MAPPING INFORMAL PUBLIC TRANSPORT TERMINALS: THE CASE OF TRICYCLES OF BRGY. 176, BAGONG SILANG, CALOOCAN CITY

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Mapping Informal Public Transport Terminals: The Case of Tricycles of Brgy. 176, Bagong Silang, Caloocan City

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Abstract

Transport infrastructure plays a big role in mobility. Many cities in developing countries are rapidly urbanizing, roads are expanding and majority of the people rely on public transportation. However, this public transport system is usually not safe and inefficient. In Metro Manila’s 11 million population, over a third of which are in poverty. Seventy percent (70%) of the population are highly reliant on public transportation. This segment of the population belongs to the urban poor and middle class.

Just like any city in developing countries, informal public transport modes play a major role in mobility especially of the urban poor and the vulnerable sector of the society. Metro Manila has a peculiar mix of different public transportation services including buses, GT/FX Express, jeepneys, tricycles (motorcycle with sidecabs), and “pedicabs” (bicycles with sidecars). These modes are predominantly operated privately and are poorly regulated by government. Tricycles alone are estimated to be at 104,166 units.

The complex and diverse modes of transport in Metro Manila has spawned informal transport terminals and hubs-- public or privately owned terminals for motorized and non-motorized public transport that have no clear government legal authorization to operate.

Effective management however begins with the identification and inventory of the existing public transportation facilities especially terminals and hubs (both formal and informal). Locating and mapping these public transport terminals and hubs, and modes are crucial in understanding transport challenges and uncovering opportunities for greater and seamless connectivity in Metro Manila. However, while maps are considered important, Filipinos are unaccustomed to their use. Not many understand transport features in maps and sharing them widely is a crucial step in enabling development actors and the people to plan and implement mobility initiatives.

This study explores the mapping of informal transport terminals and hubs in the smallest political unit called Brgy. 176, Bagong Silang, Caloocan City. The study will demonstrate the use of map-oriented studies in triggering community transport initiatives by barangay leaders, transport managers, and the underserved poor segments of the population.

Keywords: mapping, tricycle, informal public transport terminals
1. Introduction

Filipinos are largely reliant on public transportation for employment, mobility and access to services. In the last decade, the World Bank described the Philippines of having attained important improvements in transport infrastructure and services. Transportation determines the level of accessibility of the people and commodities from one place to another. Many of the options presented, however, add to economic burden of working poor, elderly and/or middle class. The important challenges remain with serious consequences for the country’s competitiveness and for meeting its growth and poverty reduction targets.

In a rapid urbanizing world, transportation systems became more diverse. Metro Manila, as the country’s foremost urban center caters to different public transportation services including buses, jeepneys, tricycles, and taxis. These are predominantly privately owned and operated. Tricycles (motorcycles with sidecars) and pedicabs (bicycles with sidecars) provide transportation services through narrow streets and routes where jeepneys and buses are not allowed to operate. There are also vans (e.g. GT express) that ply to the major routes and carry more passengers and charge a rate depending on distance.

While the country relies heavily on road network to accommodate the passengers and increasing public transport supply, there is growing demand to improve urban public transportation by making it more efficient, dependable and sustainable. It is believed that an effective management of public transportation may lead to a sound economic growth and development.

Effective management however depends in understanding transport features. One of these is in the identification and inventory of the existing public transportation facilities especially terminals and hubs (both formal and informal). Mapping is very good way to do this. Locating and mapping these facilities and modes are crucial in order to assess the mobility problems and opportunities in Metro Manila. However, it remains to be expensive and the demand for up-to-date user-ready and easy access information in transportation is high.

The focus of this study is to identify and map the public transportation terminals (specifically for tricycle) and assess its impact in terms of numbers, facilities/infrastructure available and how they are being utilized for the transportation needs of the barangay. Tricycle was chosen as a focus of this study since they comprise the majority and the primary mode of transportation within the barangay aside from jeepney, buses, and pedicabs.

This study will explore the use of crowdsourcing as a method of mapping public transport terminal (formal and informal) in the Barangay. Crowdsourcing is essential especially in new forms of mapping, which large group of users come together to create data and to add value by sharing (Smith et al., 2008). The current situation shows the proliferation of public transport terminals (mostly tricycles) in the barangay. It came to a point that there is a need to manage these terminals to lessen traffic in intersections and lessen transport related violence. However the local government do not have baseline and transport maps to start with where they can base their governance initiatives and policy recommendations.

