Introduction of Bus and BRT Systems along a Major Road Corridor in Iloilo City, Philippines

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Abstract: Over the years, urban travel demand in Philippines has increased tremendously amounting to the need of high capacity public transport as an urban mobility. Primarily, urban population growth, migration from rural areas, the growing economy and booming of industries have contributed significantly to the increase in travel demand in Philippine cities. One of the emerging highly urbanized cities in the Philippines is the city of Iloilo, which has a rapidly increasing travel demand due to the establishment of mixed-use developments recently. This study aims to introduce bus and BRT systems for two main service routes from Ungka to Iloilo City: via Lopez-Jaena Street and via Diversion Road. The study aims to evaluate the transportation impact of bus and BRT systems on the current public transport system, passenger movement, traffic behavior, and urban travel, and to assess the environmental benefits of the proposed high capacity public transport. Data were obtained through vehicle counting, onboard surveying of jeepneys and from relevant offices. These were calibrated using the software JICA STRADA 3 to create different transit models in predicting the new travel behavior of passengers in three different scenarios: without bus and BRT; with bus but without BRT; and with BRT but without bus traversing from Ungka to Iloilo City service routes.

***Key words*:** urban mobility; urban travel demand; high capacity public transport, JICA STRADA 3

1. INTRODUCTION

1.1 Background of the Study

Primarily, the increase in internal growth of urban population and the migration from rural areas significantly contribute to the increase of travel demand in Iloilo City. This extensive increase in demand rate often results to severe traffic congestion in the metropolis which greatly influences the performance of economic, social, cultural activities and daily lifestyle of urban travelers. Also, the economic growth and the rapid urban developments of Iloilo City have induced travel demand, resulting to private vehicle trends hike.

Iloilo City is an emerging highly urbanized city in the central part of the Philippines, and it has a population of 424,619 inhabitants with a growth rate of 1.8% based on the NSO, 2010 census. Its rapid growth of urban population has induced urban mobility, from 26,075 motor vehicles in

1990 to 61,337 motor vehicles in 2010. Jeepneys, tricycles and taxicabs are the three main mode of transport in the city, mixing up along trunk roads and streets. As the volume of urban mobility increases, traffic congestion worsen and the amount of pollutants concentrated in the metropolis also increases. This magnified traffic problem impedes travel comfort, and this unresolved environmental issue is detrimental to the health of city dwellers and vacationists.

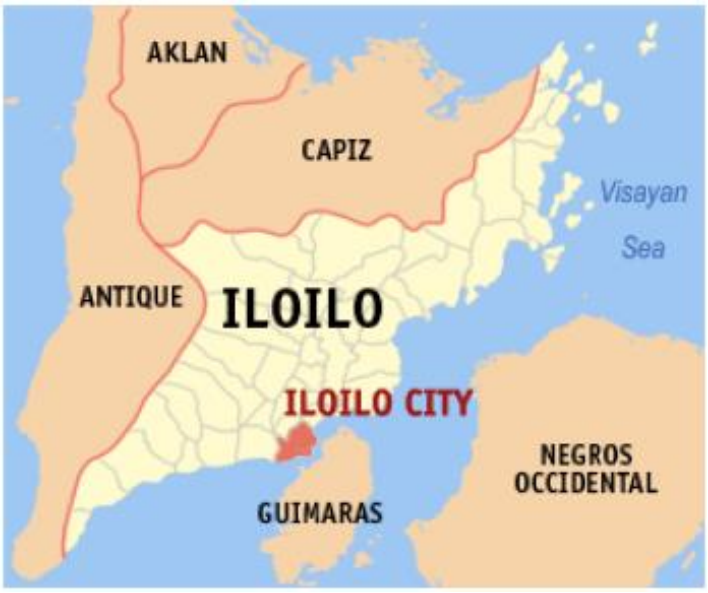

Figure 1.1 Location of Iloilo City in Panay Island
Source: Google map

This paper focuses in the introduction of bus and BRT systems for the two major routes that service travelers from the different provinces of Iloilo. These two traffic entities are, the Diversion Road en route to CBD with a distance of 10.5 km and the Lopez-Jaena Street to Fort San Pedro spanning to 8.2 km. These two major roads are articulated with different travel attractions, such commercial establishments, recreational areas, schools, transport terminals, and shopping centers are common entities which affect the passenger's modal preferences. Furthermore, these dependent routes are the only access to the Iloilo International Airport located Northwest of Iloilo City.

