

# Examining the Implementation of the Public Utility Vehicle Modernization Program (PUVMP) in General Santos City, Philippines: An Industry Perspective

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**Abstract:** General Santos City was the pilot for the implementation of the PUV Modernization Program. As such, GenSan wrote the first Local Public Transport Route Plan and is taking lessons learned by the Local Government alongside public transport operators for a 2021 update. This paper examines the effects of the PUVMP on jeepney operations, the confounding effect of the COVID19 pandemic, and the implications on the future of GenSan's public transportation to support GenSan's transport planning decisions. A research collaboration enabled the deployment of SafeTravelPH to gather daily vehicle monitoring data from participating jeepney operators from January to July 2021. This paper focused on data from the Metro GenSan Transport Cooperative (MGTC) from April to May 2021. A one-to-one interview with the MGTC's chief operator provided deeper insights into the cooperative practices on fleet management as well as costs of modernization. The findings show that several costs of modernization have been overlooked in the formulation of PUVMP that is only worsened by the COVID19 pandemic. Policy reforms are urgently needed and should be supported by innovative research.

*Keywords:* Public transport, jeepneys, modernization, operations

## 1. INTRODUCTION

### 1.1. Background

General Santos City's (GenSan) public transportation has long been dominated by tricycles, followed only by jeepneys. In 2018, the city registered 4371 for-hire tricycles, which comprises 84% of their road-based public transport. However, when compared to the Land Transportation Office (LTO) vehicle registration data, for-hire tricycles and private motorcycles with sidecars would total to around 11,000 vehicles, or about 19.2 2&3 wheelers per 1000 population in GenSan alone. This excludes the tricycles that enter and exit the city from adjacent municipalities that the city estimates to be around 40,000. The sheer number of tricycles was identified as one of the city's major transportation problems needed to be addressed in the city's Sustainable Urban Infrastructure Development (SUID) Master Plan (NEDA 2019). Two

strategies in the SUID were proposed for road public transportation: (1) the plan to fully upgrade to e-jeepneys in line with the Local Public Transport Route Plan (LPTRP) and the Public Utility Vehicle Modernization Program (PUVMP); and (2) to rationalize tricycle services as part of the city's climate change mitigation. These two strategies play well into Metro GenSan Transport Cooperative (MGTC)'s experience as a tricycle-turned-jeepney operator.

Like most cities in the Philippines, tricycles in GenSan are governed by the Motorized Tricycle Franchising and Regulatory Board (MTFRB), but in 2021, the local government formed the Public Safety Office (PSO)<sup>1</sup>: an office that oversees public safety and disaster risk management that, interestingly, includes public transport. Incidentally, GenSan is one of the pilot cities of the PUVMP of the Department of Transportation (DOTr). It is also one of the first to develop its LPTRP that it submitted in 2018 one year after the launch of the PUVMP. A few years into the present, GenSan is taking the lessons learned alongside the local public transport operators for its update of the LPTRP for 2021. Thus, the city entered into a collaboration with the researchers to deploy SafeTravelPH and other Internet of Things (IoT) for gathering data and monitoring the performance of jeepneys and tricycles especially since data collection activities has been constrained by the pandemic.

This paper is borne from the Data Analytics for Research and Education (DARE) - a program of the Commission for Higher Education and the Philippines-California Allied Research Institutes (CHED-PCARI), a component of which is entitled "Information Exchange Platform for the Public Transport Sector" and serves as the laboratory for developing tools and analytics for public transport applications, including the creation of SafeTravelPH<sup>2</sup> that is a data platform of the University of the Philippines (UP) comprising of an open-source mobile application for collecting GPS data that also provides services such as fleet tracking and performance monitoring, feedback mechanism for commuters, and information system. Through the project, a collaborative research agreement is formed with the Local Government Unit (LGU) of GenSan via the newly-formed PSO.

This study focuses on the case of the MGTC, tackling their experiences with modernization, its relationship with LADOTRANSCO and the larger Public Transport Alliance of GenSan (PTAG), the effects of the pandemic on their operations, and the implications on the future of public transportation in GenSan. An analysis is provided from monitoring and performance data of MGTC vehicles acquired through SafeTravelPH from April to May of 2021.

## **1.2. Study Objectives**

The objective of this study is to describe and measure the costs of the PUV modernization on General Santos City's public transportation system four years after its implementation using big data crowdsourced from operators and interviews with local stakeholders. The study takes the perspective of a cooperative that underwent the modernization process using MGTC as a case study. In addition, this study aims to provide insights on the confounding effects of the COVID19 pandemic and how it would shape the future of General Santos City's public transportation.

## **1.3. Significance**

By studying and analyzing the public transport operations in GenSan and the adoption of the

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<sup>1</sup> This new unit of the LGU leads the City's implementation of disaster preparedness and emergency response and would be discussed further in this paper.

<sup>2</sup> For more information, visit <https://safetravel.ph>

PUV modernization, the generated insights would serve to inform not only the city government but also the implementation of the PUVMP itself. In the years before its launch, the PUVMP has been criticized as a costly and socially inequitable program that necessitates comprehensive study and review so that the government can respond with the appropriate support to the public transport sector, especially struggling operators. The challenge of its implementation is only compounded by the COVID19 pandemic situation that can debilitate the sector without better understanding of the situation on the ground. The case of MGTC as a group of tricycle drivers that decided to cooperate and modernize is especially important to address gaps in PUVMP and tricycle governance.

This study also aligns with the DARE Program to build capacity in the domain of data science and engineering with applications in transportation by using the platforms built under the program in collaborative research.

#### **1.4. Limitations**

This study was implemented during the COVID-19 pandemic and has been met with several challenges. Most activities (sensor deployment, data collection, stakeholder engagement) had to be done remotely by the research team, limiting possibilities of validating results on the ground. The study also encountered difficulty in finding operators with sufficient resources (i.e., mobile phones and deployable vehicles), as well as the difficulty in monitoring given the possibility of rapid on the ground changes, such as free ride policies and constantly changing lockdown policies. In terms of scope, while the analysis serves as prelude to a life cycle costing, this study does not completely cover all life cycle costs as that would be covered in a separate study. Moreover, many of the costs captured in the data have changed significantly over the course of revisions, such as fuel and vehicle prices. This study merely takes a glimpse of the costs of modernization within the context of the case study.

## **2. LITERATURE AND INSTITUTIONAL REVIEW**

### **2.1. Public Transport Modernization in GenSan**

GenSan has long provided strong support to its local public transportation system even before the PUVMP. The SUID and LPTRP were crafted with the aid of preceding studies. In 2011, GenSan's LGU included transportation and mobility in its city census (CITICEN) that allowed it to have its comprehensive data including its own origin and destination data that enabled succeeding studies. In 2015, the World Bank funded crafting GenSan's Transport and Traffic Management Plan (TTMP). These studies were instrumental for drafting the first LPTRP in 2018 as part of the pilot PUVMP. In parallel, the LGU explored various partnerships and research collaboration, including the study of the DARE Program. In 2019, the NEDA supported crafting GenSan's SUID 2019-2020. Because of these preceding works, GenSan was more or less ready to take on being the pilot city of the PUVMP.

The DOTr leads the overall governance and implementation of the PUVMP. Implementation of the program is based on two department orders, the DOTr Department Order (DO) 2017-11 or the Omnibus Franchising Guidelines, and the Joint Memorandum Circular 2017-001 of the Department of Interior and Local Government (DILG) and the DOTr. Several issuances have been released under the program including important issuances like: (1) vehicle classification (Class 1, 2, and 3 jeepney standards), (2) loan structure and requirements; and (3) operators' consolidation. In the last year, consolidation became the DOTr and LTFRB's priority when it became apparent that building operators' capacities and working with the consolidation process are catalysts for increased modernization uptake, but on its own, consolidation has been

a complex social process. Members of PTAG, particularly MGTC and LADOTRANSCO, were more receptive with modernization since the two anecdotally had sufficient resources to take the risk in acquiring “modern” jeepney units. It has also been especially helpful that the LGU has been supportive of their public transportation sector even before

The goal of PUV modernization is to provide Philippine citizens with safe, environmentally sound, quality public transportation systems. To do so, the program’s ten components have been set up not only to transform public transport fleet to be cleaner and low-emitting, but also organize and consolidate operators that competed for and in routes. To support this, the program also included institutional and financial mechanisms (e.g., loan programs and training). This included institutionalizing the LPTRP.

The Joint Memorandum Circular 2017-001 of DILG and the DOTr lays out the guidelines for the local government units to craft their respective LTPRPs. The LPTRP is an important public transport reform that enables local governments in the Philippines to plan their public transportation systems. As a planning document, it influences key strategic, tactical, and operational planning decisions. Consequently, the changes espoused by modernization are attributable direct and indirect costs. And although costs and benefits of the PUVMP have been extensively studied, very few have so far captured the local ramifications and actual experiences of the first adopters.

