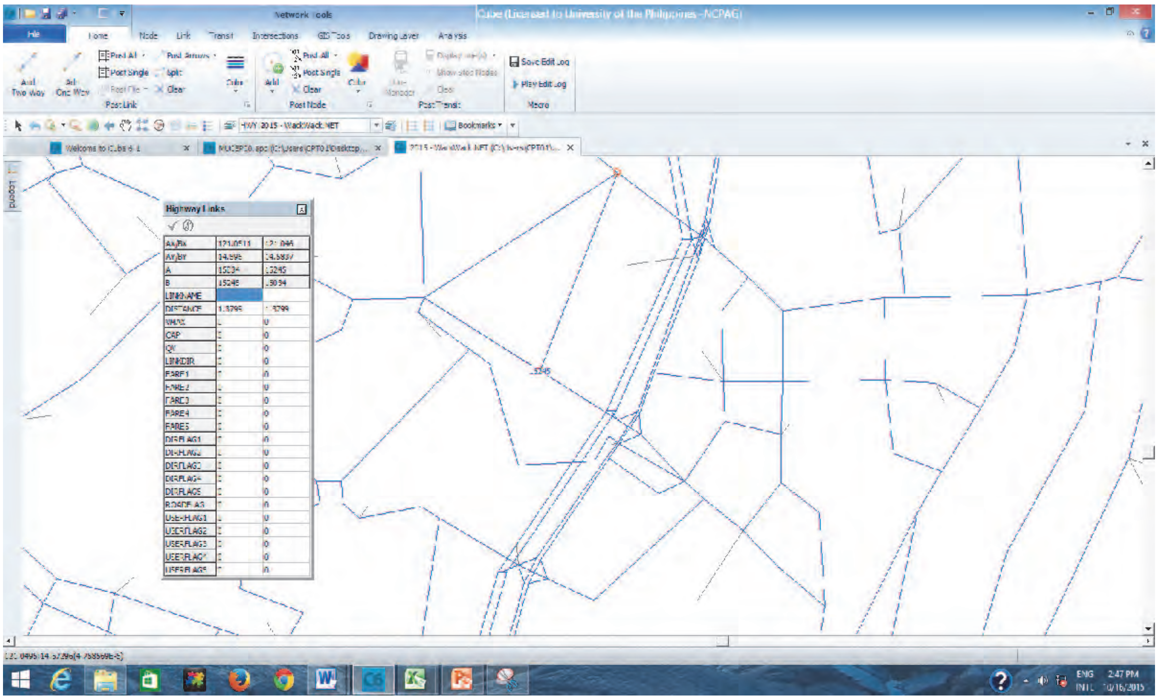
4. Add new link
    - Click Add Two-Way link in the desired network
    - Click Yes
    - Click OK