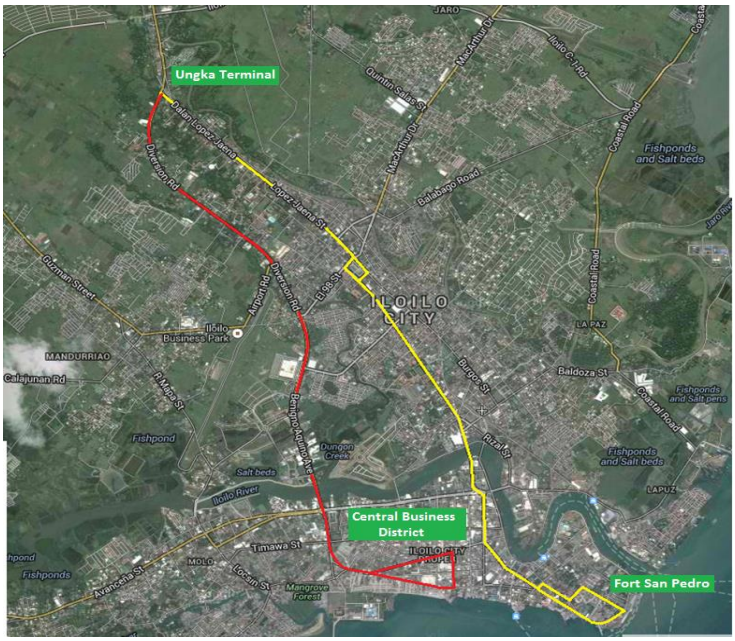

Figure 1.2 Map of Iloilo City
Source: Wikimapia

1.2 Statement of Research Problem

The Ungka to Iloilo City networks are mainly served by jeepneys. Jeepney, a predominant public modal vehicle in the Philippines, is the only practical means to access employment, education and public services in Iloilo City. This mode of transport remained uncomfortable with high level of emissions and lacking of safety measures. Unlike taxicabs and tricycles that can take any desirable routes by the passenger's travel preference, jeepney is a route dependent modal vehicle that tends to jostle for passengers causing traffic congestion. These three major public vehicles have a significant role in addressing the travel demand issue, however, their exceeding volume plus the increasing units of private vehicles plying the city networks causes traffic congestion, delays, and inconvenience to the passengers.

Figure 1.3 Jeep (right), Tricycle (middle), and Taxicab (left)

Jeepneys accounts for about 42% of the total vehicles, 30.6% motorcycles and tricycles, and 27.4% for other vehicles including private owned vehicles. As of the first quarter of 2013, Iloilo City has newly registered a total of 16,135 private vehicles, while there are only 2,783 public vehicles adding to the volume of daily traffic. As the number of vehicles plying city routes increases and the road network is not expanding, traffic congestion, delays and inconvenience would be the magnified but remained to be unresolved issues.

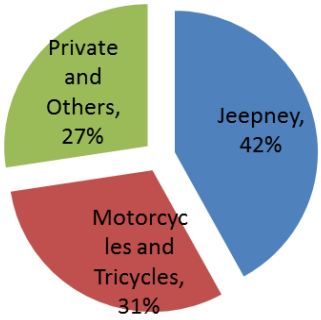

Figure 1.4 Percentage Share of Different Types of Land Transportation in Iloilo City on 2008

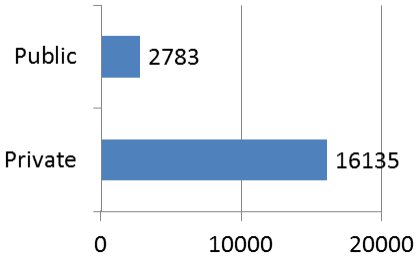

Figure 1.5 Number of Registered Public and Private Vehicles on 2013
Source: National Economic and Development Authority (NEDA)

1.3 Objectives

This study aims to introduce bus and BRT systems along a major road corridor in Iloilo City. Specifically, the study attempts to:

i. Establish three different transit models using JICA Strada 3.
ii. Assess the significant impact of bus and BRT systems in the current transport system.
iii. Determine the model that could satisfy the travel demand of Iloilo City.

1.4 Significance of the Study

This research will generate baseline information for the Iloilo City government to the implementation of a high capacity public transport for Ungka-Iloilo City service routes. The implementation of bus or BRT system in Iloilo-Guimaras Metropolitan area will enhance the lives of both local and foreign travelers in terms of convenient, effective and efficient urban mobility.

2. LITERRATURE REVIEW

2.1 Bus System

One of the most important modes of transport is the bus transport (Ahern et al, 2008). It has a wide range of passenger capacity, performance characteristics, and typically operated with designed stops and routes (Smerk, 1974). In Indian cities, buses dominate the urban area, but due to the increase in transport demand and the contriving growth of the Indian economy together with the gradual declining of bus service level resulting to the increase of private motored vehicles (Vedagiri et al, 2009).