The capabilities available in the GIS software will be explored to map the location of tricycle terminals and in order to support the analysis with regards to improving the mobility, traffic flow and transportation services within the barangay.
GIS generated maps on current transportation system can be used by the local government. Information generated from the study may open new opportunities for proactive engagement and partnership. Research results and analysis are also envisaged to be useful for planning. The results obtained can be used by the barangay leaders, transport system managers to identify strategies and policies to better plan the public transportation. Further results can be used in enhancing enforcement of safety, locations to better services, and outreach. The recommendations and strategic actions on the other may be useful for designing new innovative programs.

2. Brief description of study area

Bagong Silang or Barangay 176 is located at the northern part of Caloocan City (Figure 1). It is bounded in the North and West by the Marilao River, Barangay 175 in the South and Barangay 186 in the East. It has a total land area of 524.68 hectares with topography of gently to steeply undulating to rolling topography. It was subdivided into several phases that have been developed into Phase I, II, III, IV, V, VII, VIII, IX and X. The land use is mostly allocated for residential uses with several industrial areas. The barangay have a Type 1 with dry season from October to January and wet season from June to September.

In 1995, Barangay 176 comprised 15% of city’s total population with a total 157,578 persons. With an average household size of 5, the barangay have 31,523 households. As of 2007, NSCB accounts for a total population is 221,874 or 16.1% share of city’s population.

The barangay was chosen as a study area due to the demand from the local government officials to help them manage their public transportation. Problems related to public transportation have been a perennial problem in the area. Providing the local government with baseline information and maps is already a big leap to start with.

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1 The paper this paper is based on the paper entitled “Public Transportation Supply Mapping in Brgy 176, Bagong Silang, Caloocan City: An Illustration of GIS by Mr. Cordova, LV, Mr. Josef, JF and Mr. Ong, A. submitted to Dr. Jun T. Castro, in partial fulfilment for the Plan 259 course, 1st semester 2011-2012 at the School of Urban and Regional Planning, University of the Philippines.

2 Based on Caloocan City Medium Term Development Plan (2000-2005)
Current State of Public Transportation in Barangay 176

Barangay 176 is accessible through Quirino Highway via Malaria Susano Road via Novaliches town proper and Zabarte – Camarin Road that serves its main thoroughfares. Transportation supply is not a problem in the barangay. It has ample supply of buses, jeepneys and tricycle. In the recent information acquired from the Tricycle and Pedicab Regulatory Service (TPRS), the barangay have a total of 2,558 units of tricycles (Table 1) comprising 4 Tricycle Operators and Drivers Association (TODA).

The Caloocan City Medium Term Development Plan (MTDP) of 2000-2005 already identified that the Bagong Silang Resettlement Project’s intersections poses serious traffic problems and affects transportation efficiency in general. The identified causes of traffic congestion includes narrow right of ways and sidewalks, inefficient public transport terminal facilities, street and market vendor, poor pavement, inadequate Traffic Management System (TMS), and inadequate road geometry.

Moreover, the local barangay officials identified the problem related to public transportation supply as one of the issue in the locality that sometimes are the causes of conflict and violence affecting the peace and order situation. An important factor contributing to public transportation related problems includes illegal terminals of tricycles, conflict among TODA with regards to route assignments, node designated loading and unloading areas, and no central terminal.

3 TPRS is the recommending body to the City Council for the approval of franchise, permits, and assignment of terminals of tricycles and pedicabs.
Table 1. Route assignments of tricycles per TODA in Brgy. 176

<table>
<thead>
<tr>
<th>NAME OF TODA</th>
<th>Number of Units</th>
<th>Coverage/ Routes</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Bagong Silang TODA</td>
<td>238</td>
<td>Phase 4 (A, B, C), Phase 9, Phase 10 (A, B)</td>
</tr>
<tr>
<td>BASITODA</td>
<td>1500</td>
<td>Phase 1, 2, 3 and 8</td>
</tr>
<tr>
<td>Phase 5 TODA</td>
<td>320</td>
<td>Phase 5, 7 (A, B, C) and Phase 12</td>
</tr>
<tr>
<td>BASIDECO</td>
<td>500</td>
<td>Phase 4 (A, B, C), Phase 9, Phase 10 (A, B)</td>
</tr>
</tbody>
</table>

Source: TPRS (2011)

In its MTDP, the City of Caloocan already cited that the expanded public capital investments essential to uplift level and extent of social and economic infrastructure services, and traffic engineering in these northern areas of the city. This includes Barangay 176.

