

Establishing of the City Logistic Concept in Improving the Freight Distribution in Metro Manila

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Abstract: The transportation of goods constitutes one of the main activities that influences economy and society, as it assures a vital link between suppliers and customers. This paper discusses the establishment of city logistic concept in improving the freight distribution in Metro Manila. The paper focuses mainly on transportation considering both land and water. In this study you will see how the establishment of City Logistic Center helps logistic companies in the distribution of freight in Metro Manila through the aid of the Pasig River. This project includes the transportation problems we face in Metro Manila and the remedies to said problems. Another factor that we are concerned of is the environmental effects of too much land base use of vehicle. The paper also discusses the benefits of establishing city logistics and how will freight distribution affect the traffic flows and volumes in a highly urbanized city.

Keywords: Logistic Center, Water Transportation, Pasig River, Freight distribution

1. INTRODUCTION

1.1. Background

Products are conventionally mass-produced and undergo the typical process of distribution which is known as the Supply Chain. With logistics, this chain is able to be facilitated efficiently. This aims the prevention of delay in the distribution of products, the reduction of the possible cost for the transportation of goods, and lessens the overall undesirable environmental impacts. With this, the industries are offered to be more competent in terms of time, quality and labor.

Transportation of goods has been a vital aspect in the economic growth of the Philippines. Consequently, in a developing country such as the Philippines, private companies, and investors has to explore all the possibilities towards a more convenient, economical and efficient way of delivering the freight and goods.

1.2. Statement of the Problem

Currently, the main transportation used by companies in the Philippines is by land. However in an urban setting like Metro Manila, the traffic congestion, level of mobility and pollution is unhealthy to both business operations and the people. Not to mention, the negative environmental impacts, the crash fatalities and injuries, and the shortage of labor. Hence, a

stable transportation system has to be established and developed. Bounded by waters, water transportation has to be maximized.

1.3. Objectives of the Study

The main objective of the study is to determine the applicability of city logistic concept in improving the freight distribution in Metro Manila. The specific objectives are the following: to identify the components of city logistics, to determine the relationship of city logistics and a freight distribution, and to determine the benefits of applying city logistics in urban setting.

1.4. Significance of the Study

This study can be of great use by the logistics companies to improve their business operations and for the betterment of the quality of the companies' services which further leads to a more cohesive process regarding the delivery of freight and goods specifically in Metro Manila. Moreover, the proposed water transportation for the city logistics will empower the utilization of the Pasig River as an advantage and will likewise support its ecological growth.

1.5. Scope of the Study

This paper will discuss the factors considered in city logistics (CL), effects brought upon by CL and its current condition, the policies implemented regarding CL and freight distribution, the comparison of the monetary equivalent of land and water transportation including manpower costs, vehicular outlays and/or distribution rentals, additional expenditures (e.g. road fees and taxes) and the present processes used in the freight distribution and city logistics present in Metro Manila, the existing state of Pasig River and the perceived benefits of CL by means of water transportation.

2. REVIEW OF RELATED LITERATURE

City logistics has taken a great impact to improve the condition of mobility of goods and the credibility of a rapidly growing community to manifest their control regarding the management of congestion considering time, location and the limitation of vehicles. All of these are expected to be at most efficient implementation.

For He and Cheng, they mentioned city logistics as a complex system which not only refers to many stakeholders, such as governments, carriers, shippers, citizens, etc. but also has many influence factors. Even so, some scholars have studied this complicated system.

On the external, various factors can be pointed out to be seemingly the main cause. But on a deeper thought considering the concept of city logistics and its correlation to transportation there are more complex factors. These are called influence factor as fore mention in the research made by He and Cheng. These are the following:

- 1) Taniguchi (2000) proposed five city logistics initiatives, including advanced information system, cooperative freight transport systems, public logistics terminals, load factor controls and underground freight transport systems, which are very effective to improve city logistics.
- 2) Considering the interest of urban communities, Munuzuri et al. (2005) classify urban freight solutions into four aspects: public infrastructure, land use management, access conditions and traffic management.

- 3) BESTUFS (2007) points out three primary classes of measures: goods vehicles access and loading approaches in urban areas (for example, efficient usage of infrastructure, guidance on measures for goods vehicle access and loading in urban areas, technology in urban freight), principal issues involved in last mile solutions (for example, home shopping via e-commerce) and principal issues associated with urban distribution centers.
- 4) Shao et al. (2009) proposed twelve primary criteria to evaluate the competitiveness of city logistics and identify the key factors influencing development of regional logistics through the method of hierarchy analysis thought and fuzzy decision-making principles. The proposed criteria are economic situation, the logistics volume, the logistics industry practitioners, the logistics facilities and equipment, the logistics industry cost, postal communications status, foreign investment, the standard of education, science and technology, trade status, information status, geographical situation and industrial policy environment.
- 5) Kuse et al. (2010) underline the importance of logistics infrastructure in an effective city logistics system, which contains facility, technology and institutional infrastructures. Facility infrastructure includes physical aspects (for example, transport route networks and logistics facilities) and software aspects (for example, traffic management and control). Technology infrastructure relates to human resources, information infrastructure and industrial resources. Institutional infrastructure refers to social rules together with social consensus that support them.
- 6) Considering urban goods movements and its actors, Russo and Comi (2010) classify the main city logistics measures into four categories. The first species is measures related to material infrastructure, such as transportation sub-network used only by freight vehicles or urban distribution centers. The second species is measures related to immaterial infrastructure, such as intelligent transportation system (ITS). The third species is measures related to equipment, including new standards for loading units and environmental-friendly vehicles. The last species is measure related to governance, such as traffic regulations.
- 7) Tamagawa et al. (2010) compare the influence of two measures (road pricing, road pricing and changes of the motorway toll) on stakeholders associated with urban freight transport.

Through the preceding analysis, combined with previous studies, we can summarize development of city logistics have the following factors: (Pu, Yang and Fengwei).

- 1) *City logistics development capacity*. City logistics development capacity reflects the existing development capacity of city logistics. It's based on competitive advantages and resources. It's the development results and status in the past and present logistics market. It also reflects the future development space can be expanded for city logistics in some extent. City logistics development capacity can be reflected from logistics infrastructure facilities, scale of logistics industry, the development level of logistics information and logistics standardization.
- 2) *City logistics development environment*. City logistics development environment is an external factor measuring development level of city logistics. It is the guarantee of present development and the foundation of development potential. The general environment of city is very important to the development of city logistics. For example, the economic level of service area of city logistics directly affects the scale of city logistics. Better environment is beneficial to produce more value for city logistics. It's the key factor of city logistics development. Therefore, city

logistics development environment can be described from economic environment, policy environment and human resource environment.

- 3) *The sustainability of city logistics.* The sustainability of city logistics is the factor which measures the sustainable development ability of city logistics. The development of logistics should fit for the environmental carrying capacity. Only to ensure the sustainability of ecology can make it possible for sustainable development of city logistics. And through logistics sustainable development, ecological sustainability can also be achieved. So when we are pursuing the development of city logistics, we must pay great attention to environmental protection, and economical use of nature resources. These two points are important indicators of the sustainability of city logistics.

Similarly to any complex system, City Logistics transportation systems require planning at the strategic, tactic, and operational levels. (Benjelloun and Crainic). But there are challenges that are needed to be discussed in order to come up with the most appropriate means by putting the intelligence into a plan and be the guide for the logistics related concerns.

Through some certain comparisons, another study intensifies the need of city logistics with some variation on the key points for CL. The following are concepts layout by Sterle:

- 1) Rationalization of the freight flows in the urban areas and realization/strengthen of the infrastructures;
- 2) Usage and installation of telematics technologies and ITS systems for the Info mobility;
- 3) Access limitation measures;
- 4) Road pricing measures;
- 5) Usage of City Distribution Centers.