There is consensus that the LPTRP has become the bottleneck for PUVMP implementation. Not all cities have submitted their plans that would be the basis of franchise openings by LTFRB and would be a requirement for the financial programs of government financial institutions (GFI).

## **2.2. Strategic, Tactical, and Operational Decisions in Public Transportation**

This section takes a step back to look at modernization as part of strategic, tactical, and operational decisions. Contractual negotiations between those in the public transportation industry and the local government should be done within a well-developed framework of strategic directions, tactical detail, and with the key operational elements being closely linked to strategic and tactical levels. As such, the case in the city of Melbourne was borne out in such a manner (Stanley & Hensher, 2008), with the local Victorian Government developing a comprehensive integrated public transport improvement program alongside the public transport industry.

In fact, it was the public transport industry that undertook research on the disadvantages of the lack of transport services leading to social exclusions, and where the implementation of a minimum level of bus service that would be able to provide the majority of people with an option to travel at most times would be sufficient to avoid social exclusion, a concept that they then labelled as social transit.

The second incentive for the local government for increasing public transportation funding was the reduction of congestion costs and environmental costs that would come with a modal shift towards public transportation – these analyses were developed by a close collaboration between local government transport agencies, social welfare, environmental, labour and industry bodies, as well as members of the Australian parliament. At the strategic, macro level, there was strong political support, and thus tactical and operational movements were easily carried out.

It has been argued (Stanley & Hensher, 2005) that the development of a trusting partnership between the local authorities and operators is most likely to deliver positive outcomes in terms of overall system development and service delivery – there are two major ways that this has been carried out: through preparing system development ideas as well as contract development (Hensher & Stanley, 2003).

### 2.3. Costs of modernization

The long-term intent of the PUVMP has always been to redirect the current motorization trend to more sustainable options. Though there have been other plans by the national government and by local government units to reform the public transport system, focus on road-based public transport market is essential to realize short and midterm mitigation effects, to complement long-term improvements in mass public transport aimed at further reducing the motorization in the country (GIZ, 2016). The PUVMP was meant to establish a modern, sustainable, and climate-friendly road-based public transport system over about ten (10) years and is hinged upon two key aspects: structural changes within the public transport market, as well as fleet renewal, including the shift towards higher capacity vehicles. Structural change relies on reorganization of institutional actors in public transport planning and regulation, as well as the introduction of fleet management, service contracting, greater use of technology, and a shift towards an origin-destination demand model planning approach. Fleet renewal includes the introduction of an age limit for vehicles, improved vehicle standards for jeepneys, the introduction of financial incentives to modernize and consolidate the aging jeepney fleet, and the introduction of a new scrappage scheme.

Several studies<sup>3</sup> showed that commercial revenue can increase by operating larger capacity vehicles while also increasing operating intensity through shift-based staffing patterns in lieu of the traditional “boundary” system. In parallel, modern vehicle alternatives has been shown to provide energy efficiency benefits and even removing fuel dependence in the case of electric vehicles, which lead to environmental co-benefits. However, this improved commercial performance comes at a cost: (1) high capital investments required; and (2) increased overhead costs from salaried structure and additional staff needs. The early studies that lead to the PUVMP estimated that an average investment for a traditional jeepney and franchise would be about PHP 350,000, while a Euro IV-compliant jeepney would cost PHP 1,925,000, and an electric jeepney would cost PHP 1,850,000, but at that time these estimates excluded infrastructure and other life cycle costs. More studies would eventually delve into the life cycle costs ex-ante, but none has looked at actual data. By now, these capital costs, as found by this study, would have increased tremendously, which necessitates continuous studying of the PUVMP’s impact especially in light of the pandemic.

Implicitly, though modernization can potentially increase farebox revenues, improve commercial performance, and reduce long-term operational costs, capitalization remains a huge barrier to adoption. As such, while commercially viability was seen for the long-run, initial adoption depends on significant financial solutions to reduce capital expenditure. In addition, right sequencing of activities and programs of the PUVMP is critical. Regulatory reform is a needed step even before requiring the LPTRP formulation and submission, routerationalization, and investments in new fleets. This would have allowed for better appreciation and acceptance by stakeholders had they have been allowed more time to prepare and adjust for modernization (Congressional Policy and Budget Research Department, 2020).

## 3. STUDY AREA: GENERAL SANTOS CITY

### 3.1. Geography

GenSan, with a total land area of 492.86 sq. km., lies in the province of South Cotabato, which belongs to Region XII, otherwise known as Central Mindanao or SOCCSKSARGEN. It is

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<sup>3</sup> GIZ 2015; Clean Air Asia 2017

surrounded by the municipalities of South Cotabato and Sarangani Province: Malungonin the north, Maasim in the south, Alabel in the east, and T'boli in the west.

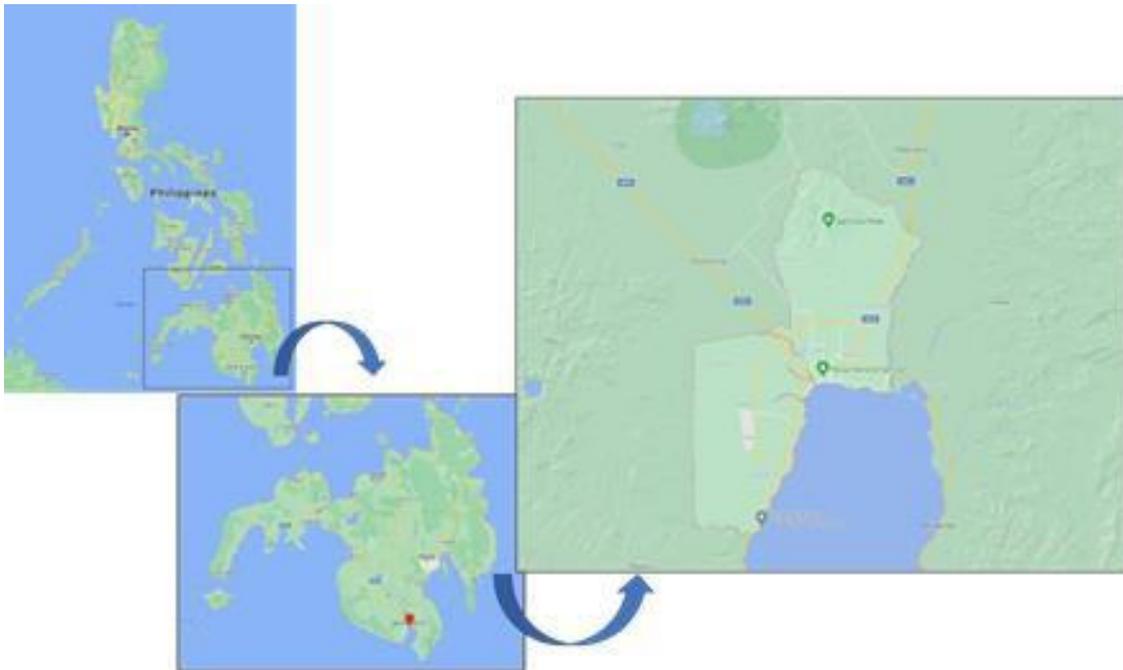


Figure 1. Location Map of General Santos City, Philippines  
(Source: Google maps)

### 3.2. Socio-economic Profile of General Santos City

Based on the 2015 Census of Population of the city, the city has a 2015 population of 594,446, with an average annual growth of 1.91 percent from 2010 to 2015. The number of households in 2015 was at 144,340, with an average of 4.1 household members per household. Figure 2 shows the population of the 10 most populous barangays of the city (PSA, 2015). More than 97 percent of the population live in urban barangays of the city.