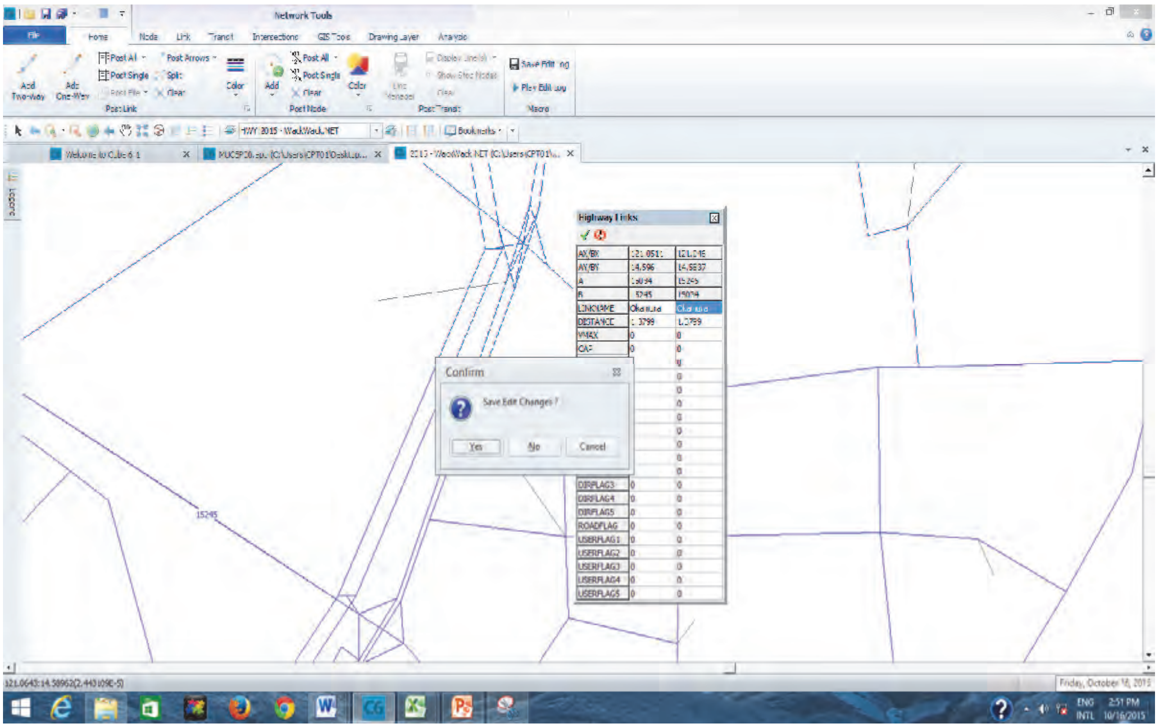
5. Add two way in the intersection



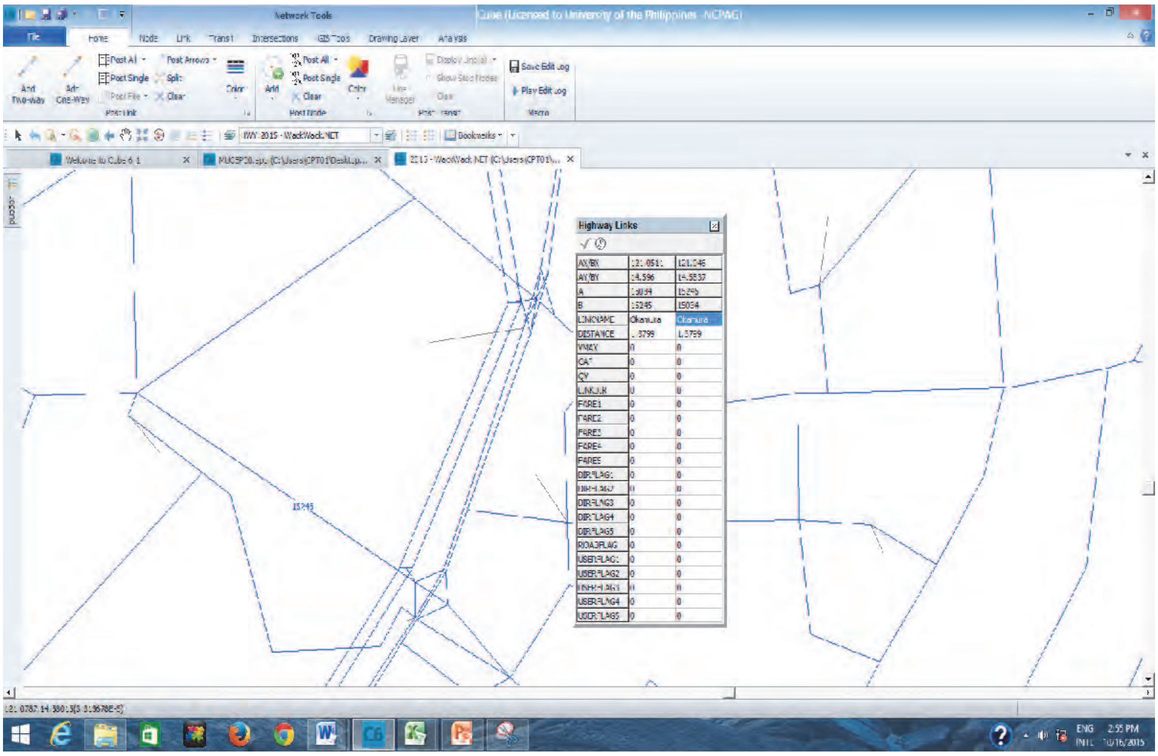
6. Check the Link Information – take note of the information – fill in the details and then save