2.2 Bus Rapid Transit (BRT)

According to Fukuda et al (2006), Bus Rapid Transit (BRT) has increasingly become an attractive urban transit alternative in many Asian developing cities due to its cost-effective and flexible implementation. It is believed that ecology friendly transportation should be a high-capacity public mode providing advance technology features, and luxurious yet comfortable facilities while having lower emission, moving faster and safer, and most importantly, being attractive to commuters. Considering its advantages, the BRT system has become increasingly attractive in many developing cities in Asia, including Jakarta, Bangkok, Hanoi and Manila who currently have started, planned and are considering to operate BRT systems.

3. METHODOLOGY

3.1 Data Gathering

The 2010 census of Iloilo City's population, including the growth rate and the number of households generating travel demand were obtained from the NSO. The number of private and public vehicles plying Iloilo City networks were the data gathered from the LTO. Current and future urban development of Iloilo City was notified by the DPWH. Environmental impacts of current modes of transport in the metropolis were procured from the CENRO.

3.2 Onboard Surveying

Passenger's behavior survey was conducted through onboard surveying in twenty-three (23) jeepney routes. Time of boarding and alighting of passengers were recorded.

3.3 Volume Count

The volume of traffic in each specific trunk and intersection were determined using volume count. Peak hours are in between 6am to 9am and 4pm to 6pm.

3.4 Transit Modelling

With the help of a transportation forecasting tool, three (3) transit models were designed and analyzed. The transit modeling tool used in determining the impacts of each model to the current mode was the JICA STRADA 3.

4. RESULTS

In order to compare the present condition of the current transport system with the proposed transit system, data were collected, calibrated to the present condition and analyzed using the JICA STRADA 3.

Iloilo City is divided into 180 barangays. Using JICA STRADA 3, the transport network of Iloilo City were developed and is consist of 3375 links, 2752 nodes, and 181 zones.

Figure 1.6 Road Network with Political Zone Centroid

Figure 4.1 shows yellow dots representing the centroid of each political zone. Each political centroid is connected to the nearest road link to be considered as part of the road network for further traffic analysis.

4.1 Volume Count Survey

A volume count survey was conducted at Luna Street, Iznart Street, and at Diversion Road in order to obtain the percentage of each public mode of transport plying along the two Ungka-Iloilo service routes. The peak hour along the northbound side and southbound side of Lopez-Jaena to Fort San Pedro was during 4 – 5 PM. On the other hand, peak hour along northbound and southbound side of Diversion Road to CBD was during 10 – 11 AM. The actual values and percentage of each jeepneys for Lopez-Jaena Street to Fort San Pedro route and in Figure 4 and 5 for Diversion Road to CBD route are shown in the following figures:

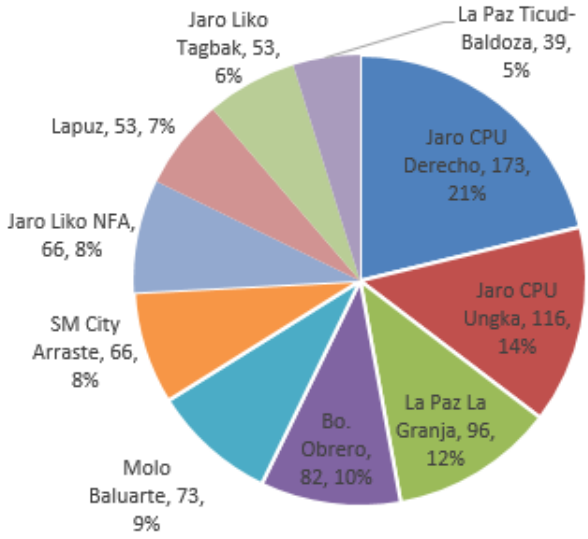

Figure 4.1 Percentage Share of Jeepney each Route Northbound of Luna Street

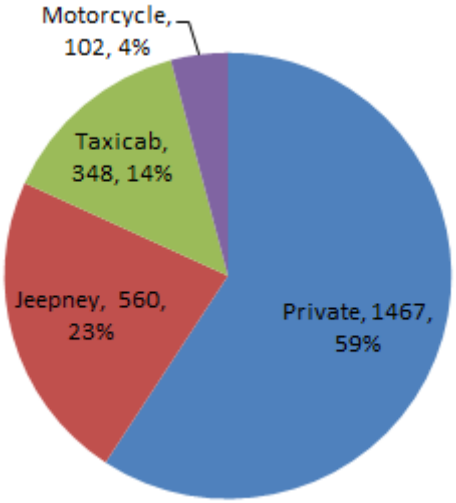

Figure 4.2 Percentage of the Peak Hour Volume Northbound of Luna Street

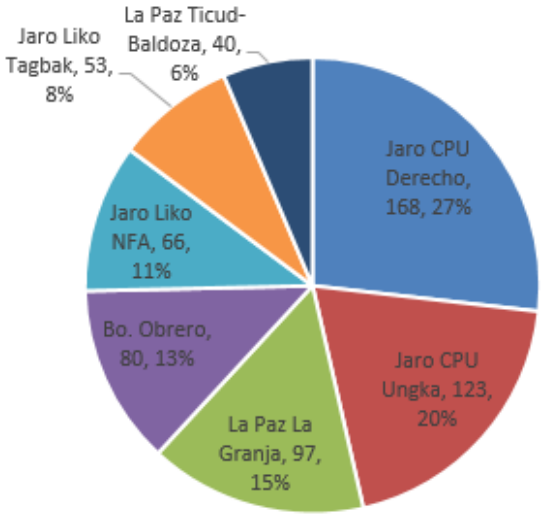

Figure 4.3 Percentage Share of Jeepney each Route Southbound of Luna Street

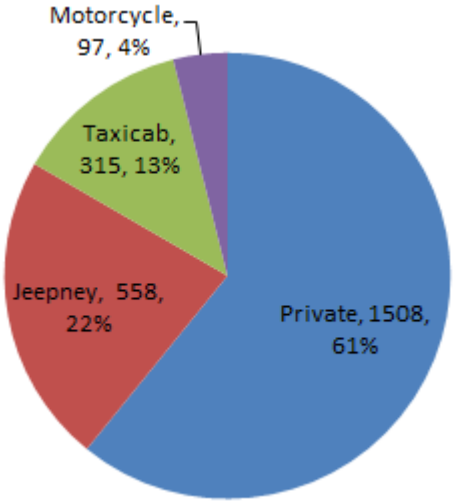

Figure 4.4 Percentage of the Peak Hour Volume Southbound of Luna Street

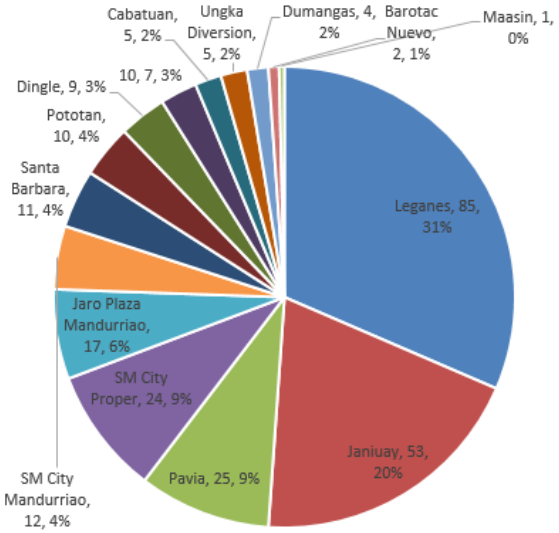

Figure 4.5 Percentage Share of Jeepney each Route Northbound of Diversion Road

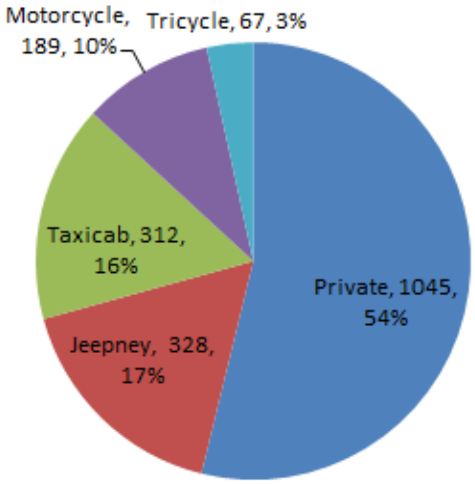

Figure 4.6 Percentage of the Peak Hour Volume Northbound of Diversion Road

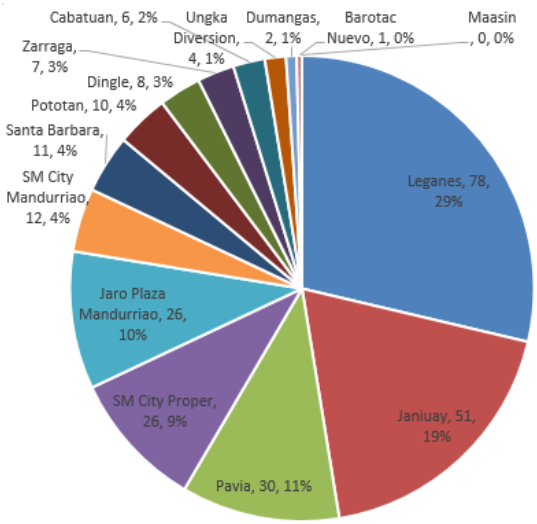

Figure 4.7 Percentage Share of Jeepney each Route Southbound of Diversion