Urban freight flows regulation: The main measures used for the control and regulation of the traffic flows can be classified as follows:

- 1) definition of speed limit, rights of way, one way streets;
- 2) definition of limited traffic zones and pedestrian areas;
- 3) forbid the circulation of pollutant vehicles and motivate the usage of environmental friendly vehicles;
- 4) penalize the private transportation;
- 5) definition of time windows for the access in the urban areas and for loading/unloading operations;
- 6) usage of preferential lanes or of predefined paths for the delivery and the pick-up of goods;
- 7) limitation on the deliveries in several time slots;
- 8) limitation on the weight and size of the vehicles which perform the deliveries;
- 9) authorization for the entrance in the city center just to the best practice operators;
- 10) provide incentives for the renewal of the fleet vehicles

3. METHODOLOGY

3.1. Conceptual Framework

The conceptual framework shown in Figure 1 was constructed to create a coherent graphical idea of the study and its objectives. This conveys the fundamentals of understanding what will

be employed in outlining substantial information and ideas that will impart in identifying specific problems and describing the parameters concerning the study.

3.2. Analytical Framework

The analytical framework shown in Figure 2 was constructed to outline the procedure in the research of the study.

From the statement of the problem and setting of the objectives, readings will be done in order to review the related literatures on this topic. Together with the methodologies, there will be data collection (surveying industries and freight distribution) which will be used as the primary data to be analyzed in both statistical and descriptive method. Based from the analysis, conclusions will be presented and particular recommendations will be made.

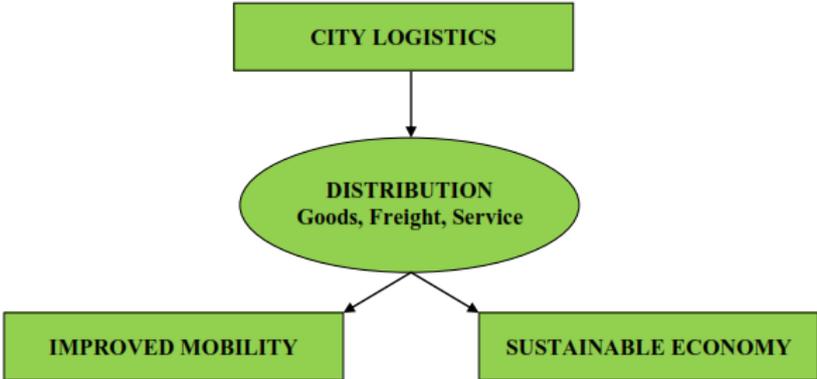


Figure 1. Conceptual Framework

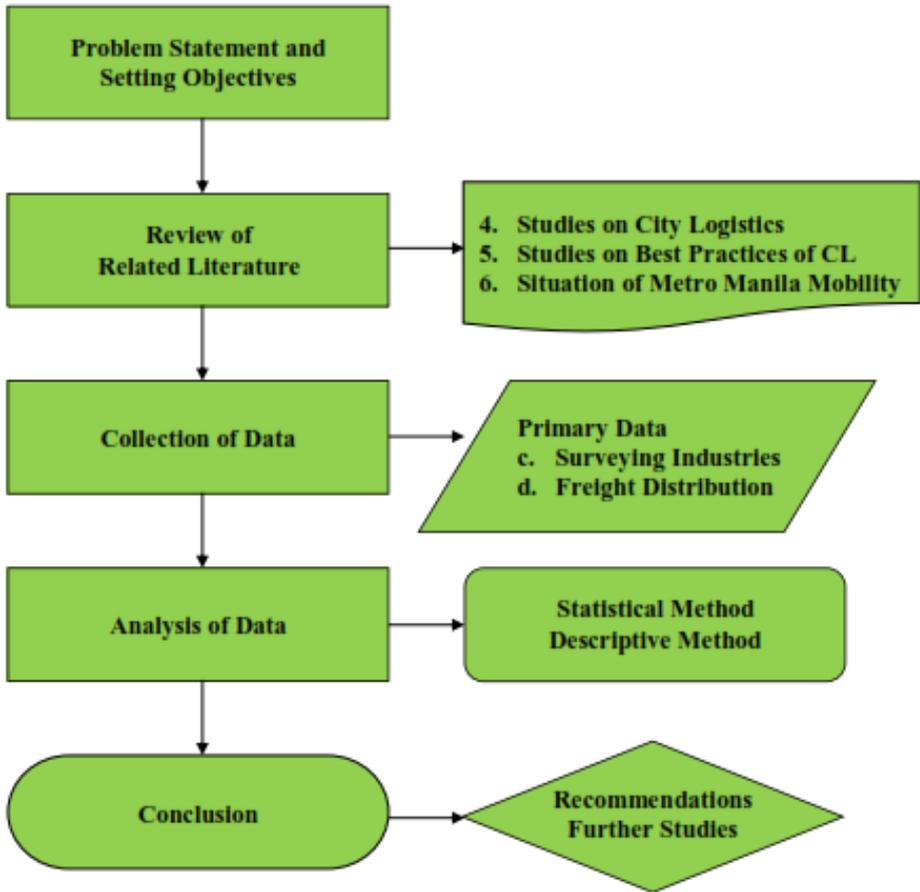


Figure 2. Analytical Framework

4. RESULTS AND DISCUSSION

4.1. Factors Considered in Establishing City Logistics

There is still no recognized definition for what City Logistics is all about. Different person has different explanation. Like for example, Scholar Taniguchi thinks city logistics is, in the market economy, taking into account of city traffic environment, traffic jam and energy consumption, the process which achieved by the private sector to make the logistics and transport activities holistic optimization. Cui Jie-he, a scholar of China, believes that city logistics is, in a certain city administrative planning conditions, a regional logistics for meeting the demand of city economic development, and the characters of city development. Cheng Shi-dong holds city logistics is physical flow of goods in the city; gather scatter goods between city and external region; the waste clean-up activities.

However, the complexity of the city logistics system may be simplified into the four factors (see Figure 3) to which it revolves. These factors are the shippers, the consumers, the transport service providers and the government. Basically, one element is interdependent with the other three and vice versa which is mainly the reason as to why it is effective.

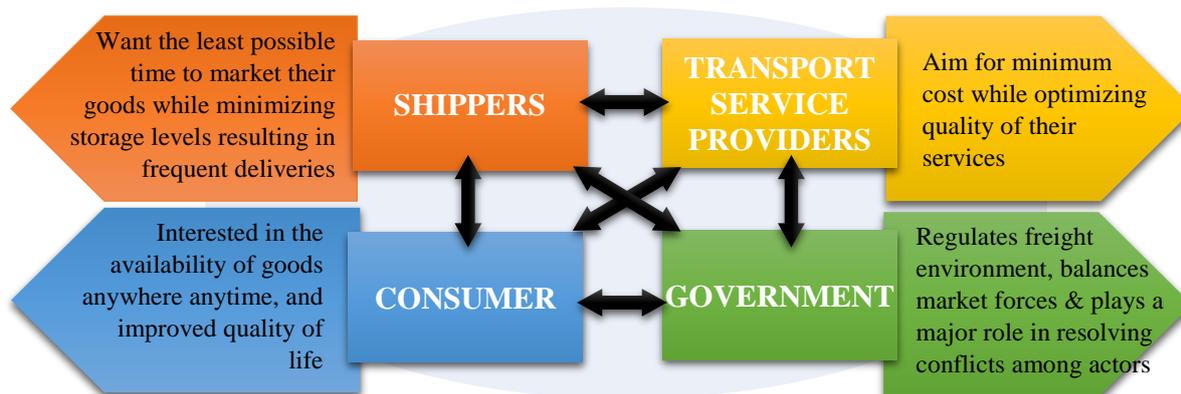


Figure 3. Factors that Contribute to the City Logistics System
 (Reference: Philippine Intermodal Logistics System and Policies by H. Lidasan and J. Castro)