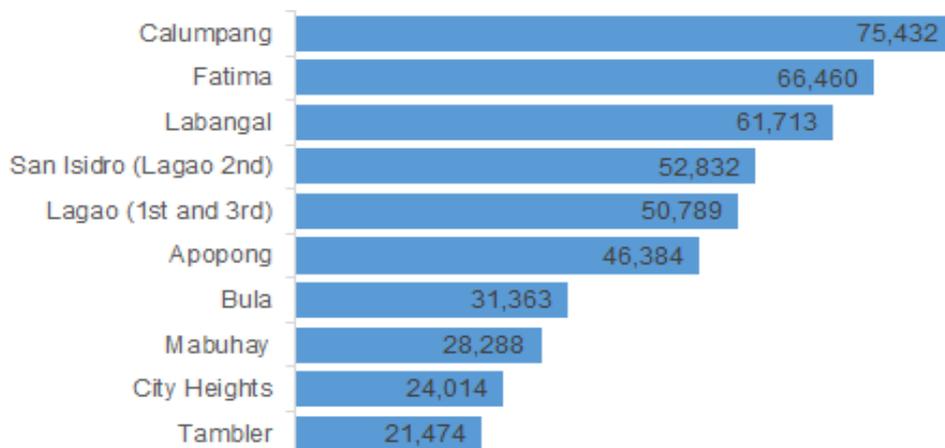


Figure 2. Top Ten Most Populous Barangays of General Santos City

### 3.3. Transport Situation of General Santos City

GenSan has a diverse set of public transportation modes (Figure 4). The trisikad is a smaller version of the tricycles that can fit four passengers and mostly operate in secondary roads, with some venturing out into the major highways. The habal-habal is a motorcycle taxi, which serves the urban peripheries of the city. As no law authorizes and regulates motorcycle taxis, such forms of public transportation have been deemed illegal and unsafe. With private motorcycles moonlighting as habal-habal, regulation is virtually impossible (GenSan SUID, 2019).

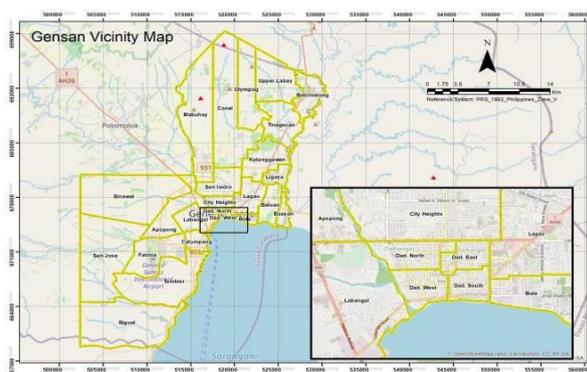


Figure 3. Map of General Santos City (City Center inset)

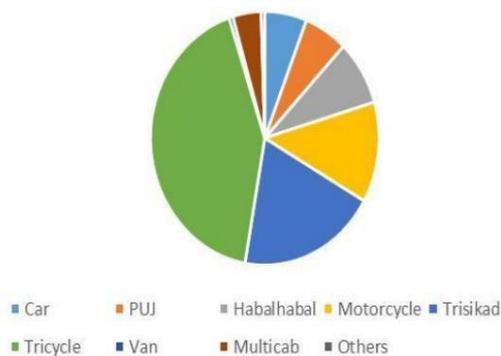


Figure 4. Trip Modal Share of General Santos City (GenSan LTPRP 2017)

81 percent of all school-bound and work-bound trips are by public transportation, and the rest are made by private transportation. Only 6% of the private transport trips are made by car, the rest by motorcycle. The city has a significant share of trips made by public transportation, with the tricycles sharing almost half of all trips. The growth of the tricycle as the dominant mode of transportation, they have pushed the existing jeepneys from 11 routes to just operational routes (GenSan LTPRP, 2017).

Proliferation of tricycles prevails as a problem for the LGU and operators alike. A study in 2014 estimated that there are about 42,000 tricycles that operate throughout GenSan, which could mean there are many unregistered (“colorum”) units compared to the registered units, with the other tricycles coming from the neighboring municipalities. This was determined through a cordon line survey at the borders, counting the tricycles (private and public) in and out of the city (GenSan SUID, 2019). The SUID also identified tricycle proliferation as a problem to address as part of their local climate change mitigation actions. On the other hand, the jeepney operators see tricycles as a threat to their operations being their primary competition for ridership. As the tricycle sector realize the emergence and increasingly ubiquitous jeepney operations, some jeepney operators even claim that tricycles also have exhibited opposition.

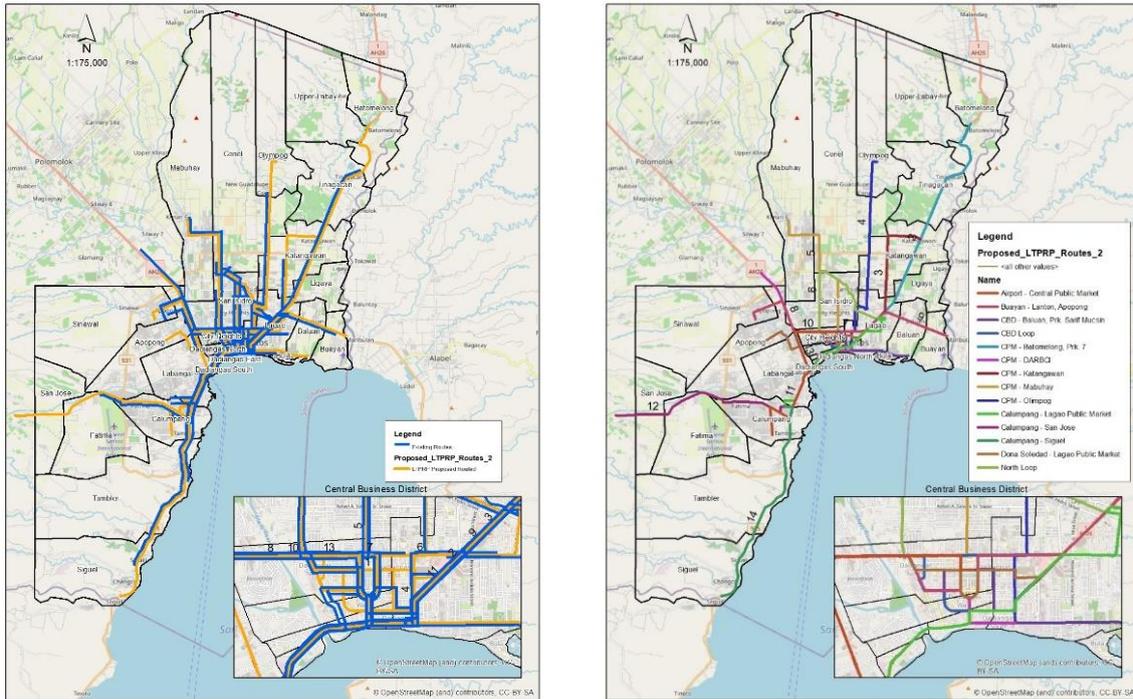
GenSan’s LTPRP is supposed to address these issues by providing more support to jeepney modernization and rationalizing their tricycle operations. One of the plans of the LGU was to define “tricycle operations clusters” that would serve as boundaries for tricycles. This strategy is still being studied, and in fact the DARE program has been engaged as well to monitor tricycle movement that was explored with the use of Radio Frequency IDs (RFID) technology.

### 3.4. Jeepney routes

As of February 2021, the GenSan LGU has opened fourteen (14) routes, as indicated in Table 1, and visualized in Figure 5 alongside the jeepney routes prior to the LPTRP formulation. It can be observed that the LPTRP routes (yellow) are mere extensions and mergers of the original routes. MGTC mentioned in the interview that their current routes are an example of merged routes.

Table 1. GenSan City New Routes (From ICTRANS, 2021)

Route Name	Route Length(Km)
ROUTE 1: CBD – PUROK SARIFMUCSIN	8.31
ROUTE 2: CENTRAL PUBLICMARKET – PUROK 7 BATOMELONG	19.06
ROUTE 3: CENTRAL PUBLICMARKET – KATANGAWAN	11.18
ROUTE 4: CENTRAL PUBLICMARKET – OLYMPOG	14.64
ROUTE 5: CENTRAL PUBLICMARKET – MABUHAY	12.41
ROUTE 6: NORTH LOOP	15.15
ROUTE 7: CBD LOOP	6.95
ROUTE 7: CBD LOOP	6.95
ROUTE 8: CENTRAL PUBLICMARKET – DARBCI	9.05
ROUTE 9: BUAYAN –LANTON, APOPONG	17.34
ROUTE 10: DOÑA SOLEDAD –LAGAO PUBLIC MARKET	12.87
ROUTE 11: CALUMPANG –LAGAO PUBLIC MARKET	12.20
ROUTE 12: CALUMPANG –SAN JOSE	14.03
ROUTE 13: AIRPORT – CENTRAL PUBLIC MARKET	16.87
ROUTE 14: CALUMPANG –SIGUEL	14.37



Overlay of old and LPTRP routes

LPTRP routes

Figure 5. GenSan City jeepney route map

### 3.5. Public Transport Alliance of GenSan (PTAG)

The Public Transport Alliance of GenSan (PTAG) is the first and largest transport cooperative in the city. It was established in 2014 to coordinate four-wheeled transport operators within GenSan (Gubalani, 2020). It plays a key role in the local public transport of the city and works closely with the LGU (Portal), with its current President, Mr. Robert N. Cang even having a position in the GenSan City Public Transport Route Plan Committee on the Local Public Transport Route Plan (LPTRP) team (GenSan LTPRP, 2017).