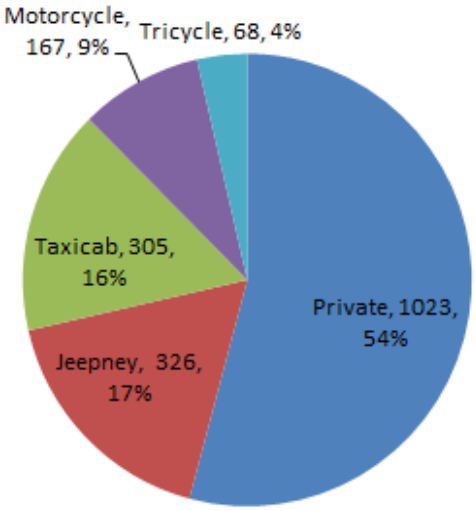

Figure 4.8 Percentage of the Peak Hour Volume Southbound of Diversion Road

4.2 Onboard Survey Analysis

Before conducting an onboard survey, the jeepney volume survey was first conducted to estimate the frequency of jeepney plying the Ungka to Iloilo service routes. It was found out that for jeepney traversing northbound of Ungka-Iloilo City service routes the peak hour is during 7:40 – 8:40 AM, and between 5:30 – 6:30 PM for southbound jeepneys.

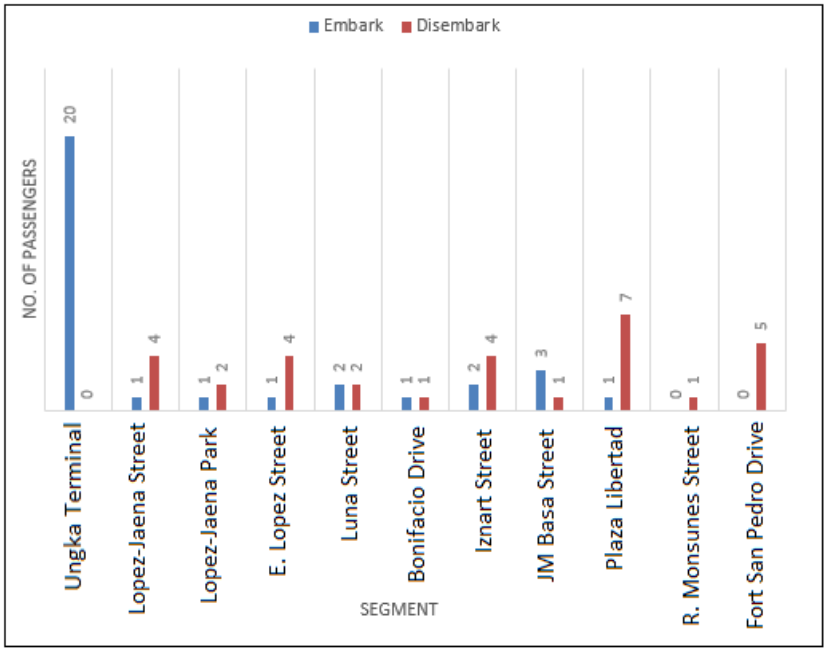

Figure 4.9 Average Total Passengers Embarking and Disembarking Per Segment by City Jeepneys

Figure 6. shows the average total number of embarking and disembarking passengers in each segment. The jeepney ridership shows that the most passengers embark and disembark at the end stations.