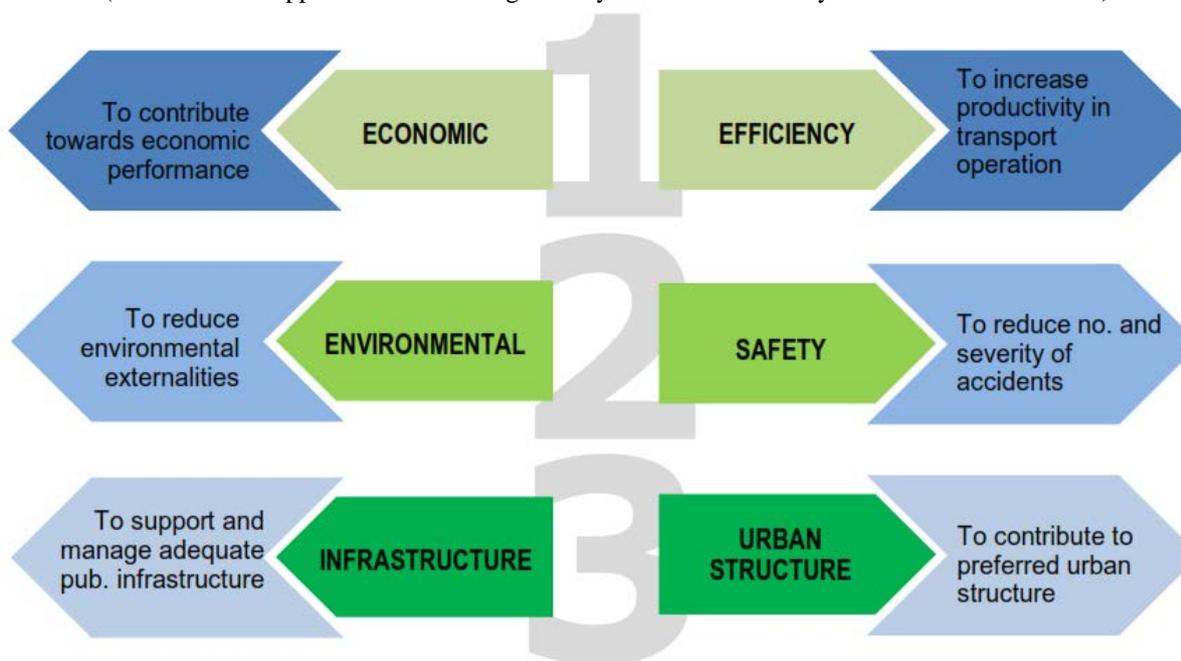


Figure 4. Logistic Objectives
 (Reference: Philippine Intermodal Logistics System and Policies by H. Lidasan and J. Castro)

Table 1. Logistics Policies by the Government

	INFRASTRUCTURE PROVISION		REGULATIONS		ECONOMIC MEASURES	
	Physical/ Transport	Information	Regulations	Standardization	Pricing	Subsidies
Land use		Digital map, GPS	Zoning for logistics activities		Property tax	
Networks	Ring roads, freight networks	ETC, Road traffic info system	Truck route control, vehicle and time restriction		Road pricing	
Terminals	Distribution centers	Berth guidance system		Standards for intermodal terminals		Subsidies for cooperative facilities
Parking	On-street	Parking	Compulsory		Parking	Subsidies

	parking spaces	guidance info system	parking spaces, parking time		charge differentiation	for off-street parking spaces
Vehicles/ Containers	Electric vehicles, Low emission vehicles	Fleet mgmt system, vehicle and cargo matching	Emission control, load factor control	Standardized containers, electronic tags	Vehicle tax, fuel tax, environmental tax	Subsidies for low emission vehicles
Cargos		Cargo tracking, order entry systems				Subsidies for cooperative delivery

4.2. Problems Encountered in the Current Logistic System

1) *Truck Ban*

Metro Manila Development Authority (MMDA) Chairman Francis Tolentino said the Metro Manila mayors have agreed to ask Manila Mayor Joseph Estrada not to apprehend trucks from 3 p.m. to 4 or 5 p.m. for the next two weeks, or a window of two more hours in addition to the 10 a.m. to 3 p.m. lifting of the truck ban.

However, major trucker associations objected to the proposal and insisted on the removal of the truck ban. They said Manila should assign a dedicated truck lane inside the city.

2) *Taxes and Tolls*

In using land transportation, a big part of the freight distribution expenses go to taxes and tolls. The usual land-based vehicles for the transportation of goods used are designated as CLASS 3 which are trucks with three or more axles and is seven feet or more in height.

The expressways used are NLEX, SCTEX, SLEX and STAR. Freight are not only transported for about a trip per day which suggests a higher accumulated expense not to mention the number of expressways and payment of toll fees done for a single trip only. The following tables show the range of toll fees varying from north.

Table 2. NLEX Toll Fees (as of 2012)

CLASS 3 (Trucks with 3 or more axles and 7 feet above height)													
ENTRY / EXIT	Balintawak	Mindanao Avenue	Valenzuela	Meycauayan	Marilao	Bocaue	Sta. Rita	Pulilan	San Simon	San Fernando	Mexico	Angeles	Dau
Mindanao Avenue	136												
Valenzuela	136	136											
Meycauayan	136	136	136										
Marilao	136	136	136	136									
Bocaue	166	166	166	166	166								
Balagtas	211	211	211	211	211	44							
Tabang	241	241	241	241	241	75							
Sta. Rita	253	253	253	253	253	86							

Pulilan	306	306	306	306	306	141	54						
San Simon	399	399	399	399	399	234	147	92					
San Fernando	471	471	471	471	471	304	218	163	70				
Mexico	527	527	527	527	527	360	274	220	127	56			
Angeles	594	594	594	594	594	427	341	287	194	123	67		
Dau	652	652	652	652	652	487	400	346	253	182	125	58	
Sta. Ines	652	652	652	652	652	487	400	346	253	182	125	58	42

Table 3. SCTEX Toll Fees (as of 2011)

CLASS 3 (Trucks with 3 or more axles and 7 feet above height)										
ENTRY / EXIT	Tipo	Dinalupihan	Floridablanca	Porac	Clark South	Mabalacat	Clark North	Dolores	Concepcion	San Miguel
Tipo										
Dinalupihan	107									
Floridablanca	274	166								
Porac	396	288	122							
Clark South	488	380	213	91						
Mabalacat	502	395	228	106	14					
Clark North	539	432	265	143	51	36				
Dolores	553	446	278	156	64	50	13			
Concepcion	646	538	371	249	157	143	106	92		
San Miguel	771	664	497	375	283	268	231	218	125	
Tarlac	815	707	540	418	327	312	275	262	169	43

3) *Traffic Congestion*

Delivering goods on time is not as easy as it sounds like. There are lot of things to consider before delivering large number of goods, especially here in the Philippines. We are aware that Metro Manila is one of the most congested cities in the country, and no logistic company dream of any delays in terms of deliveries.

4) *Travel Time*

With narrow roads and large vehicle volume, it is impossible not to have a slow moving traffic. It is clearly defined above that logistics is the management of the flow of goods from the origin to destination. That includes the time travelled between them.

5) *Fuel Consumption*

Huge vehicles needs more gasoline compare to smaller vehicles. And every now and then, gasoline prices goes up without notice. Fuel consumption is directly proportional with price and considered as an additional cost to the companies' expense.

Table 6. Weight and Fuel Consumption of Land-Based Vehicles

Class	Applications	Gross Wt. Range (lbs.)	Empty Wt. Range (lbs.,)	Typical Payload Capacity Max.(lbs.)	Typical Fuel Economy Range in 2007(mpg)	Typical Fuel Consumed (gal/1000 ton-miles)
2b	Large Pick-ups, Utility Van, Multi-Purpose,	8,501 - 10,000	5,000-6,300	3,700	10-15	38.5

	Mini-Bus, Step Van					
3	Utility Van, Multi-Purpose, Mini-Bus, Step Van	10,001 - 14,000	7,650-8,750	5,250	8-13	33.3
4	City Delivery, Parcel Delivery, Large Walk-In, Bucket, Landscaping	14,001-16,000	7,650-8,750	7,250	7-12	23.8
5	City Delivery, Parcel Delivery, Large Walk-In, Bucket, Landscaping	16,001-19,500	9,500-10,800	8,700	6-12	25.6
6	City Delivery, School Bus, Large Walk-In, Bucket	19,501-26,000	11,500-14,500	11,500	5-12	20.4
7	City Bus, Furniture, Refrigerated, Refuse, Fuel Tanker, Dump, Tow, Concrete, Fire Engine, Tractor-Trailer	26,001-33,000	11,500-14,500	18,500	4-8	18.2

6) *Country's Competitiveness*

The competitiveness of the country can be clearly affected by the current freight distribution. In most recent updates and news reports, numerous problems of traffic congestion have been identified to various locations around Metro Manila. There were also road constructions and road re-blockings. Not to mention the different truck ban policies or implementations concerning trucks which are occupying a large volume of vehicles on land. These does not only affect road traffic congestion but as well block major ports that slows the trade and could hinder the country's overall score.