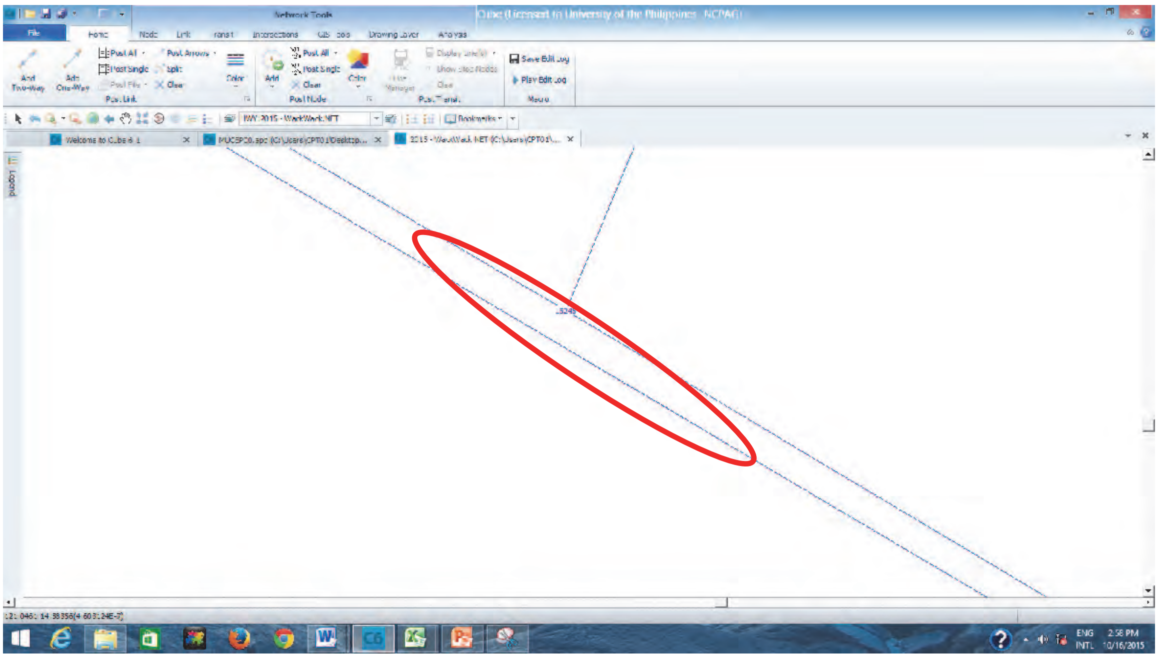
- Click the Arrow to check the Highway Links detail of the added link
- Fill in the name of the link in LINKNAME cell
- Save



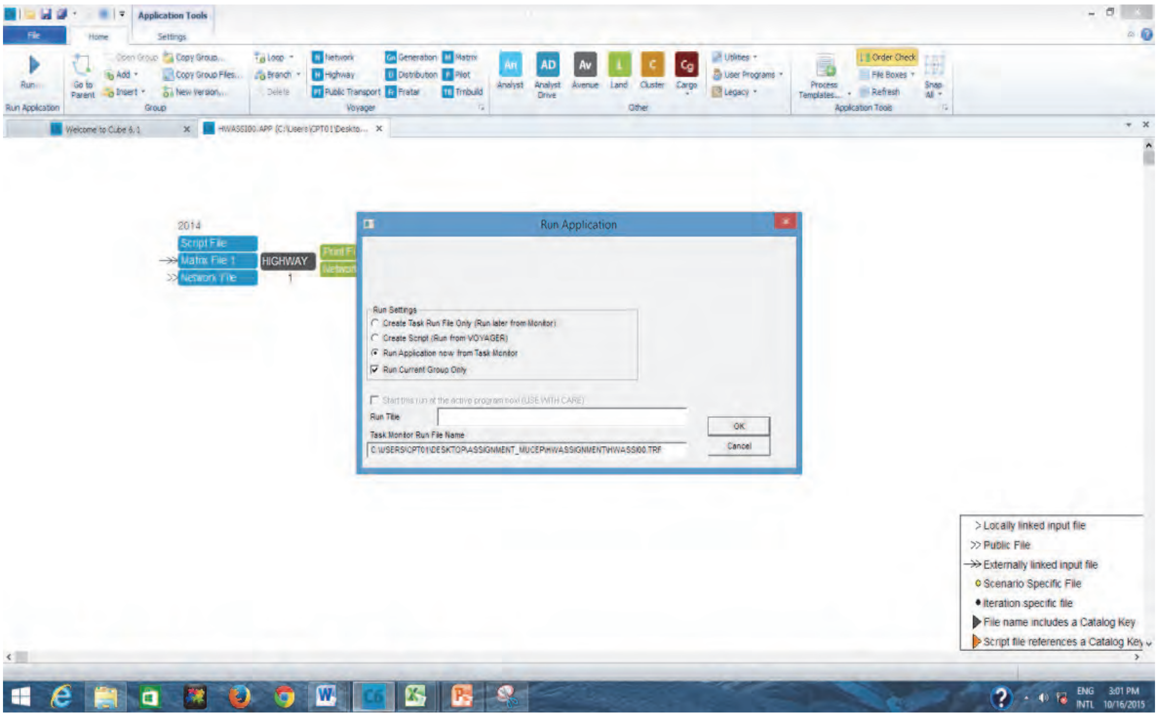
7. Check the link info of the new link
    - Fill in the details (See Table 5.6 of the Manual on Travel Demand Forecasting)