As of January 2020, PTAG was made up of seven (7) member-cooperatives, among them the Lagao Drivers Operators Transport Cooperative (LADOTRANSCO) and works to upgrade and modernize the public transport vehicle fleet of the cooperatives to be able to comply with the government's Public Utility Vehicle Modernization Program (PUVMP). The most recent cooperative to join PTAG is the Rajah Buayan Transport Cooperative, or RBTC, which joined the alliance in 2018.

During the COVID-19 pandemic, PTAG partnered with General Tuna Corporation, Philbest Canning Corporation and Century Pacific Agricultural Ventures Inc. to hire vehicles to shuttle factory workers. In total, PTAG has provided 32 units of e-jeepneys and 52 units of multi-cabs to shuttle around 3,000 essential factory workers who are crucial in supplying food for the rest of the country (2020).

### 3.6. Inventory of PTAG Public Transport Fleet and Service Structure

As of January of 2021, the PTAG has 301 jeepneys, with 51 of them being electric jeepneys, 30 being Euro-4 compliant modernized jeepneys, and 220 of them being traditional jeepneys. The largest cooperative is the Apopong Lagao Jeepney Operators and Drivers Transport Service Cooperative (ALJODTSCO), having 85 traditional jeepneys, and the smallest cooperative is

the Rajah Buayan Transport Cooperative (RBTC), with one (1) electric jeepney and three (3) traditional jeepneys. There are 245 drivers that comprise the membership of PTAG. These were included in an inventory shown in Table 2.

Table 2. Inventory table and participation to the study of PTAG members

OPERATOR	ROUTE/S SERVICED	NO. OF DRIVERS	NO. OF PARTICIPATING DRIVERS	RATE OF PARTICIPATION
Apopong Lagao Jeepney Operators and Drivers Transport Service Cooperative (ALJODTSCO)	Route 2, Route 8	60	0	0%
FVR Malagat Tumbler Transport Cooperative (FVR)		18	3	16.6%
Lagao Drivers Operators Transport Cooperative (LADOTRANSCO)	Route 10, Route 11	43	43	100%
Metro Gensan Transport Cooperative	Route 5, Route 6	107	38	35.5%
Rajah Buayan Transport Cooperative (RBTC)	Route 9	4	4	100%
Modelong Tricycle Drivers in Gensan Transport Cooperative (MTDGTC)	Route 4	13	6	46%

The operators were previously public transport drivers, either as tricycle drivers or jeepney drivers. They entered the industry from as early as 1994 (RBTC) to as late as 2016 (MGTC). The general trajectory for the operators was as a driver or operator-driver, and they then joined or formed cooperatives afterwards. The operators' transport groups mostly began through associations of drivers that evolved into cooperatives. The OFG requirements to give priority to cooperatives became a strong driver for their organization. Financial incentives from national and local government were also a major decision factor for the transport associations to form cooperatives. The DBP also played a part in developing cooperatives by lending money to cooperatives that proved to be financially capable.

Before SafeTravelPH, GenSan had a dearth of transport data from the studies described in Section 2.1. The city of GenSan already has access to extensive data related to transport and traffic from previous projects, such as the community-based monitoring system, the LPTRP, and the 2017 Traffic and Transport Management for Philippine CDS Cities Project, World Bank. However, most of these data were utilized only by the government, and operators lacked capacity nor resources to analyze data for their operations. The government also needed a way to monitor public transportation over space. Through SafeTravelPH, the government and

operators were able to benefit from real-time performance monitoring data and in fact claimed to have used the data to manage their fleet, such as improving frequencies/reducing headways as well as determining when a unit may dock after meeting its target mileage for the day. This is also enabled with the support of the LGU through its the Public Safety Office as it pushed for a more science-based approach to policy development.

SafeTravelPH was able to track 83 units for the period of the research collaboration, or 27.5% of the total units. 96 of 245 drivers are registered with SafeTravelPH, a rate of 39%. These were included in an inventory shown in Table 3-2. There was a large amount of non-participants and the main issue was lack of funds for mobile phones, mobile data and connectivity, which was not typically in the budget of some associations or individual drivers. Associations like ALJODTSCO, while willing to participate, decided to wait for a subsidy from DOTr and LTFRB before joining the program, hence the low to non-participation rate.

### **3.7. About MGTC**

MGTC is a cooperative of past tricycle operators and drivers in GenSan. The current chief of operations organized tricycle drivers beginning with three Tricycle Operators and Drivers Associations (TODAs), initially during the advent of the electric tricycles. When news of the government's thrust to modernize public transportation came to GenSan, MGTC decided to organize and upgrade from tricycle operations to multicab before it went for modern units in 2018. MGTC's first 8 modern units were partly supported by the GenSan local government, although most of the capital costs were funded through private bank financing. Now, MGTC alongside LADO Trans Co are two of the first adopters of modern and electric jeepneys. MGTC is a member of PTAG. MGTC to date has 128 jeepneys of which 21 are electric, while 1 is a modern Euro 4 diesel unit. Currently, MGTC is authorized to operate in Route 5 (Dona Soledad/Brgy Mabuhay - Lagao Public Market) for 73 jeepneys and 6 (Northern Loop) for 62 jeepneys, both of Class 2 standards. Route 5 is a rationalized route from GenSan's first LPTRP (2018). Route 6 on the other hand is a developmental (new) route which was found to be competing with other transportation options and was recommended for review in the upcoming LPTRP update for 2021.

## **4. METHODOLOGY**

### **4.1. Research Framework**

Figure 6 shows the processes that the overall study has undergone leading to this paper. The research is a combination of (a) software and hardware R&D, (b) government collaboration, (c) operator engagement and participation, (d) IoT deployment, (e) monitoring, evaluation, and feedback, and (f) survey and interviews. Each are briefly discussed as follows:

- a. At the core of the research is the constant R&D of the SafeTravelPH information exchange platform. This includes hardware and software to cover data capture, data warehousing, and UI/UX research.
- b. Just as critical is building the use case with stakeholders. For GenSan's case, the researchers formalized a collaborative research agreement with the PSO of the local government.
- c. Operators were then engaged, oriented, and encouraged to participate in view of the PSO's thrust in improving public transport support and services.
- d. The deployment of IoT devices (cameras, RFID) and installation of mobile phones required

significant coordination and testing before proper monitoring is conducted. The researchers took regular feedback from LGU and operators alike.

- e. Fleet performance was monitored daily for participating drivers and reports were submitted monthly. These reports are validated by the operators and are used for their own operational decision making.
- f. An operations survey was conducted to gather data on operational practices, fleet management, infrastructure, repair and maintenance, and costs. Operators were also interviewed for specific insights on the data they provided in the surveys.
- g. Lastly, the data are used to analyze policy. In the context of this study, crowdsourced data, surveys and interviews were utilized to describe modernization at the time of COVID19.

These seven (6) fundamental components are the drivers of this study that loops back to improving SafeTravelPH services with the aim of supporting improvements in public transport quality of service and understanding ground truths of public transport operations, which has been contextualized for MGTC as case study in this paper.

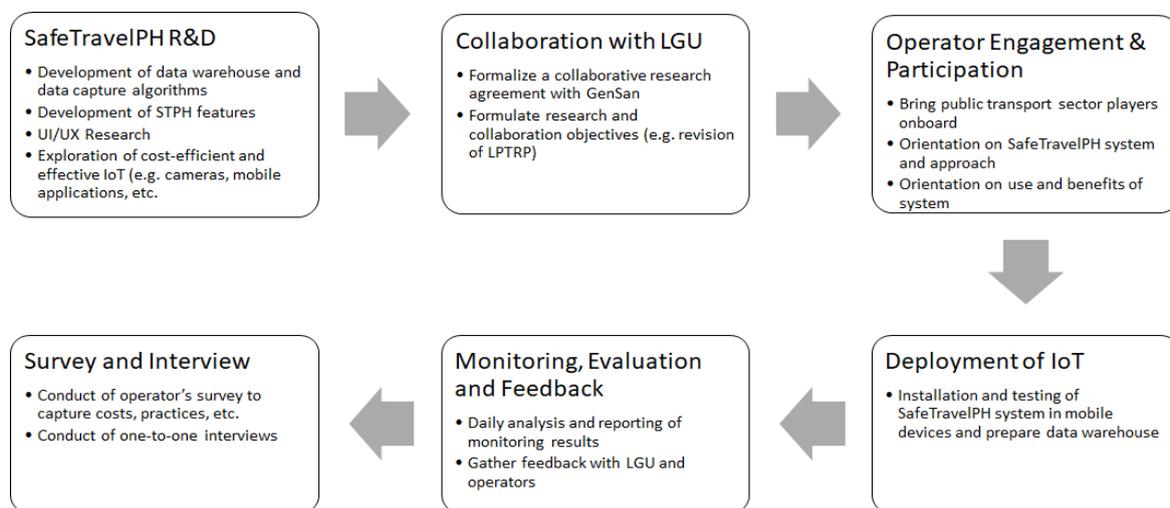


Figure 6. Research framework

#### 4.2. Costs inventory

The data and analysis also looks into relevant capital expenditure (CAPEX) and operational expenditure (OPEX) as prelude to a more detailed life cycle analysis, which is broadly described by Wang et. Al. (2019) in the diagram below. For this study, only initial costs (CAPEX) and operating costs (OPEX) are covered as the life cycle cost inventory are still ongoing.