7) *Environmental Aspects.*

Another important negative aspect of transportation that is needed to be discussed is its environmental costs. In 1998, the transportation of goods was responsible for 28% of gas emissions. Between 2003 and 2010 this share is likely to increase to about 50%. Environmental costs can be represented in function of the quantities of polluting substances that each vehicle produces, so estimating the different traffic flows and compositions, these costs can be estimated.

4.3. Existing State of Pasig River

4.3.1. Profile

The Pasig River has a length of 25 kilometers linking the Manila Bay and the Laguna de Bay. However, it also bisect Manila from its contiguous urban area into northern and southern halves. Marikina River and San Juan River are its major streams.

The river, physically flow conditional upon the water level variance between Manila Bay and Laguna de Bay. During dry season, the water level in Laguna de Bay is low with the river's flow trend reliant on the tides. While during wet season, the water from Laguna de Bay is reversed towards Manila Bay because the lake has high water level.

From the lake, the river tracks between Taguig City, and Taytay, Rizal, before inflowing Pasig City. This portion of the Pasig River, to the convergence with the Marikina River branch, is known as the Napindan River or Napindan Channel. From there, the river creates the joint border between Makati City to the south and Pasig City, followed by Mandaluyong City to the north. The river then abruptly turns northeast, where it has become the boundary between

Mandaluyong and Manila before turning again westward, joining its other major stream, the San Juan River, and then following a supple path through the center of Manila before discharging into the bay.

4.3.2. Bridges

A total of 17 bridges cross the river. The first bridge from the source at the Laguna de Bay is the Napindan Bridge, trailed by the Arsenio Jimenez Bridge. Crossing the Napindan Channel in Pasig is the Bambang Bridge. Downstream is the C-5 Road Bridge linking the cities of Makati and Pasig. The Guadalupe Bridge between Makati and Mandaluyong carries Epifanio de los Santos Avenue, the major highway of Metro Manila, (together with MRT-3 from Guadalupe Station to Boni Station). The Rockwell Bridge and Makati-Mandaluyong Boundary Bridge are another bridges that connect the two cities downstream and forms the end of Makati Avenue.

The easternmost bridge in Manila is the Lambingan Bridge in the district of Sta. Ana, followed by the Padre Zamora (Pandacan) Bridge between Pandacan and Santa Mesa, which also carries the southern line of the Philippine National Railways (PNR). The Mabini Bridge (formerly Nagtahan Bridge) provides a crossing for Nagtahan Avenue, part of the C-2 Road. Ayala Bridge carries Ayala Boulevard and connects Isla de Convalecencia to both banks. Further downstream are the Quezon Bridge from Quiapo to Ermita, the LRT-1 bridge from Central Terminal Station to Carriedo Station, MacArthur Bridge from Sta. Cruz to Ermita, and the Jones Bridge from Binondo to Ermita. The last bridge near the mouth of Pasig River is the Roxas Bridge (formerly called Del Pan Bridge) from Tondo to Port Area.

4.4. Perceived Benefits of City Logistics (considering Water Transportation)

The city logistics that considers water transportation will have the supply distribution using ferries and other water transportation vehicles. The group eyes the use of the Pasig River as a strategic key for the establishment of the city logistic concept in the Philippines.

The following are the perceived benefits for the city logistic concept:

- 1) Offers new job opportunities.
- 2) Promotes water transportation.
Since Philippines is an archipelagic country, waters are intended to be maximized while still keeping it environmentally safe.
- 3) Water aeration in the Pasig River.
Pasig River is known to be one of the most polluted waters in Metro Manila. Everyone thinks that it's toxic and can never be brought to life. With the frequent use of water transportation on Pasig River, water aeration will occur and will aid in river improvement and restore water quality as well.
- 4) Larger amount of goods to be delivered.
Given smaller time travels, there is more likely an increase in the trips of the deliveries of the freight. The use of vessels and ships will also allow larger amount of goods to be conveyed. These will then elevate the number of targeted work accomplishments for the day improving the companies' performance and the customers' satisfaction rate.
- 5) Minimized fees.
A research by H. Lidasan and J. Castro illustrated a comparison between RoRo and Containerized Transport of the Transport of Tomatoes from Cagayan de Oro to Manila, in PhP/Kilo. Details are shown in Table 7.

In terms of expenses, the table below shows an example of the comparison of land based deliveries (Container) and water transport deliveries (RORO) computed in pesos. With water transportation as the means of freight distribution, we can say that cost is significantly lower than land based distribution. This case is similar with the use of Pasig River as the means of distribution. Comparing a city delivery truck with a maximum typical payload capacity of 8700 lbs (approximately 4000 kg) and the current Pasig River. Ferry that has a capacity of 150 persons (roughly 9000 kg), one trip for a delivery via truck can be doubled using a vessel. We can also minimize the number of spoilage per delivery because it is a lot faster than land-based deliveries.

Table 7. Transport of Tomatoes from Cagayan de Oro to Manila

TRANSPORT – LOGISTICS ACTIVITIES	CONTAINER	RORO	SAVINGS
Trucking from far to consolidator in CDO	0.40	0.40	
Trucking from consolidator to CDO Pier	0.05	0.05	
Freight	1.75	1.68	0.07
Handling (CDO & MNL)	0.10	0.00	0.10
Wharfage (CDO & MNL)	0.01	0.00	0.01
Trucking from MNL North Harbor to Navotas	0.50	0.50	
Terminal Fee	0.00	0.05	(0.05)
Losses (spoilage)	1.31	0.09	1.22
TOTAL TRANSPORT – LOGISTICS COST	4.12	2.77	1.35
% of Transport Logistics Cost to Retail Price (Manila = P25 / kilo)	16.5%	11%	

Table 8. Estimated Transport Cost of Tomatoes from Cagayan de Oro to Manila

TRANSPORT – LOGISTICS ACTIVITIES (in PhP)	CONTAINER	RORO	SAVINGS
Trucking from far to consolidator in CDO	10,000	10,000	
Trucking from consolidator to CDO Pier	1,250	1,250	
Freight	43,750	42,000	1,750
Handling (CDO & MNL)	2,500	0	2,500
Wharfage (CDO & MNL)	250	0	250
Trucking from MNL North Harbor to Navotas	10,000	10,000	
Terminal Fee	0	1,250	(1,250)
Losses (spoilage)	32,750	2,250	30,500
TOTAL TRANSPORT – LOGISTICS COST	103,000	69,250	33,750

- 6) Increase mobility in freight distribution.