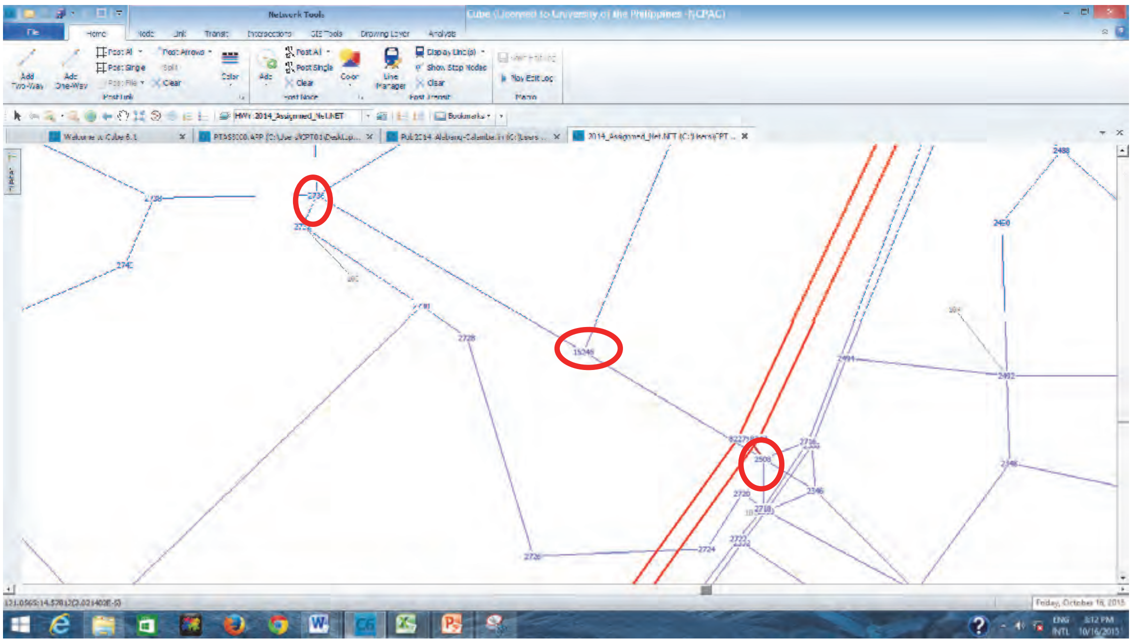
8. Follow the same process for the other two links
9. Delete the old link



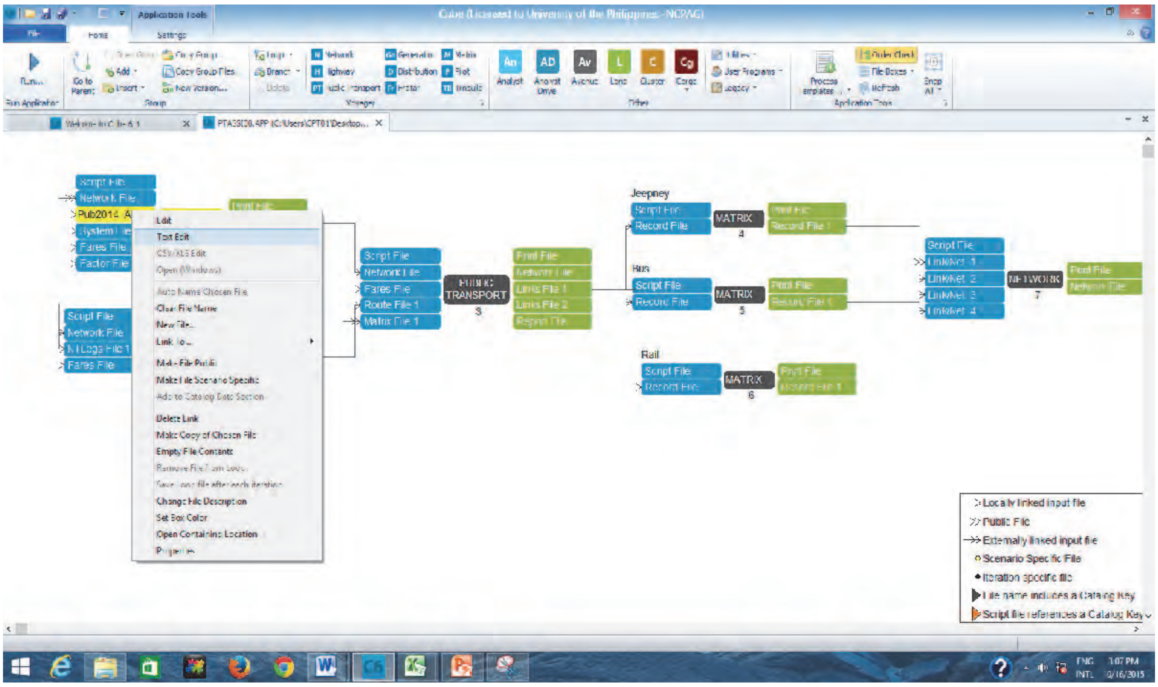
10. Double Click Highway Assignment
   - Click Run - Run Current Group Only