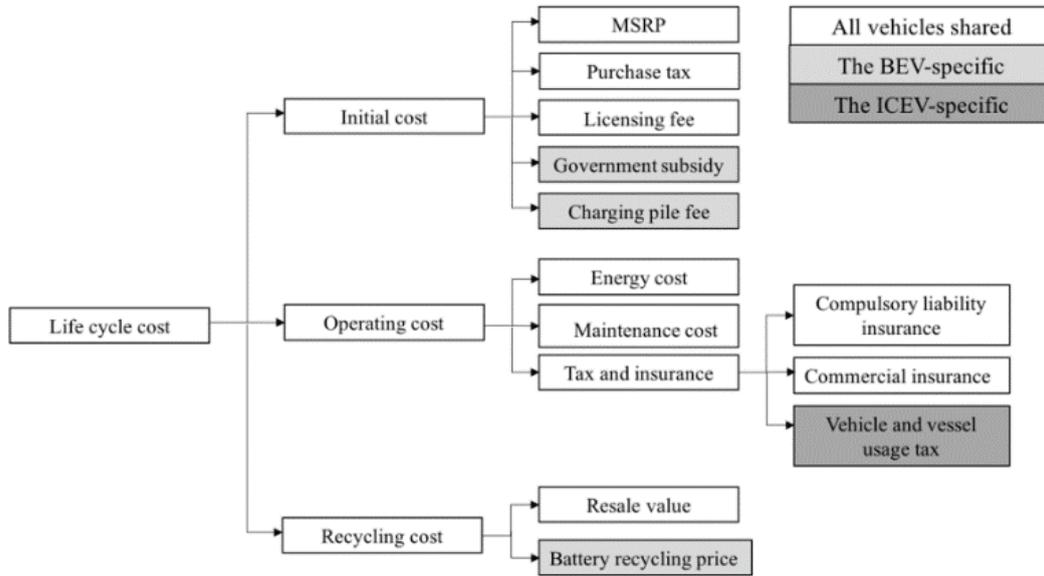


Figure 7. Life cycle costs in transportation (Wang et. Al. 2019)

### 4.3. Data

Jeepneys of participating operators in GenSan were tracked through SafeTravelPH over 3 to 5 second intervals. SafeTravelPH tracked vehicle location while also allowing drivers to input boarding and alighting during operations. The data was transmitted through Cloud servers and analyzed locally by the researchers.

For this paper, a total of 4.9 thousand hours of logged data from MGTC were analyzed across 59 devices and drivers from April 1 to May 31 2021. During this period, MGTC only operated on Route 5. Succeeding months were not analyzed due to the full implementation of DOTR’s Service Contracting program which became the priority of all jeepney operators. Level of participation varied daily, with some logging no data for a day.

Table 3. Data profile for MGTC monitoring

Number of participating devices	59
Inclusive dates	April 1 - May 31
Total logged hours	4.9 thousand
Total logged vehicle kilometers	55.02 thousand

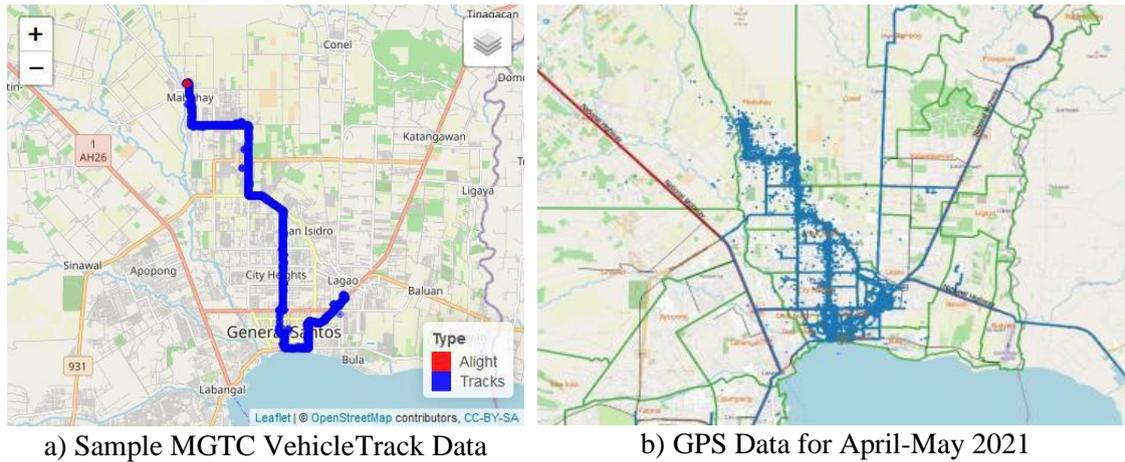


Figure 8. SafeTravelPH vehicle tracking feeds of MGTC Route 5 in GenSan

#### 4.4. Service Performance Analysis

Only individual drivers' performance is analyzed focusing on the deployment for MGTC. For the months of April and May, the critical speed averaged at 34.06 kph. In the same period, MGTC drivers averaged at 2.3 roundtrips per day across all the participating units, with about 3 to 4 persons per trip.<sup>4</sup> This resulted in an average of 22 total ridership per day. On a good day, MGTC's operations in Route 5 can reach 30 to 40 persons per day, which was confirmed by the chief of operations during the one-to-one interviews.

Figure 9 presents the number of roundtrips from April to May vis-a-vis the number of participating drivers during the monitoring period. The chart illustrates the number of roundtrips on average logged by each participating driver. The drop of participating drivers in May can be clearly seen as this was the period of transition to the Service Contracting. Although data is insufficient to check for month-on-month trend and seasonality, it can be observed that there is an upward trend in the number of roundtrips heading towards the end of each month when averaged across all participating drivers.

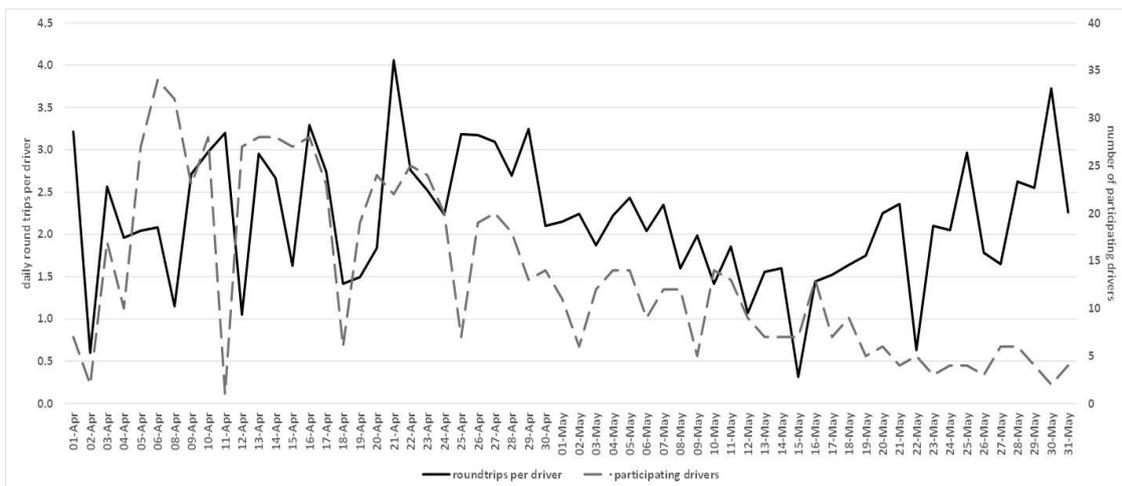


Figure 9. Daily roundtrips per participating driver for MGTC in April and May

<sup>4</sup> These estimates are largely influenced by accurate driver submissions via the SafeTravelPH Application, although the authors note that at least for April, participating drivers have been active before the Service Contracting Program led drivers to shift to that program's application.