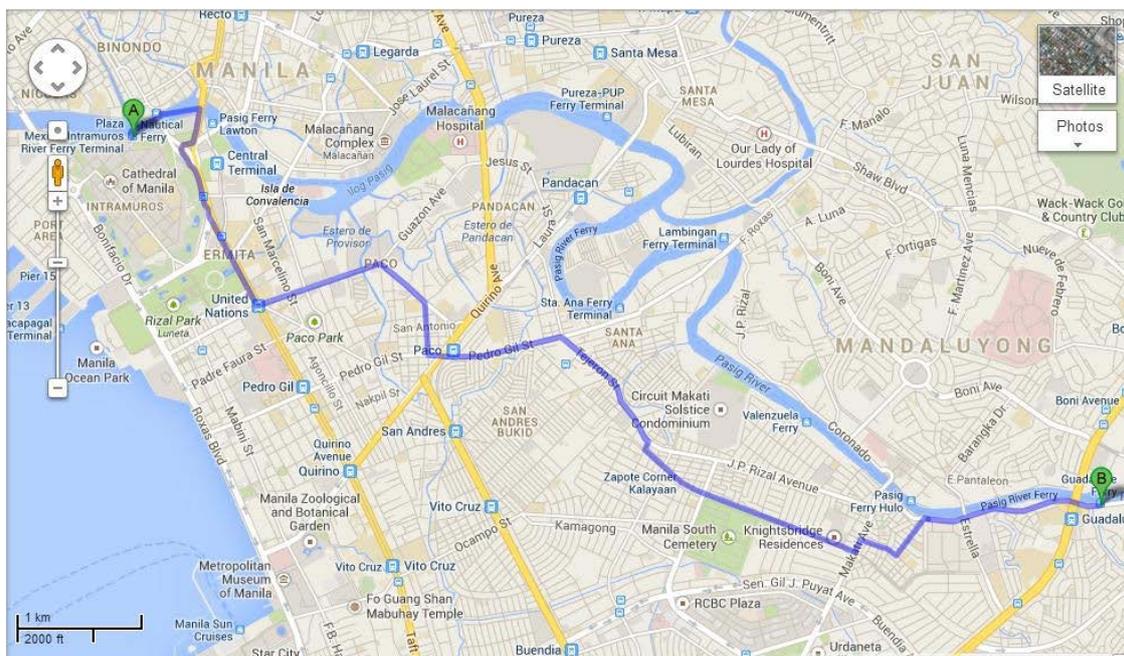


FIGURE 5. Shortest Land Route from Escolta to Guadalupe, Makati (10.9 kilometers via Kalayaan Avenue)

(Reference: Philippine Intermodal Logistics System and Policies by H. Lidasan and J. Castro)

Estimated Travel Time from ESCOLTA to GUADALUPE (via ferry): 45 minutes

Estimated Travel Time from ESCOLTA to GUADALUPE (via land vehicle): 90 minutes

7) Less gas emission.

Table 9. Greenhouse Gas Emissions from Different Modes of Transportation

MODE	TOTAL DIRECT GREENHOUSE GAS EMISSIONS (kg CO ₂ equivalent per ton km)
Road	
Vans	0.5907
Heavy Goods Vehicle	0.1231
Air	
Domestic Short Haul	1.73499
Rail	
Train	0.03159
Water	
Bulk Carrier	0.02943
General Cargo	0.013150
Deep Sa Container Ship	0.01536
Short Sea Container Ship	0.029703
Vehicle Transporter	0.03835
Ro-ro Ferry	0.05136

8) Less encountered problems like traffic congestions.

Not only will it be beneficial for the freight distribution, the traffic flow in land will also largely be improved. Given that numerous trucks are used to deliver goods, the volume of land-based vehicles will be reduced if water transportation will be considered.

4.5. Logistics Center (with the help of Pasig River)

Considered as the “The Tiger City”, Mandaluyong is one of the country’s highly urbanized cities where numerous offices, financial and entertainment hubs, shopping malls and hotels are located.

Establishing the city logistic concept through a Logistics Center, will practically improve the companies and businesses handling of freight and distribution through a more organized scheme of consolidation, packaging, and storage of products. It will be situated at the major transport routes and terminals which will serve as the epicenter from where products will be assembled and shipped in sets to maximize the quality of service in a relatively short period of time.

4.5.1. Profile of Barangay Buayang Bato

Buayang Bato is a barangay of the highly urbanized city of Mandaluyong, it has a total land area of 7.26 hectares and is geographically located exactly at 14°34' 12" North of the Equator, and 121° 3' 6" East of the Prime Meridian. The barangay lies beside the Pasig River and near to Boundary of Pasig City. Situated westside is Barangka Ilaya and on eastside is Highway Hills which are both barangays of Mandaluyong City. Barangay Buayang Bato is bisected by Pioneer St., bounded by Buayang Bato Creek on its left and Sheridan Street on its right.

4.5.2. Current condition

The land use pattern of Barangay Buayang Bato is currently a mix of institutional and residential areas. Based on the Foot Survey 2004, the barangay has 0.22% institutional and 0.22% residential coverage in Mandaluyong City. Figure 7 shows the land use in Barangay Buayang Bato.

MAJOR BUSINESS ESTABLISHMENTS

Barangay Buayang Bato as of to date was not yet idealized to be one of the prime location for industrial and commercial businesses but, it is accessible to plenty and these can be located at adjacent barangays. The businesses and its approximated distances are shown in Table 10.

ECONOMIC PATTERN

Generally the bounded territorial area of Mandaluyong, was a former forestry agrarian town with undulating landscape, cosmic plains, and marshlands. Comparing the eminence of municipalities in Metropolitan Manila, Mandaluyong was a retrograde. The town was inaccessible to Manila, the center of growth and progression of the country. These places were hindered by the Pasig River, which is the biggest and longest river passing the metro. Sufficient civil connectors were not established like roads, bridges and systematic water transportation. Barangay Buayang Bato, lies adjacent to the river and to the municipality of Pasig.

The construction and improvement of one of the major road, Epifanio Delos Santos Avenue (EDSA), gave birth to economic growth of Metro Manila. Mandaluyong was one of the blessed, the old agrarian town started to blend competitively with the urbanization. They also get an additional advantage with the buildup of Shaw Boulevard and the Sevilla Bridge as another connection from Manila.

As the time passed, Mandaluyong became a central location of major transport of Metropolitan Manila. The progression became aggressively as an ideal location for large business and commercial establishments with global standards. The area was maximized that led to increase of commercialization. This can be cited to prominent roads such Ortigas

Avenue, Martinez, San Francisco, Sgt. Bumatay, Barangka Drive and Pioneer Streets. In the year 1994, Mandaluyong was formally classified as a highly urbanized city which intensify their land use. By the year of 1997, the Medium Intensity Industrial Zone bounded by Shaw Boulevard, Mandaluyong-Pasig boundary, the Pasig River, and EDSA turned into Central Business District. This was the city’s response as another redevelopment project for the prime areas in the Metropolis.

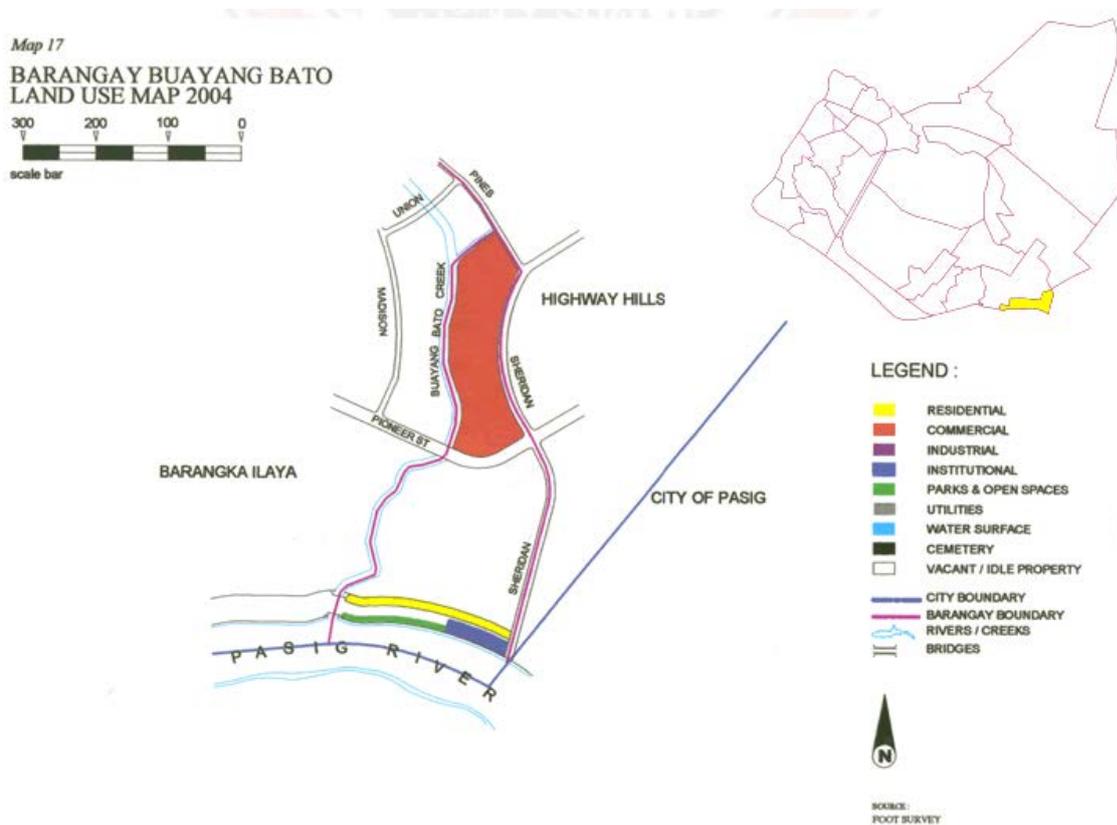


FIGURE 6. Land Use Map of Barangay Buayang Bato
 Table 10. Major Establishments and Distances