4.3 Transit Modeling for Passenger Flow and Transfer

There are three significant scenarios being considered in the assessment of passenger flow and passenger transfer along the two Ungka-Iloilo service routes. The data used in the calibration of these three transit models were the OD matrix, political boundary, Iloilo City network, and the different jeepney routes obtained from onboard surveying. The different scenarios are shown in the following figures:

Scenario 1: Without bus and BRT.

i. Current Transport System along Lopez-Jaena Street to Fort San Pedro
Assumptions: f=22veh/hr, v=10km/hr

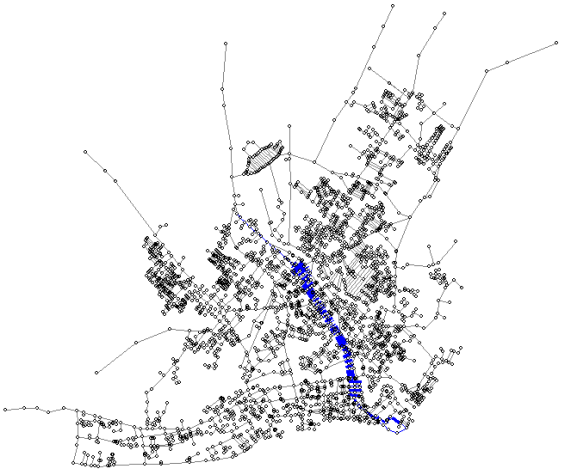

Figure 7. Passenger Flow
Maximum Volume=90
Volume per Dot=20

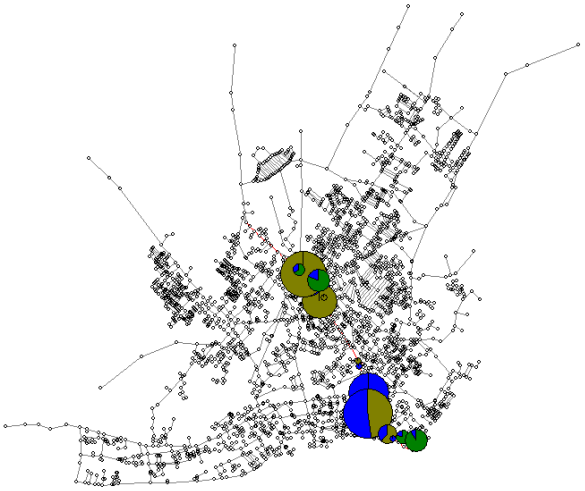

Figure 8. Passenger Transfer
Maximum Volume=55
Volume per Dot=1

ii. Current Transport System along Diversion Road to CBD
Assumptions: f=60veh/hr, v=14.5km/hr

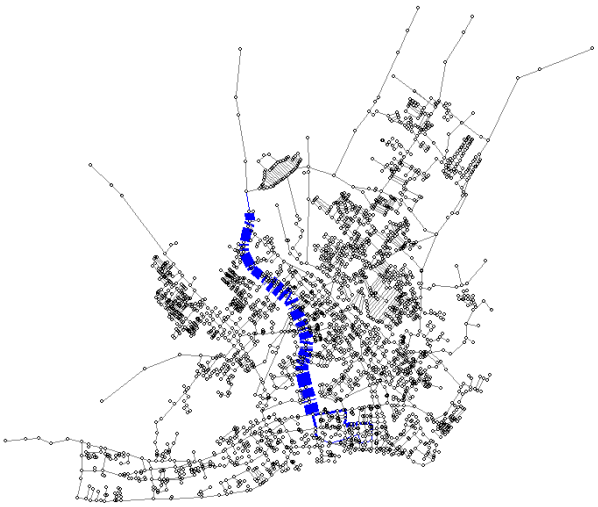

Figure 9. Passenger Flow
Maximum Volume=275
Volume per Dot=60

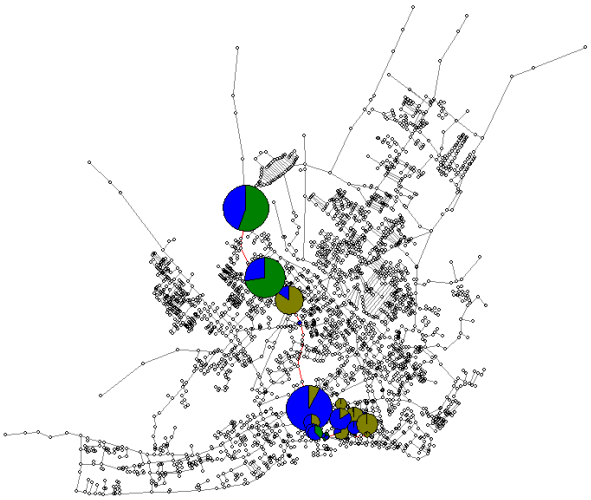

Figure 10. Passenger Transfer
Maximum Volume=155
Volume per Dot=3

Scenario 2: With bus but without BRT.

i. Proposed Bus System along Lopez-Jaena Street to Fort San Pedro
Assumptions: f=20veh/hr, v=15km/hr