3. Objectives

The goal of the study is to identify, map and assess the public transportation supply (with focus on tricycles) with the aide of crowdsourcing technique and GIS. Specifically, the project would like to:

1. Develop a map of public transportation terminals of Barangay 176;
2. Analyze the current public transportation supply (specifically tricycles) and facilities with the standards and existing policies vis-à-vis identified problems within the barangay.
3. Identify strategic actions that the Barangay can undertake to improve their transport situation vis-à-vis the local government’s plan.

4. Methodology

To identify, map and assess the public transportation supply of Barangay 176, the following conceptual framework below (Figure 2) was used. A Pressure-State-Response framework was utilized as a reference in the assessment and getting the feedback from the local stakeholders. Several methods for data collection were done

1. Crowdsourcing mapping – technique used to easily pinpoint the location of terminals in the Barangay.
2. Focus Group Discussions – An FGD was conducted with select barangay officials including those involved in policy and program implementation (e.g. traffic).

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4 The methodology and activities in this paper is based on the class group exercise (Cordova, LV, Josef, JF and Ong, A.) in Plan 259 AY 2011-2012 School of Urban and Regional Planning, UP Diliman.
3. Key Informant Interviews – The team also conducted KIIs with local policy makers, TPRS, DPSTM and commuters (in general) to gather more data that will support the project.

4. Survey questionnaire – Through the office of Barangay Secretary, the team was able to distribute a total of 100 questionnaires to stakeholders (government officials/ workers, private sector, drivers, and commuters)

5. Secondary Data Gathering

**Figure 2. Conceptual and Analytical Framework of the Study**

Local knowledge is very important. Using crowdsourcing technique, these knowledge can be translated into essential information for mapping public transport terminals. Through this method, everyone contributes. Crowdsourcing was done by utilizing a big barangay map. Key questions were asked to the local stakeholders in order to identify and pinpoint the locations and what mode is in the specific locations. The method generated lots of information in less than an hour at the least cost. Then the data information will be validated through ground verification.

In order to generate maps of Barangay 176, the data from the crowdsourcing technique was inputed and translated into shape files. Since there are no shape files available, raster images road networks and barangay boundary from wikimapia and Google Earth using ArcGIS were utilized. Likewise, global positioning system (gps) coordinates from Google Earth were used for georeferencing.

**Figure 3. Discussions and crowdsourcing exercise with local stakeholders**
First step was to overlay the road network from wikimapia.org onto the satellite image from Google Earth using GIMP, a graphic manipulation software, to produce a single raster image (jpeg file). The output image was then added as a layer file into ArcGIS and georeferenced using datum WGS_1984 and GCS_WGS_1984 for spatial references used by Google Earth.

A separate shape file (polyline) for barangay boundary and road network was added, and the barangay boundary and roads were traced onto the respective layers. Segments were then labelled as major and minor roads. These were identified and validated through a consultation by key barangay officials. This serves as an additional field in the attributes table of the road network shape file that was used to generate base maps.

**Table 2. Additional data on transportation systems gathered during consultation and added to database to generate GIS map.**

<table>
<thead>
<tr>
<th>Feature/Data</th>
<th>Shape file/layer</th>
<th>Methods employed</th>
</tr>
</thead>
</table>
| Major roads – 10 m buffer | Generated new polyline shape file using road network layer | • Added field ‘Type’ in attributes table  
 • Exported identified segments as a new layer  
 • Buffer (analysis) using 10m as buffer value |
| Minor roads – 7m buffer   | Generated new polyline shape file using road network layer | • Added field ‘Type’ in attributes table  
 • Exported identified segments as a new layer  
 • Buffer (analysis) using 7m as buffer value |
| Tricycle terminals        | Added new point shape file                      | • Added terminals as points in identified areas onto the shape file               |
| Jeepney terminals         | Added new point shape file                      | • Added terminals as points in identified areas onto the shape file               |
| Bus terminal              | Added new polygon shape file                    | • Added terminal as polygon in identified area onto the shape file                |
| Traffic prone areas       | Generated new polyline shape file using road network layer | • Added field ‘TPA’ in road network attributes table  
 • Exported identified segments as a new layer  
 • Buffer (analysis) using 10m as buffer value |
Table 3. Standards and methods employed to analyze the maps.