ESTABLISHMENT	DISTANCE
Metro Badminton	86 meters
Legend Hotel	143 meters
Globe Telecom Plaza	229 meters
Pioneer Highlands	229 meters
Asia Brewery	302 meters
EDSA Hotel	600 meters
Astoria Plaza Hotel	1,300 meters
Robinsons Placa Pioneer	400 meters
Guadalupe Commercial Complex	700 meters
EDSA Central	1,100 meters
La Luz Del Mar San Juan Batangas	2,100 meters
Army Museum Fort Bonifacio	4,100 meters
Philippine Air Force, PAF Museum	6,900 meters
Cembo Elementary School	600 meters
Pamantasan ng Makati	800 meters
University of Makati	800 meters
Makati Park and Garden	2,000 meters
Bel Air 3 Park	2,000 meters

PHYSICAL INFRASTRUCTURES AND FACILITIES

Barangay Buayang Bato, was considered to be one of the natural drainage for the whole city where the runoffs drain from the rolling slopes. Aside from this, the city is generous to develop network of Reinforced Concrete Pipes and covered line canals lining all cities and barangay roads. These arterials are connected to the main drainage facilities lining national roads. The installation and maintenance are covered by the Department of Public Works and Highways (DPWH), but it is still associated to the local level of Mandaluyong. The City Engineer's Office are also responsible for the implementation of all roads and drainage facilities.

Power services in the city are provided by the Manila Electric Co. (MERALCO). Generally, the existing status of electrification covers the entire city. This includes residential, commercial, industrial and street lighting facilities. But there are few households remain unserved, probably due to their economic status while they are situated in depressed areas. Sometimes, illegal connection were being done which bothers its aspect towards the environment. This kind of practice is really hazardous and causing accidental electrocution.

There are two source of water supply for the whole city, one is from the Angat Dam and the other is through the ground water deep wells. Most in the city is supplied by Manila Water Company Inc.

Currently, most of the households have their individual water connection from distribution system while others depend on dug wells. The water distributed from the main system was assured to be potable, but people still stay cautious and use this water for washing and housework purposes only. Drinking water is bought to distillery and refilling stations.

The Sanitation Division of the City Health Office conducts regular monitoring of water sources on various places such as schools and restaurants, as well as all water refilling stations operating within the city.

ZONING

It can be observed that the map shown in Figure 7 visibly describes zones for specific use, commercial, residential, institutional, parks and open spaces.

TRANSPORTATION

The urbanization of almost entire Mandaluyong brought the community an ideal benefit regarding the movement of goods, services and people. Due to its location, land transportation and water transportation can be best maximized.

The barangay is composed of various major and minor roads, Pioneer Street was their largest form of network. As for the typical, jeepneys are one of the most popular mode of public transportation for commuters. Aside from this, they do have buses, taxis, tricycles and pedicab. The community can be described as a busy community going along with the effect of establishments surrounding the area. The disadvantage of these are congestion, and for the small roadways it is then only use for one way. Private cars also add an impact to the flow.

Another thing that is beneficial to the barangay is the Guadalupe MRT-3 station, which can be accessed across using the Guadalupe Bridge. The station is located along EDSA.

Lastly, the Pasig River is adjacent to the barangay. The river is used by some cargo freights company already, and commuters who want a fast and direct travel from Pasig to Manila. The nearest is Guadalupe Ferry Station, which is facing opposite the barangay.

POPULATION AND SETTLEMENTS

According to Census 2000 the population of Baragay Buayang Bato is 1038, and on year 2010, it became 1340. The barangay has an average of size of four for household. It has a population density of 149.17 and a registered voters of 1220.

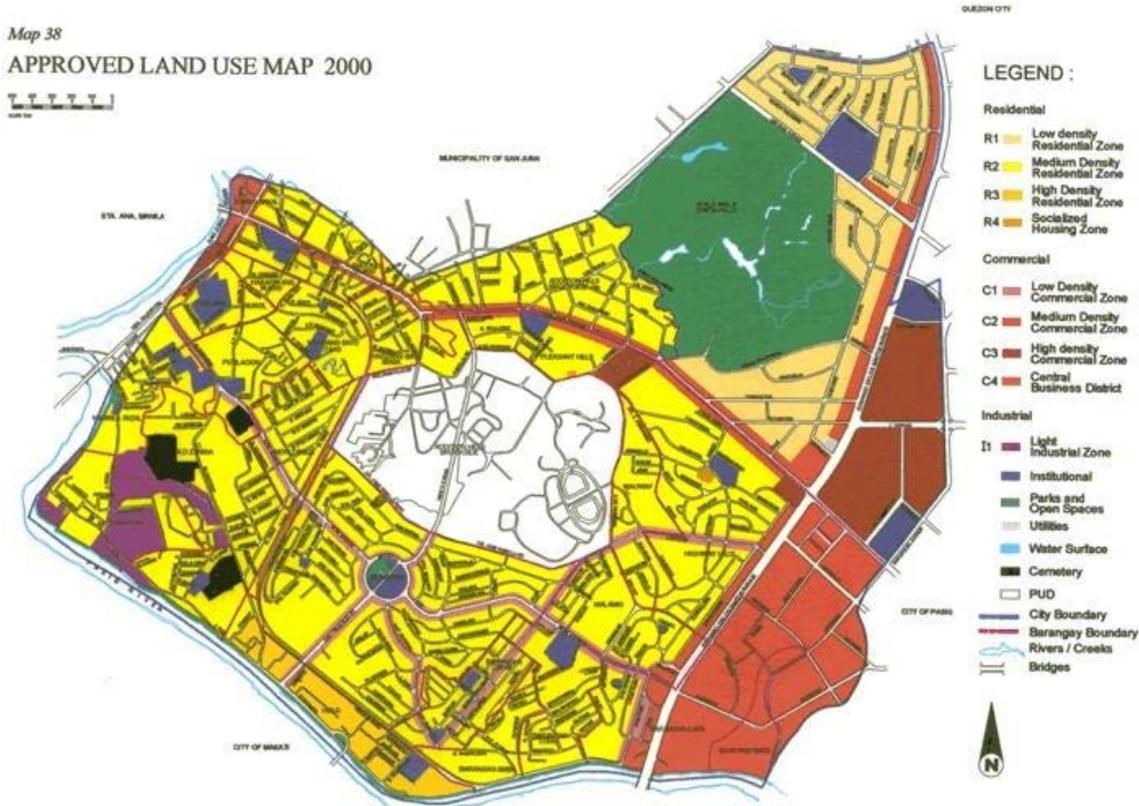


FIGURE 7. Approved Land Use Map 2000

4.6. Logistics and Companies Responses

A survey was conducted for the logistic companies to know the trend of deliveries and how much it cost them in in the process of their freight distribution. The results are as follows.