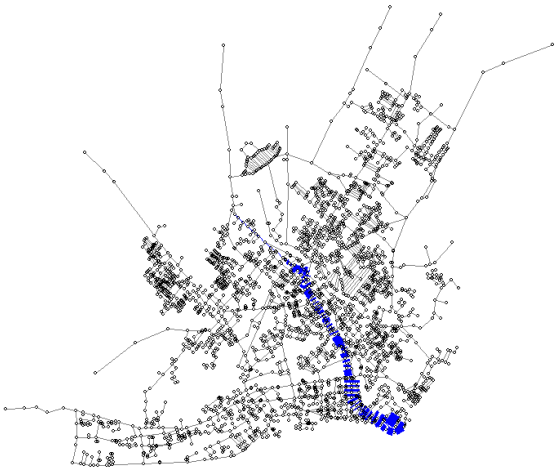

Figure 11. Passenger Flow
Maximum Volume=247
Volume per Dot=50

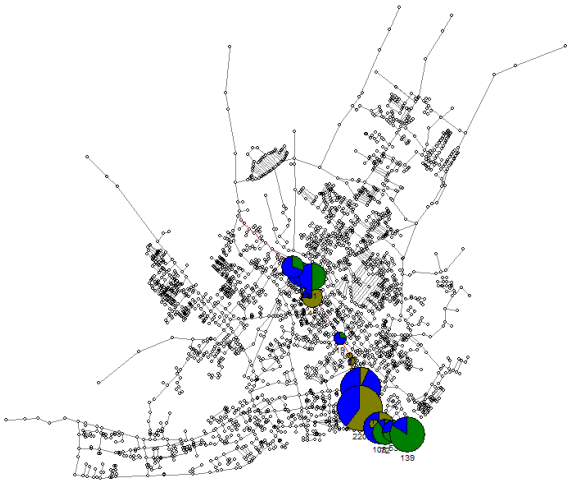

Figure 12. Passenger Transfer
Maximum Volume=220
Volume per Dot=4

ii. Proposed Bus System along Diversion Road to CBD
Assumptions: f=20veh/hr, v=15km/hr

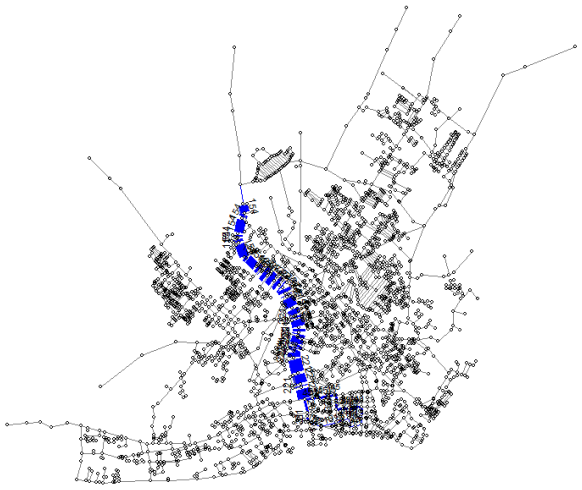

Figure 13. Passenger Flow
Maximum Volume=274
Volume per Dot=60

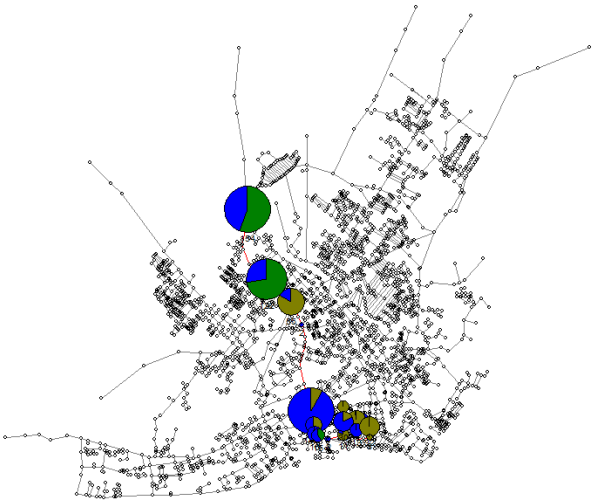

Figure 14. Passenger Transfer
Maximum Volume=154
Volume per Dot=3

Scenario 3: With BRT but without bus.

i. Proposed BRT System along Lopez-Jaena Street to Fort San Pedro
Assumptions: f=20veh/hr, v=30km/hr