In contrast, Figure 10 presents the average passengers per trip vis-a-vis the roundtrips per day in April and May. What can be observed is a very low occupancy in April and May, with brief spikes of “good ridership” in early April and late May. Again, a caveat is the religious input of drivers, Nonetheless, many of the drivers are religiously keying in boarding and alighting during this period before the Service Contracting program.

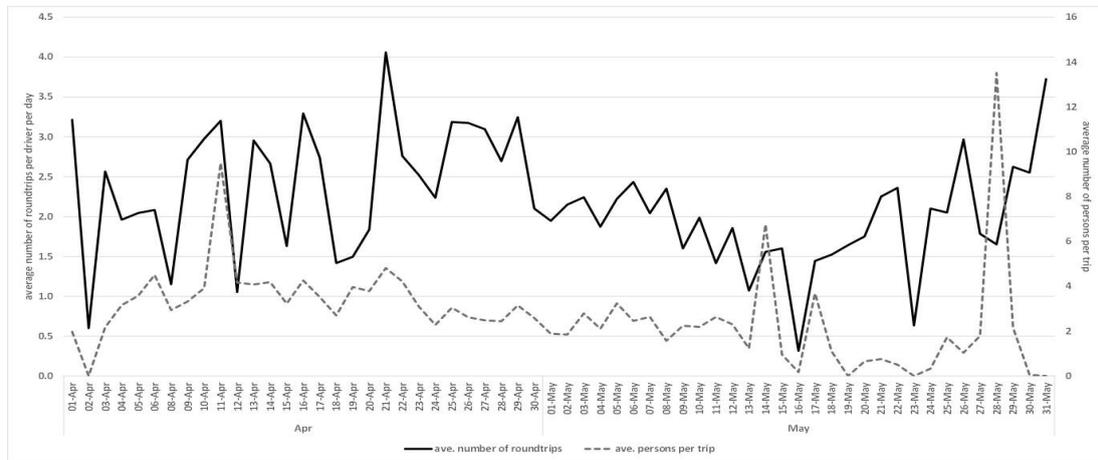


Figure 10. Daily round trips and passengers per trip per vehicle per day for April and May

#### 4.5. Survey and Interview with MGTC’s Chief Operator

An operator’s survey was conducted to capture the following: (1) fleet information; (2) detailed characteristics of routes including garages and depot; (3) fleet management practices; (4) energy management practices; (5) operational management approaches; (6) vehicle inspection and maintenance; (7) end-of-life strategies; and (8) feedback on existing public transportation policies by the national government that includes the PUVMP. Responses to the survey were supplemented and validated through one-to-one interviews with the chief operators. The interview was also an opportunity to discuss challenges brought about by the pandemic situation. To contextualize the costs of modernization, detailed sources and amounts were asked. Table 4 shows the costs indicated in the survey and validated through the interview.<sup>5</sup>

Table 4. MGTC costs of modernization

Source	Unit	Number of Units	Unit Amount (PhP)	Total Amount per Year (PhP)
<b>Capital Expenditure</b>				
Euro 4 diesel jeep purchase	per vehicle	1	2,450,000	2,450,000
Electric jeep purchase	per vehicle	21	1,840,000	38,640,000

<sup>5</sup> This is an initial list as some information are pending as of writing this version of the paper

Source	Unit	Number of Units	Unit Amount (PhP)	Total Amount per Year (PhP)
Slow charging station plus office construction	per station	1	150,000 - 250,000	150,000 - 250,000
Battery packs (reserves)	1 set per 2 vehicles	10	460,000	4,600,000
<b>Operational Expenditure</b>				
Battery rental (8 units)	per month	8	3,000	24,000
Garage rental(2 properties)	per property per month	2	30,000	60,000
Mandatory vehicle insurance <sup>6</sup>	per vehicle per year	135	60,000 <sup>4</sup>	8,100,000
Vehicle electricity consumption <sup>a</sup>	Wh/km	216	Php 9 per kWh	34,551
Fuel consumption (diesel) <sup>a,b</sup>	Km/L	6	PhP 52 per liter	161,200
Inspection and Maintenance <sup>c</sup>	Per unit month	22 units 12 months	5,000	1,320,000
Management Fees/Association Dues	Per month	12 months	30,000	360,000
Staff <sup>d</sup>	Per person		TBD	TBD

<sup>a</sup> Assumption based on the performance of Tojo e-jeepney model units adopted in GenSan. It is acknowledged that new models are being purchased with new performance capabilities. Electricity rates based on 2020 Mindanao rates.

<sup>b</sup> Assumption based on the performance of Euro 4 diesel jeepneys and with an average of vehicle km/unit. Diesel prices based on current prices.

<sup>c</sup> This is mandatory as part of the PUVMP loan programs

<sup>d</sup> This assumes minimum wages for the number of personnel indicated by MGTC. Unfortunately, to date, this data has not been provided and validated, but retained here for the sake of discussion.

Other identified sources of costs have yet to be included as of writing this paper. These costs would be included in an updated analysis of this study and would cover: (1) Staff remuneration; (2) Business registration fees; and (3) Building permits and requirements. In line with the costs and processes of modernization, MGTC's chief of operations mentioned the following challenges because of the PUVMP:

- MGTC currently has pending loans from the Development Bank of the Philippines (DBP) since the Bank has apprehensions on the operators' capacity to pay due to limited travel

<sup>6</sup> This amount is based on LADO TransCo's response. Jeepney insurance is accredited by the LTFRB and would be the same for most vehicles.

during the pandemic. This constrains the cooperative's compliance under their Notice of Selection (NOS)<sup>7</sup> to meet at least 15 modern units as they try to fill in the 156 total authorized units in their routes.

- MGTC's Route 6 as a developmental route is viable under the condition that demand for the current tricycles and colorum vehicles would shift to the jeepneys, which has not been met. This has forced the halting of jeepney operations. In fact, the SUID identified the dominance of tricycles as a challenge to local public transport operations. To date, MGTC temporarily operated on the route last June 6, 2021, in view of subsidies from the Service Contracting Program of DOTR/LTFRB during the pandemic.
- Some of the OFG's requirements, such as the required resident mechanic per ten (10) vehicles, place unnecessary costs on the operators. This is because new vehicles usually do not require repairs, while maintenance can be done by drivers. The current business model forced by the OFG is not sustainable.
- During the pandemic, as seen in Section 4.3, ridership has been very low due to the cycle of travel restrictions both domestic and interregional. The quarantines have reduced travel, especially for students. Prior to the pandemic, MGTC already had wisdom in its fleet management approach, such as reducing or increasing headways for peak and off-peak operations. The SafeTravelPH system aided in this area for the pandemic but as seen from data, ridership has been severely affected.

#### **4.6. GenSan's public transport during COVID19 and beyond**

This study demonstrated that public transportation has been negatively affected by the pandemic, and this was reflected by the performance of ridership during the monitoring from April to May. It is only expected that the low ridership was slowly driving public transport operations to the red if not for financial support provided via the service contracting program. Although not the focus of this study, the implicit message is that modernization has been stagnated by the effect of restricted mobility during the pandemic. The service contracting somewhat helped in the survival of the sector temporarily, but long-term solutions are needed to sustain and even scale up the uptake of PUV modernization. Although COVID19 was a scourge to the public transport system, it also presents opportunities for green recovery, but the costs presented should be better-understood as was the aim of this study.

#### **4.7. Cost of modernization for MGTC**

Figure 11 presents the annualized data from Table 4. By taking a year of the CAPEX and OPEX, it is estimated that CAPEX is already 80% of the cost for MGTC. Under pandemic conditions, it will take MGTC years (to be estimated in another study) to recover unless supporting policies are provided. Although the table is indicative of MGTC's CAPEX and OPEX only, the figure clearly suggests that there are advantages in favor of electric vehicles compared to ICE Euro 4 vehicles. Even so, the cost is astoundingly high and implies high capitalization requirements. In the long-run, it is expected that operating electric jeepneys would have a net positive benefit as fuel costs are reduced.