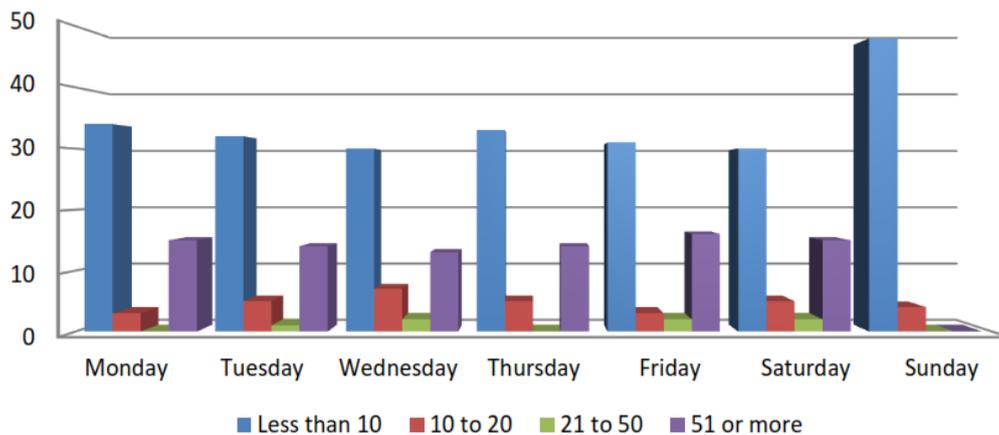


Figure 8. Number of Regular Deliveries

Based on the survey results, the graph shows that most of the companies has less than 10 regular deliveries only. Regular deliveries mean regular customers. This result doesn't prove that the total deliveries they have for a day is less than 10. But still some companies have more than 51 regular deliveries per day. This means that the use of land transportation as the means of freight distribution can still result to large volume of vehicle on highway, especially during Mondays to Saturdays.

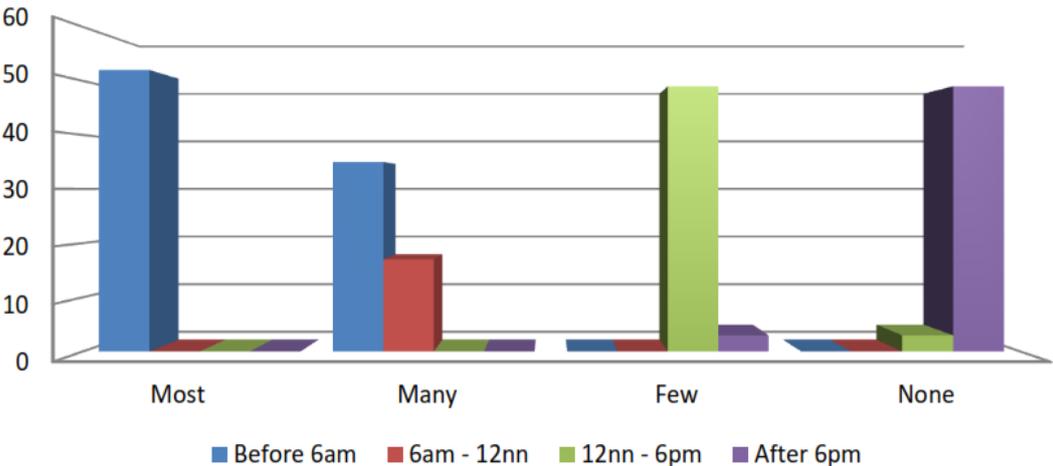


Figure 9. Time of Deliveries on Weekdays

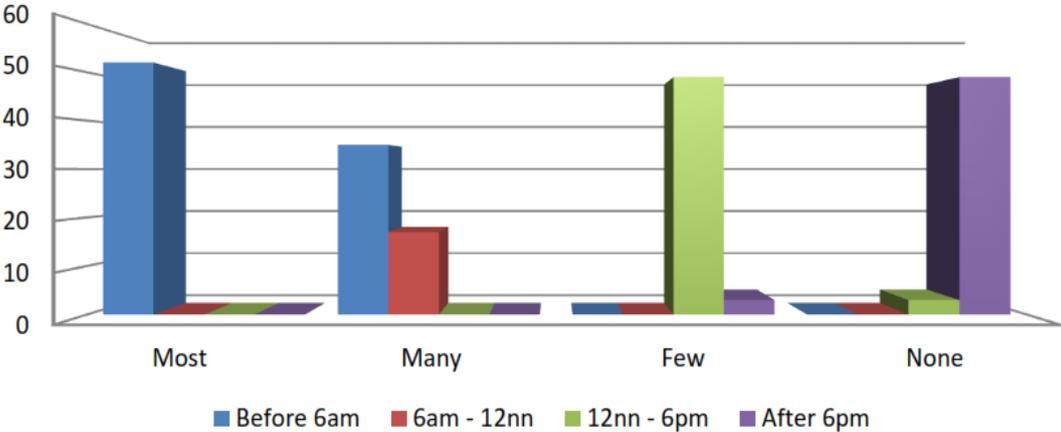


Figure 10. Time of Deliveries on Weekends

The companies has most deliveries before 6 am. Some of them send their deliveries between 6am to 12 noon. Few have their deliveries sent during the afternoon and most of the companies doesn't send their deliveries after 6 pm. This means that the volume of delivery trucks on highways before 6 am is large. This may be because of the truck ban implemented by the Local government with the help of MMDA.

Just like in any project. Delays are inevitable. Survey shows all companies experience delays in their deliveries. This is another proof that we can never trust everything that is land based. We can only lessen delays by adjusting the travel time to its extent.

Figure 11 shows the usual delivery delays from supplier to receiver due to traffic problems. There are many reasons why a supplier is late in delivering products or rendering services. Sometimes delay in deliveries is because one of their suppliers was late in delivering. It could be also be caused by production problems or an emergency where they need to work for another customer.

Figure 12 shows expenses they incur per day. Most of the companies spend P500 – P2000 for tolls, more than P5000 for fuel usage, P500 – P2000 for laborers and above P5000 for vehicle maintenance (monthly).

Figure 13 shows that most companies wish to improve their service through lessening their delays. Next is their expense, followed by availability, reliability and lastly, customer service.

As you can see from the graph, all companies agreed to use the Pasig River as their medium in freight distribution.