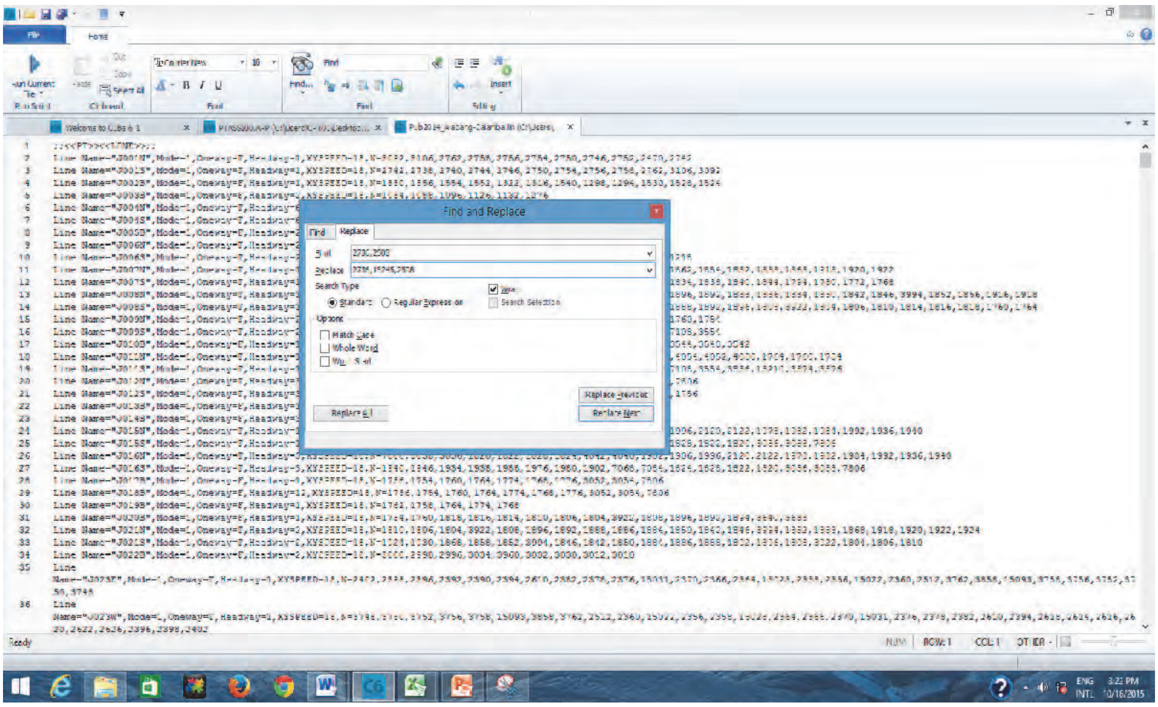
11. Go to the Parent Model
   - Double click PT Assignment
   - Open the line file
   - Click on the transit route information
   - Post Node
   - Click OK
   - Take Note of the Node Numbers of the divided link



12. Go back to Parent Model then Right Click Line File
    - Choose Text Edit



13. Click Control F
    - Click Replace and write the node numbers of the old link
    - Type the node numbers of the new link in Replace
    - Click replace all



14. Do the same process for the opposite direction
15. Save
    - Close
    - Run