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<sup>7</sup> The NOS is given to operators to recognize them as sole service providers of the route/franchise. This is distinct from the Certificate of Public Convenience (CPC) which is the franchise itself, and is given to the one with NOS upon application/presentation of units to be used

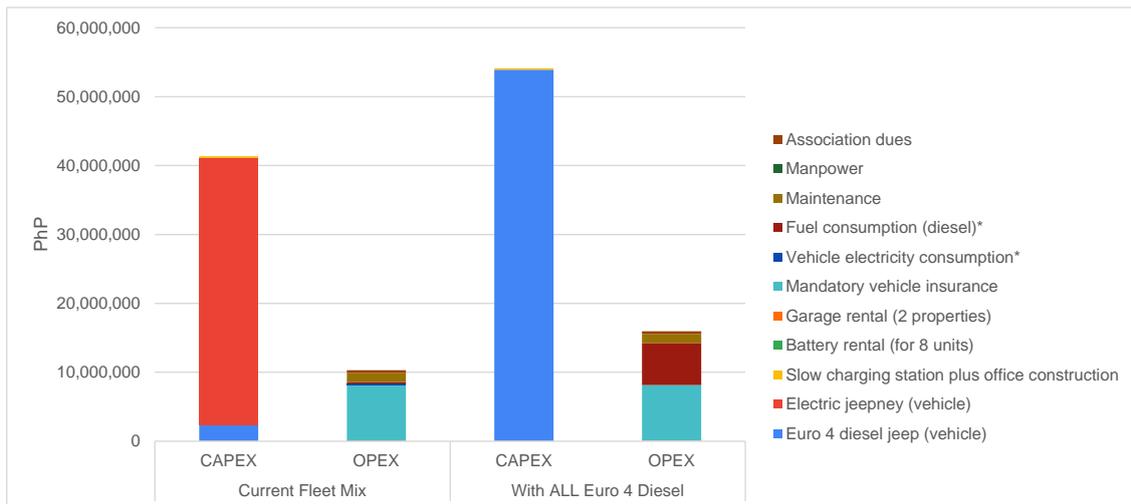


Figure 11. Estimated CAPEX and OPEX per year of MGTC's current fleet mix

The figure also illustrates the fact that the costs of modernization does not end with vehicle purchase, but also extends to infrastructure and manpower investments that are not covered by current policies in support of the PUVMP. For this reason, the operators continue to lobby for higher equity subsidies. There is a need to look at the details, especially on policy-relevant costs like taxation and tariffs, business registration costs, etc. in crafting a more comprehensive support package that can be time-bound in view of the modernization time horizon. GenSan's initiatives like studying the legal framework to make the SSF possible, create large strides in modernization at local level, even when national level bottlenecks exist.

#### 4.8. Complexities in modernization and the nuances of sequenced implementation

Modernization is a complex and very costly technical and political process that influences strategic, tactical, and operational decisions. First, it involves creating market demand for alternatives which on its own requires economic, financial, and fiscal instruments to build confidence. Second, it requires tactical investments in infrastructure and support systems such as digitalization, prior to which is the development of proper standards. Third, it requires building the capacity of both local government and operators to adapt to the changes without negatively affecting the basic public services.

According to the operators, the sequence of implementing the PUVMP was faulty. In their opinion, the government should have first focused on establishing and building capacity for cooperatives. Although the LTFRB and DOTR have shifted to this approach, it might have been late. Capacity building should include knowledge on cooperative structures, cooperative function and legal rights, cooperative culture, and effective cooperative management. MGTC had to learn this by themselves although there has been strong support from the local government.

Many cooperatives overlook the need to evolve and expand to other aspects of public transport operations such as fleet management, asset management, investment planning, and structured operations. PTAG took advantage of the Republic Act 9520, or the Philippine Cooperative Code of 2008, which allowed cooperatives to import without taxes. The cooperative required contributions from the members for capitalization and began building their business and expanding their capabilities. Because of this, the cooperatives were ready for the PUVMP's implementation. PTAG found a smooth transition into modernization and agreed to

continue to work together because of their positive experience with the alternative despite remaining an informal group. They have been planning to establish themselves as a legal entity. They intend to handle training, seminars, and other assistance that it can extend to its members. Again, strong financial and technical support provided by the local government played a critical role.

PTAG suggested that the modernization should only happen when the cooperative has gone through regular forums and trainings of the DOTR, OTC, LTFRB, and the local government to tackle fleet management, vehicle maintenance, financial management, and others. Cooperatives should demonstrate through evaluation its capacity to modernize.

#### **4.9. The importance of information and education campaigns**

Initially, there was a lot of resistance from the transport groups due to the cost and difficulty of modernizing the various vehicle fleets. The transport groups were concerned of the possible phasing out of old but still functional units and reluctantly procuring modern yet expensive vehicles. Instead of focusing on fleet renewal, the government should have started with building capacity for cooperatives - specifically in proper financial management and capitalization within a culture of cooperation. This can significantly build confidence in cooperatives to acquire modern vehicles and slowly pay-off the debts incurred from modernization.

The government should have enlightened the operators as to the necessity of modernization and that it is inevitable. PTAG had the foresight to identify that bus cooperatives would eventually take over routes that they were already servicing if they did not modernize, which would mean tough competition and less income. Hence, the operators were eventually convinced to modernize.

In the case of PTAG, the government was able to convince the general managers of each operator. After learning more about the modernization and its effects, the general managers made a case with their Board of Directors. PTAG strongly emphasizes the need to first convince the operation's Board of Directors because they decide if should be pursued. For this reason, time and effort were allotted in convincing the Board and eventually agreeing to the modernization. This resulted in a united front in discussing the program with its members and ensuring its smooth transition.

There was also resistance from the PTAG member operators in selecting the type of unit to be acquired. In one of the general assemblies of an operator, when the members asked what type of jeep was recommended, a specific brand was given instead of the type of jeep. As such, PTAG reiterated the importance of building awareness in available options in the market while being neutral to brand and being sensitive to costs.

Some technical knowledge is also key. For PTAG, it helped that the general manager was able to review and compare each option's technical specifications and design. He also computed the fuel consumption per liter of each option. Later, the matrix was presented to the members. It was demonstrated that a Euro-4 with a 2.9 or 3.0 engine can travel 6-8 kilometers with only a liter of fuel. Once converted, this would cost around PHP 150.00 per round trip. When compared with the electric jeep, it was almost half the cost per round trip (PHP 60.00 - PHP 80.00), which was itself already cheaper and more efficient than traditional jeeps. As such, when the cost was demonstrated, drivers were won over to the concept of electric jeeps for regular routes, and diesel jeeps for drives that required a longer range.

#### **4.10. The importance of LGU support and co-financing to modernization**

Though GenSan's cooperatives have by now accepted the national government's thrust for modernization, they recognize that the plans of the DOTR are not perfect. Their main concern

remains to be financing. As DBP and Landbank policy, modernization subsidies were initially pegged at PHP 80,000.00 before eventually increasing to PHP 160,000.00. This was still not enough as the DOTR was not able to assess and clarify the up-front costs of acquiring modernized jeepneys such as chattel mortgage fees, bank service fees, and others. As such, this has led to a lot of people thinking that the policy is anti-poor, as it is difficult for small operators and cooperatives to get the money together to fund the modernization. Moreover, this study has shown that there are other costs not covered by existing policies, including necessary investment in infrastructure, the terminal fees, cooperativization, and others. There are also trumped-up costs internalized by the current policies, such as garage, safety officers, and resident mechanic requirements. PTAG suggests that in this regard, the national and local government should work together to co-finance and support the operators. Since PTAG maintained an open communication with the GenSan LGU, they were able to voice their concerns on funding the procurement of new vehicles, specifically, leveraging the fact that the LGU encouraged the operators in going into the public transport industry. In effect, the LGU has stepped in and legislated an ordinance providing additional subsidies for the modernization program. The ordinance declared that for every modern vehicle unit a transport cooperative or corporation acquires, a subsidy of PHP 100,000.00 will be given. The guarantee of assistance from the LGU was a great boon for the transport cooperatives and eventually led to their agreement of modernizing their operations.

#### **4.11. Devolution of service contracting function**

PTAG agreed that the service contracting program is conceptually good. However, there are issues with its implementation. A common sentiment among the PTAG operators is that the mobile application required by the LTFRB in monitoring their operations, the GoSakay app, was inaccurate. For instance, in some routes in GenSan, mobile connection is unreliable. On dead spots, the app will not register the kilometers travelled. Instead, the app stops recording the unit's data until it is reconnected. This had a large impact on the service collection of drivers as LTFRB is highly dependent on the data provided by the app. As a result, PTAG operators use the SafeTravelPH app simultaneously with the GoSakay app to get accurate recordings of their trips. One lesson for this study is that accurate feedback requires proper post-processing and reporting of data to maintain user interest.

Additionally, PTAG members have encountered financial issues due to the program. Though there is a PHP 2,000.00 government subsidy for phone procurement, there is no such subsidy for mobile data. Operators had to pay for mobile data costs. Since the government had issues in disbursing the drivers' remunerations, operators continued paying their drivers' wages. With the cost of mobile data, drivers' wages, and the administrative outlay for preparing the reports to be submitted to LTFRB, the operators were shelling out more than what they were receiving. Hence, some PTAG operators did not have a choice but to suspend their participation in the service contracting program.