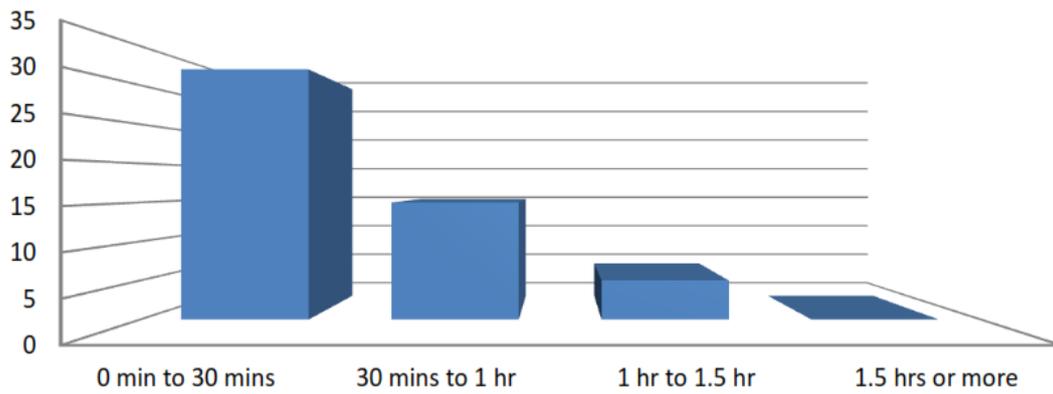


Figure 11. Usual Amount of Time Deliveries are Delayed

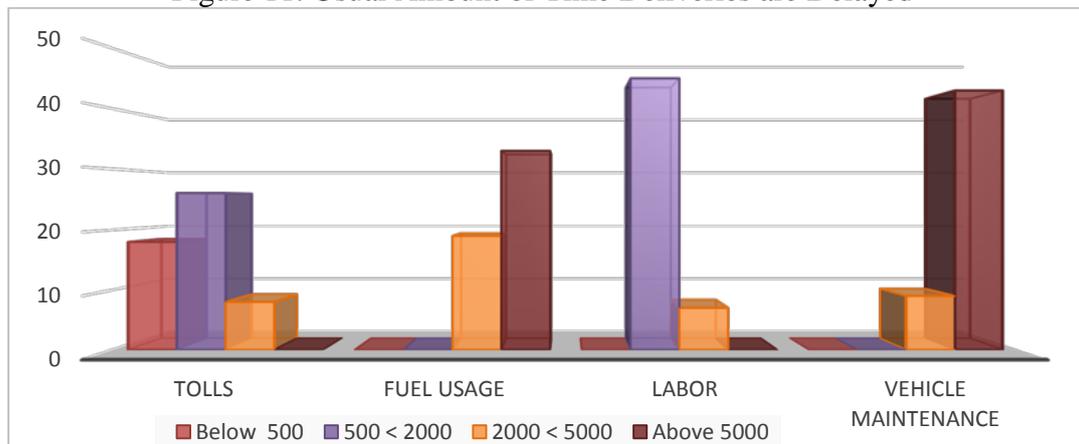


Figure 12 Expenses

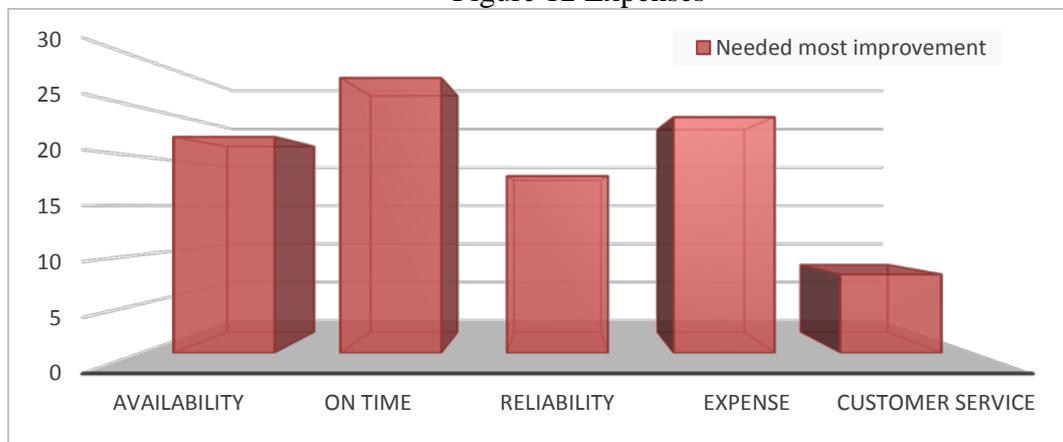


Figure 13. Aspects Which Need Most Improvement

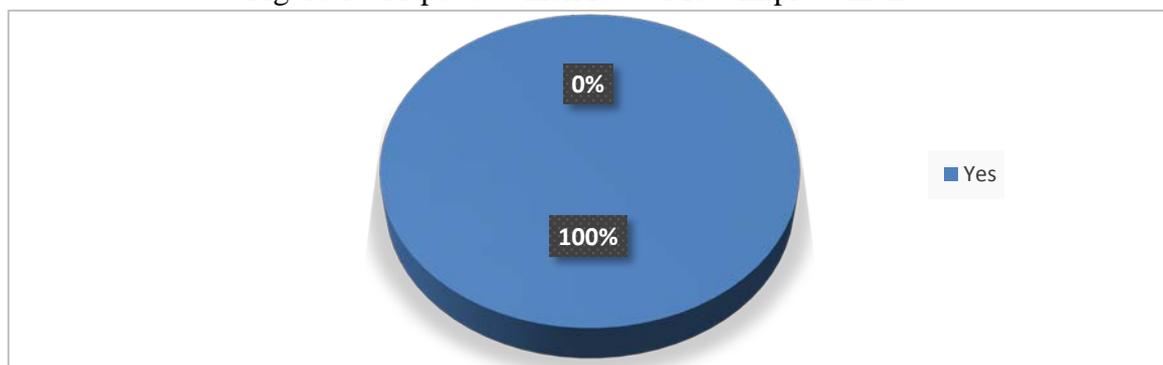


Figure 14. Agreement to Pasig River Utilization

5. CONCLUSION

Traditionally, freight transportation planning and decisions have been realized by the operating companies and usually not by the public authorities. In the last years, public authorities have begun to develop some ideas to manage and contain the levels of congestion, air pollution and noise. Some of the most common measures taken by the authorities in different countries are restrictive policies such as regulations on parking, street access, hours of operations, etc. City logistics is the process where the distribution of freight is optimized to the point where traffic congestion, environmental effects and any other urban problems may be lessened.

The establishment of the city logistics concept in Metro Manila with the use of the Pasig River as the main medium is found successful with the support of the conducted surveys and from other studies regarding city logistics. The researchers also found out that the comparison of land-based logistics systems and CL using the Pasig River has significant differences in several ways like expenses, travel time, gas emissions, traffic congestion and the country's competitiveness.

For the logistics center suggested, the location of Buayang Bato is suitable for the vehicles that will pick-up or delivered in the area. In terms of population, Buayang Bato has 1,340 residents as of census 2010. Also, since no major establishments are near the area, there will be no interruptions with regards to transactions and the work of the people. In addition to this, no other logistics center is located within or near Buayang Bato so no other operations will be interrupted and delayed. Thus, as for the logistics center to be constructed, operations will run smoothly.

The researchers were also able to assess the different views of the respondents regarding the use of a water-based transportation system over the land-based system. The applicability of a Logistics Center has proven effective in a theoretical assessment as shown in conducted surveys. Though some respondents still prefer the use of land based transportation, many think that through shipping, the negative environmental effects will decrease dramatically along with the traffic complications experienced in main roads. This CL concept, prioritizing water transportation, will improve freight distribution by effectively handling goods without adding interruptions to highways thereby causing heavy traffic and pollution. In relevance with the survey results of the companies, we can say that they, too, agree with the utilization of Pasig River for their freight distribution.

6. RECOMMENDATION

Establishing a city logistics concept to any developed areas signifies an important contribution in the fields of transportation planning and engineering. This study shows not only the comparison of water and land based transportation but also the efficiency and environmental impacts using the Pasig River as a mean of shipping and distribution of goods.

In establishing City Logistics promoting water transportation through the utilization of the Pasig River, the researchers recommend the following to maximize its effectivity:

The government must review and implement policies in relation to water transportation including appropriate vessel types for the Pasig River (vertical clearance for bridges, weight limit), high security (Pasig River lighting, water level monitoring) and maintenance (proper garbage disposal).

The transport service providers has to take into consideration that the Logistics Center

to be constructed will be elevated since Buayang Bato is relatively low in nature and can be exposed to environmental conditions such as high tide and low tide, rainy seasons and flash floods. They should also provide sufficient areas for the arrival and departure of freight.

The group recommends the implementation of this concept in our country especially in Metro Manila. This could be the solution to the traffic congestion and pollution in the urban areas. This concept, if properly implemented, will pave way to a more stable community further leading to economic growth in an ecological manner.

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REFERENCES

- Benjelloun and Crainic. *Trends, Challenges, and Perspectives in City Logistics*. 2009
City of Mandaluyong. Retrieved from: <http://www.mandaluyong.gov.ph/profile/history.aspx>
City of Mandaluyong. Retrieved from:
<http://www.mandaluyong.gov.ph/govt/bgys.aspx?id=007>
City of Mandaluyong. Retrieved from:
<http://www.mandaluyong.gov.ph/govt/mapbgy007.aspx?id=007>
City of Mandaluyong. Retrieved from:
http://mandaluyong.gov.ph/profile/land_tbl3.01.aspx
He and Cheng. *Analyzing key influence factors of city logistics development using the fuzzy decision making trial and evaluation laboratory (DEMATEL) method*. School of Management, Huazhong University of Science and Technology, 2012
Jesus Gonzalez Feliu. *Models and methods for the City Logistics*. Politecnico Di Torino
Lidasan and J. Castro. *Philippine Intermodal Logistics System and Policies*
Marichu Villanueva. *Compromise Eyed on Manila Truck Ban*, *Philippine Star*, February 27, 2014. Retrieved from: <http://www.philstar.com/headlines/archive/690?page=286>
Pu, Yang and Fengwei. *Research on Evaluation System of City Logistics Development Level*. School of Management Dalian Jiaotong University