<table>
<thead>
<tr>
<th>Analysis Map</th>
<th>Basis used</th>
<th>Methods employed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricycle terminals and 200m buffer zones</td>
<td>Used the walkability index (200 – 400m) from HLURB</td>
<td>Buffer (analysis) using points in tricycle terminals shape file and 200m buffer value</td>
</tr>
<tr>
<td>Identification of No Loading/ Unloading Zones (proposed)</td>
<td>Used the walkability index (200 – 400m) from HLURB</td>
<td>Created new point shape file to mark center of traffic prone area, Buffer (analysis) using tricycle terminal shape file and 200m buffer value</td>
</tr>
<tr>
<td>Identification of Loading/ Unloading Zones</td>
<td>Used the walkability index (200 – 400m) from HLURB</td>
<td>Created new point shape file for loading/unloading zones, Measure tool, to manually measure 200m intervals from No loading/unloading zones buffer edges</td>
</tr>
<tr>
<td>Identification of Possible Sites for Central Terminal</td>
<td>HLURB standard (750m)</td>
<td>Created new polygon shape file for central market, Buffer (analysis) using market as center and 350m buffer value</td>
</tr>
</tbody>
</table>

5. Results and analysis

5.1 Road Networks and Public Transportation Routes

Using the buffers set and KII conducted with key local officials, road networks and routes were mapped. Figure 6 shows the major and minor roads. The locals classify major roads into *kanan* and *kaliwa*. There are jeepneys assigned to take these routes. Figure 7 Buses are taking the *kanan* (Camarin Road) route along with some jeepneys and separate in the industrial site in Phases 2 and 3. While these
modes traverse major roads, tricycles service the periphery or minor roads.

There are 3 traffic prone areas identified. These are located in the rotonda (Phase 9) that serve as terminal of jeepney taking kaliwa route and tricycles. Second is located in the intersection of Camarin and Ligaya Roads near the Phase 1 and Phase 4 market, parish church, and barangay hall. The other traffic prone area is in the intersection located at Phase 5. Rows of commercial establishments are located in this area of the barangay. Many of the jeepneys are taking time to load and wait for passengers that causes traffic. Other factors that cause traffic are vendors along the streets and on Sundays in churches.

5.2 Location of Terminals

This study also located other transport terminals such as jeepney, buses, and pedicab to see its connection with the tricycle terminals. The TPRS designates terminal assignments of the tricycles through their respective TODAs. Table 4 showed that there are only ten (10) terminals are officially assigned by the TPRS for tricycles. However, we have accounted a total of 40 terminals of tricycles. The excess terminals are unaccounted and unofficially recorded in the local government office. Though residents are accustomed to see them and not aware that these are informal terminals. Aside from this, there are also 2 terminals of jeepneys, 1 for buses, and 1 for pedicab identified in the Barangay. Figure 8 shows the locations of these terminals.

Table 4. Designated terminal assignment for tricycles.

<table>
<thead>
<tr>
<th>NAME OF TODA</th>
<th>Designated Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Bagong Silang TODA</td>
<td>Bridge going to Harmony, Front of Kalayaan Elem. School</td>
</tr>
<tr>
<td>BASITODA</td>
<td>Phase 1 (front of Elem. School), Phase 3 (Front of Elem. School) and Phase 8</td>
</tr>
<tr>
<td>Phase 5 TODA</td>
<td>Phase 5 and Phase 7C (covered court)</td>
</tr>
<tr>
<td>BASIDECO</td>
<td>Phases 2, 3,4,10 (Pagkabuhay and Shelter)</td>
</tr>
</tbody>
</table>

*Source: TPRS, Caloocan City*

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5 Based on the interview with TPRS personnel
Using the walkability\(^6\) index and factoring in the location of the terminals, it can be easily observed that the terminals (especially tricycles) are in excess and located near to each other (Figure 9). Terminals are either on the streets or shares space with pedestrian sidewalks.

The HLURB Executive Order 648 prescribes that the location of the terminal (presumably central terminal) should be located at least 750 meters away from the market (Figure 5; Figure 10). However, the situation of terminals in the barangay is seen otherwise.

Tricycle terminals are not strategically located and some are concentrated in an area (e.g. Phase 4 near market and Phase 10). The bus and jeepney terminals on the other hand utilize the vacant lot and roadsides which affect the traffic flow.

Figure 10 suggests the proper location of infrastructure and other facilities. It is expected that by adopting the prescribe standards may further improve planning, management and policy/decision making of the barangay.