Moreover, PTAG members posit that the pilot program had a lot of avenues for corruption. For example, the use of GCash to pay operators is an easy method by which for the GCash accounts to be opened by the LTFRB themselves. One suggestion raised by the operators is to empower the cooperatives to submit a verified and authorized list of the drivers who are participating in the service contracting scheme, which would help regulate the funds being disbursed.

#### **4.12. Challenges and recommendations to the implementation of the LPTRP**

Upon implementation of the LPTRP and the legislation of an ordinance disallowing tricycles from traversing the national highway, PTAG saw opportunity and viability of operations

because of the changes at the planning and policy stage. However, this was met with opposition from tricycle drivers. The tricycle drivers perceived the changes as “theft” of their routes that threatened their income, resulting in alleged harassment incidents. Because of this, the jeepney drivers fought for support from local decision-makers.

PTAG believes stronger political will is needed from the local government to prevent “colorum” vehicles from operating. National and local governments should also assure the continuity of the LPTRP when the administration changes. Colorum vehicles should be prevented and eventually eliminated using the LPTRP as the basis. Additionally, there should also be an intensive information and education campaign (IEC) targeted on local implementers such as barangay officials and enforcers, so the LPTRP can properly be implemented. Their roles should be stipulated in an ordinance.

#### **4.13. GenSan’s support to PUVMP**

In compliance with the OFG, GenSan’s largest operators: LADO Transport Cooperative (LADO TransCo) and MGTC became two of the first adopters of “modern” jeepneys resulting from the PUVMP<sup>8</sup> including both new Euro 4 jeepneys and electric jeepneys. The two cooperatives are members of the Public Transport Association of GenSan (PTAG). This would not have been possible if the LGU has not been actively supporting the sector through the extensive studies, collaboration, policy formulation, and financial support. Three supporting mechanisms have been seen as strong enablers of the modernization of LADO and MGTC:

- a. To enable the modernization, the GenSan LGU partly subsidized the initial purchase costs of modern jeepneys for PTAG. To date, there are 30 modern Euro 4 diesel jeepneys and 51 electric jeepneys out of the 301 total units owned by PTAG. To facilitate this, in 2019, the city government issued a draft ordinance creating a Special Support Fund (SSF) to transport cooperatives to as much as PhP100,000 per vehicle compliant with government requirements, and one of these requirements is the approval of vehicle loans by the Development Bank of the Philippines (DBP). According to the ordinance, funds would be sourced from the city’s Disaster Risk Reduction and Management (DRRM) fund, but has been redirected to the City Economic Management and Cooperative Office (CEMCDO) as recommended by the city’s legal advisers in observance of the Commission on Audit (COA)’s findings that allocating DRRM funds is inconsistent with existing rules and regulations. To date, the subsidy has lapsed into law, thus, the cooperatives will receive the grant. According to the local government and from the local operators, all seven cooperatives would benefit from the subsidy subject to the loan approval of their procured vehicles by the DBP. The fund would subsidize units in line with GenSan’s local public transport route plan (LPTRP), to a maximum of PhP 38 million over two years beginning 2022.
- b. The city has also been open to explore support in supporting infrastructure. The LGU relayed that it is studying the possibility of shared charging infrastructure facilities that the LGU can channel investments to.
- c. Ultimately, the LGU demonstrated that it is open to continuously partner with the public transport service providers alongside academe and other development partners to ensure that it meets its goal of providing better public transportation services. GenSan’s LPTRP was by no means perfect, but the LGU collaborated and co-designed where needed with key stakeholders with public interest in mind.

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<sup>8</sup> While PTAG were the first modern jeepney operators as PUVMP pilot, the emergence of “modern jeeps” already happened with some operators in Metro Manila such as GET’s COMET and 1-TEAM e-jeeps attempts

PUV modernization in GenSan has been met by the same challenges of shifting to the alternative technologies in the current market. First is market availability. The first adopters in GenSan worked with ToJo motors for the initial units to be available in the city. Second are capital costs, including initial vehicle purchase and support infrastructure (garage and charging infrastructure). As also discussed in this paper, modernization entailed other costs beyond fleet transformation, as demonstrated by MGTC's case.

## 5. CONCLUSION AND RECOMMENDATION

The researchers, through its engagement with the GenSan LGU PSO and local public transport operators, contextualized the costs of modernization using a collaborative approach to big data analytics, intelligent transport system applications, data capture, fleet monitoring, and stakeholder consultation. This paper focused on MGTC's operations as a case study from April to May 2021. The researchers also gave context of local operations in light of the COVID19 pandemic. Based on data collected through IoT and the SafeTravelPH platform, it was found that jeepney operations remain at a loss due to restricted travel and changes in travel demand that has not been captured by the original LPTRP of GenSan. Moreover, based on interviews and the operators' survey, it was clear that modernization has been very costly, from the necessary capital investments down to the operational expenditures. The combined costs of modernization and the pandemic situation might prove to be debilitating to GenSan's jeepney sector if timely and proper reforms are not acted on. Hence, the complexity of modernization is recognized as a technical and political process that covers strategic, tactical, and operational decisions.

The performance assessment crowdsourced from MGTC's participating units showed that ridership has been very low, with few "good days" from April to May of 2021, within the partial lockdown periods. When contextualized with the costs of modernization from the operator's survey, it can be surmised that the sector has been in the red especially during the pandemic period, and in succeeding studies, this can be validated by looking at estimated pandemic revenues. Survival was only made possible by the financial support in the form of the Service Contracting Program, albeit a stop-gap measure during the lockdown period. In the long-run, the bottlenecks of the overall PUVMP would remain one of the largest obstacles in the modernizing public transportation.

Policy and technical reforms are imminent not only at local level but also in national policies. Some imminent reforms that this study recommends are as follows:

1. It is important to ensure the continuity of the PUVMP through proper legislation. Many players in the public transport sector like MGTC have made large investments that losing the program may leave the industry in debt at the cost of thousands of livelihoods.
2. The OFG should be reviewed and revised by identifying the sources of costs and scaling these requirements for a holistic picture of its effects on public transport operations. There should be "just transition", meaning proper sequencing and window period of specific requirements. Some requirements may in fact be redirected into external (third party) industries rather than internalized into operations. In this paper as an example, the resident mechanic requirement has been indicated as an unnecessary internal cost.
3. The OFG should be aligned with a roadmap with accurate timelines. This roadmap is ideally integrated with relevant roadmaps like the EV Roadmap being crafted by the Department of Energy, not only in view of industry development but also for creating demand for modernization in an equitable and just manner.
4. Local governments should be proactive in monitoring and reviewing their routes and updating their route plans. There should be clear strategies in shifting and managing travel

demand to ensure viability of routes. In line with this, the national government should also be proactive in building the LGU's capacity in storing, collecting, and analyzing public transport data. Services provided by open platforms like SafeTravelPH would make this process more sustainable. It is therefore recommended to guide LGUs in building similar partnerships and collaborative research.

5. One of the drivers of modernization in GenSan was the support and subsidy provided by the local government. It will be beneficial to the PUVMP to take this experience forward, exploring which can be replicable for other LGUs and creating an enabling policy landscape so that LGUs can fund the modernization of their public transport operators.
6. As LGU needs better capacity to formulate plans and finance their local operators, the LTFRB should likewise have better capacity to evaluate and adjust franchising requirements at local level that is responsive to local context.
7. The Service Contracting Program could be better and integrated with the PUVMP, such that it enables modernization and service quality. As such, the DOTR could begin looking into an integrated approach to these programs. Moreover, systems should be built for efficient implementation and monitoring, which should cover data capture, data warehousing, analysis, and decision support.

This study also has the following recommendations to succeeding research:

1. Research on the life cycle costs of modernization especially in cities that aspire for adopting electric jeepneys. This can be done for GenSan using the inputs shown in this paper. Life cycle costs are important decision factors especially when new technologies and infrastructure are involved. The life cycle costs will also further refine the economic and fiscal policy reforms necessary for modernization. A broader cost-benefit analysis (CBA) may also be in order subject to available data.
2. Revisit the origin-destination of GenSan and review the observed and latent travel demand of the city through surveying, open platforms like SafeTravelPH, and transport modeling.
3. Conduct policy research on economic and financial hinges to enable modernization in a just and equitable manner. This may mean specific adjustments and lag time for tax incentives that cover not only local market entry but also sustainable transport operations.
4. Rationalize public transport routes and services. Although GenSan currently only has jeepneys and tricycles, there should be a longer-term view of the transition to larger capacity vehicles
5. An integrated tricycle planning framework can be studied to improve LPTRP processes, and this should also come into a broader Integrated Land Use and Transport Master Planning Framework for Local Governments.

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