Figure 15. Passenger Flow
Maximum Volume=458
Volume per Dot=100

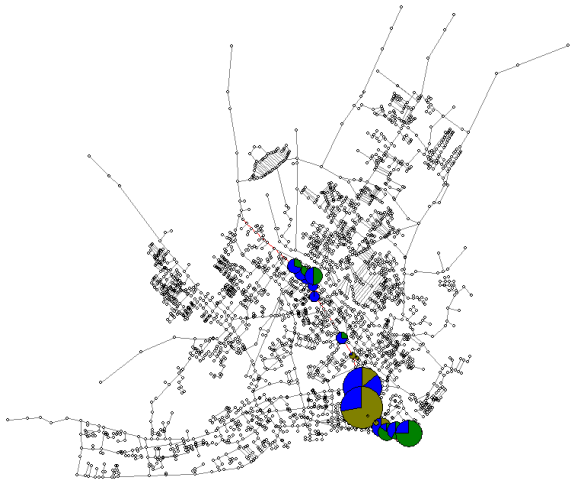

Figure 16. Passenger Transfer
Maximum Volume=429
Volume per Dot=8

ii. Proposed BRT System along Diversion Road to CBD
Assumptions: f=20veh/hr, v=30km/hr

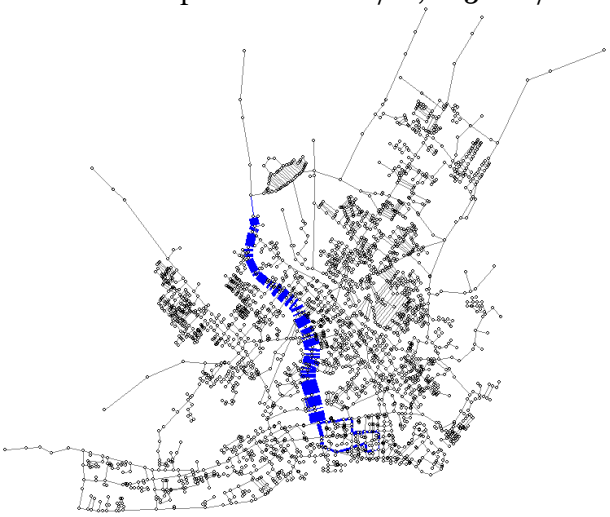

Figure 17. Passenger Flow
Maximum Volume=279
Volume per Dot=60

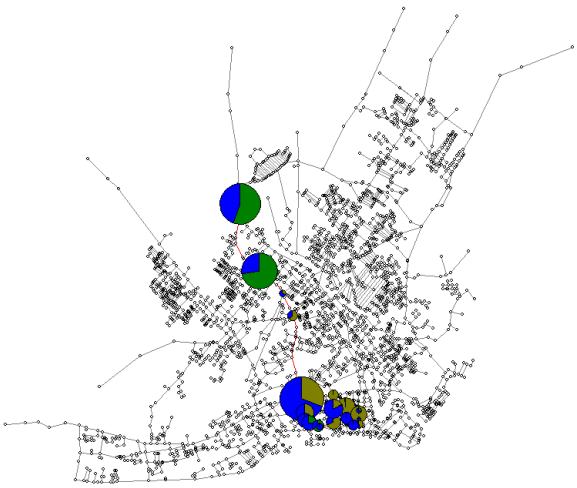

Figure 18. Passenger Transfer
Maximum Volume=180
Volume per Dot=3

5. CONCLUSION

As of the first quarter of 2013, Iloilo City has newly registered a total of 16,135 private vehicles, while there are only 2,783 public vehicles adding to the volume of daily traffic. As the number of vehicles plying city routes increases and the road network is not expanding, traffic congestion, delays and inconvenience would be the magnified but remained to be unresolved issues.

The best solution to mitigate congestion and to meet the demand of travel in Iloilo City is through implementing a more advance, cost effective, high capacity, and attractive public transport. The

implementation of BRT will enhance the travel lifestyle and would bring luxury in a cheaper cost for travelers who desire to navigate the city of Iloilo.

Using the three transit models, it was found out that there is a greater percentage of passenger transfer and passenger flow in the network developed. Base on the data gathered and simulated, it was projected a varying results among the three developed scenarios: (1) without bus and BRT, (2) with bus but without BRT, and (3) with BRT but without bus.

The proposed bus and BRT systems have showed satisfactory results. Both high capacity public transports have proved to have a great impact on the traffic behavior, passenger flow and passenger transfer.

ACKNOWLEDGMENT

This paper will never be realized without the following people: Francis Marie Vallejo, Karl Cesar Leguro, Lyndale Marie Patriarca, and Almina Marie Gange for sharing their time and effort in helping us in this research; Frederick Sosuan, for providing us relevant data; and Dr. Alexis Fillone, for giving us the opportunity to have a collaborative study with his student in DLSU and for providing us the tools in this research.

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