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\(^6\) Generally defined as a measure of how friendly an area is to walking. For this study, distance is set at 200 meters.
Figure 6. Road network of Barangay 176 illustrating major and
Figure 7. Road network and routes of Barangay 176 in major roads
Figure 8. Identified terminals for jeepneys tricycles, and pedicabs, and traffic prone areas.
Figure 9. Identified terminals of tricycles overlaid with walkability zones.
Figure 10. Illustration of 750 meters radius consideration in locating central terminal.
6. Recommendations/Strategic actions

Analysis of the four (Figure 6-9) generated baseline maps means that management of public transportation supply requires an integrated approach. This included policies, governance, infrastructure, and innovative schemes. With the available information, possible GIS applications its basis (with regards to standards used) were explored and utilized the solutions and strategies identified by the barangay officials to manage their public transportation supply. Moreover, the strategic actions identified also supports the perception of stakeholders (commuters in general) gathered from the survey. The GIS generated maps generated are expected to provide illustration of the strategic actions.

**Policies**

The pending Barangay Ordinance No. 005 Series of 2011-02-24 for the implementation of stickering system is a good start to manage the public transportation supply. The RDPSTM recorded more than 300 tricycle and jeepney violators (e.g. colorum and out-of-line) as of January 2011. According to the key barangay officials, the proposed ordinance and system envisaged to help solve these problems that add to the volume of public transportation in the Barangay. Moreover, this moved is expected to change the behaviour of the commuters not to ride and utilize the colorum and out-of-line vehicles.

Another policy aspect is the formulation of traffic schemes and strict implementation of traffic rules and regulations. The current traffic scheme of the barangay is limited to the previous ordinance that needs to be updated. To address the flow of traffic and manage the daily public transportation supply in the identified traffic areas, rerouting schemes are identified as a possible solution.

As shown in Figure 11 the areas for re-routing schemes were illustrated. These are: 1) Near intersection of Camarin and Langit Roads – diverting all vehicles, making right turn after the market and closing the segment of Camarin Road before the barangay hall and few meters away from the parish church; 2) Before the bridge bordering Brgy. Camarin and Brgy. 176, jeepneys and buses will be diverted to take an alternate route going directly to the terminal in Phase 2. This will lessen the volume of vehicles towards northern directions passing through the Camarin Road.

**Facilities and Infrastructure**

In support to the traffic schemes, designating loading and unloading areas should be established in the barangay along major roads to start with. This is to facilitate the traffic flow and discipline among drivers and commuters. Using the walkability index 200 meters, loading and unloading areas were identified along the major roads (Figure 12). Loading and unloading starts at 200 meters from the intersection of the identified traffic prone areas and assignments can be identified accordingly by the barangay officials. Considering the traffic guidelines, it is also recommended that loading and unloading starts 6 meters from all intersections. It should be supported by

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7 The barangay officials is currently looking for the copy of the ordinance in order to recommend amendments of the current scheme through a resolution.
infrastructures like waiting sheds and walkways or sidewalks to ensure safety of the commuters. Other infrastructures like central terminal should be considered by the LGU in the future.
Figure 11. Proposed re-routing schemes in Barangay 176
Figure 12. Proposed loading and unloading areas in Barangay 176
Governance

The aspect of governance will only become effective only if all stakeholders are involved in the process determining solutions. Public transportation is a sensitive issue in the Barangay. It has been the root cause of many police reports and news in media. Added to this, it is the main source of income for many families in the area. However, this need to be resolved with continuous coordination among sectors supported with soft and hard infrastructure of the local government.

Conflict among operators/drivers is a governance issues. These should be resolved with continuous dialogue considering future plans (e.g. properly locating of terminals) that conforms with the set standards (e.g. HLURB, National Building Code, National EST Strategy), local policies and plans such as the Caloocan City’s Medium Term Development and Comprehensive Land Use Plans that considers safety and convenience of all stakeholders.

The Barangay may also consider building its own database of public transportation supply especially starting from registered buses, jeepneys, tricycles and pedicabs top archiving ordinances. This is deemed necessary and will enable easy implementation of all programs in the future. Moreover, they can closely coordinate with TPRS and RDPSTM to support this initiative.

To further manage the public transportation in the barangay, the authorities may also consider working with national agencies/ bureaus like MMDA and LTFRB in relation to programs related to urban redevelopment and transportation planning.

7. Limitation and opportunities of the study

The scope of the study was limited to available data accessed during the 3-month period. However, the group was able to establish the baseline and generate digitize maps that can be used in future studies and planning of the barangay. Future studies that may be explored by the barangay may include the following:

- Volume inventory and road capacity
- Travel pattern with regards to peak hours
- Demand patterns
- Transportation forecasting
- Passenger behaviour
- Road capacity
- Impact of transportation to land use and future development
- Formulate transport plans considering National EST Strategy

References

Barangay Ordinance No. 005 Series of 2011-02-24, Brgy. 176, Caloocan City.


