

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

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). Project 3 of the program 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 SafeTravelPH¹ - a platform owned by the University of the Philippines that is comprised 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 for planning. Through the project, a collaborative research agreement is formed with the Local Government Unit (LGU) of General Santos City (GenSan) through the newly-formed Public Safety Office (PSO). This new unit of the LGU leads the City's implementation of disaster preparedness and emergency response. The PSO is further discussed later in this paper.

GenSan is one of the pilot cities of the Public Utility Vehicle Modernization Program (PUVMP) of the Department of Transportation (DOTR). It is also one of the first to develop a Local Public Transport Route Plan (LPTRP) which it submitted in 2018 one year after the launch of the PUVMP. Several 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 agreed to collaborate with the researchers in deploying SafeTravelPH and other Internet of Things (IoT) for gathering data and monitoring the performance of jeepneys and tricycles especially during the pandemic.

While the engagement with GenSan covers all jeepney cooperatives, this paper focuses on the case of the Metro GenSan Transport Cooperative (MGTC), tackling their experiences with modernization, the effects of the pandemic, and the implications on the future of public transportation in GenSan. To provide insights in their on the ground experiences, 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 effects of the PUV Modernization Program on General Santos City's public transportation system four years after its implementation using big data crowdsourced from operators and interviews with local stakeholders. This study also aims to contextualize the costs of modernization on local operations using MGTC as a case study. Lastly, this study also aims to provide insights on the confounding effects of the COVID19 pandemic and what it means for 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 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.

¹ For more information, visit <https://safetravel.ph/>

2. LITERATURE REVIEW

The implementation of PUVMP 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. The guidelines lay out the policies in place for the application of appropriate modes of public transportation to be applied in a specific corridor or route. It also lays out a hierarchy of road transportation modes, depending on the passenger demand of the corridor measured by passenger per hour per direction (pphpd), and the vehicle capacity. The hierarchy is laid out with the Public Utility Bus on top, followed by Mini-buses, PUJs/UV Express, Filcabs.

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.

2.1. Strategic, Tactical, and Operational Decisions in Public Transportation

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).

2.2. Operational Costs of Modernization

Modernizing the local Philippine jeepney industry is meant to lay the foundation for enabling

public transport system reforms and is intended to redirect the current motorization trend considering its rapid growth over the past decade. Though there are 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 is 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.

The GIZ studies showed that commercial revenues can increase from the operation of larger capacity vehicles while also increasing operating intensity through shift-based staffing patterns vis-à-vis the traditional “boundary” system, wherein a driver rents the vehicle for the day and operates a single shift. However, this improved commercial performance comes at a cost: (1) increased investment requirement in the purchase of new vehicles, and (2) drastic changes in operating structure featuring salaried staff creating increased cost overheads. It was estimated that an average investment for a traditional jeepney and franchise would be at 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. The original studies did not even include costs in infrastructure and human resource costs.

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 commercial 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, route rationalization, 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 surrounded by the municipalities of South Cotabato and Sarangani Province: Malungon in the north, Maasim in the south, Alabel in the east, and T’boli in the west.

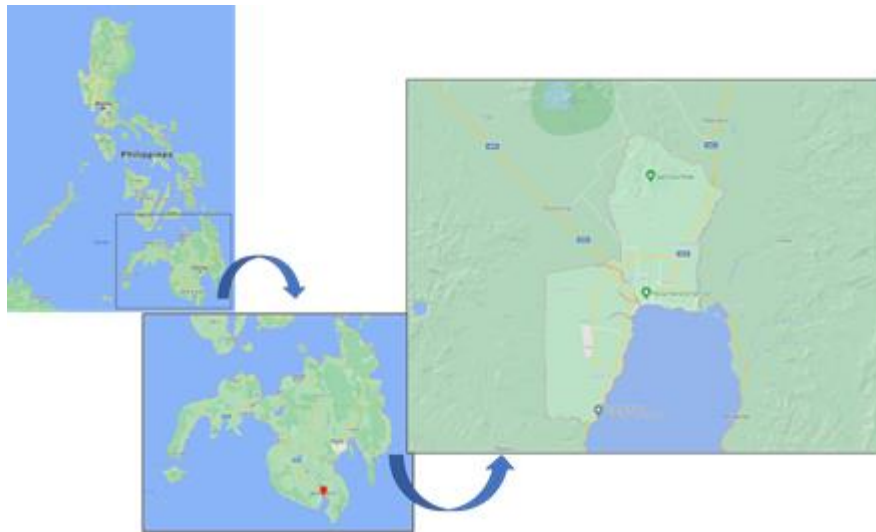


Figure 3-1. Location Map of General Santos City, Philippines (Source: Googlemap)

GenSan City envisions itself as a globally competitive and livable city with the following vision statement:

“By 2030, General Santos City, the Home of Champions, is a globally competitive and livable city where prosperous, healthy, friendly, well-educated and responsible citizens actively participate in effective governance for a sustainable future.”

In line with this, the city implemented ordinances to encourage a livable city. For instance, in 2018, the city government passed an ordinance enacting the comprehensive land transport and traffic code of the city. Additionally, in 2020, there was an ordinance adopting the new organization structure of the Public Safety Office (PSO), which governs the City Transportation and Traffic Engineering Division, City Transport and Traffic Management Division, City Civil Security Division, City Disaster Risk Reduction and Management Division, and Administrative Division. The PSO is responsible for administering and implementing all traffic enforcement operations, traffic engineering services, traffic and transport planning, regulations and franchising, transport facilities management, traffic education programs, and movement of persons and goods.

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 persons from a population of 538,086 in the 2010 census of population. This translates to a 1.91 percent growth of the population from 2010 to 2015. The number of households in 2015 is at 144,340, with an average of 4.1 household members per household. Figure 3-2 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.

Moreover, 64 percent of the working age population are employed, with an 84 percent and 34 percent of male and female residents are part of the labor force, meaning a larger number of men are employed than women (GenSan SUID 2020).

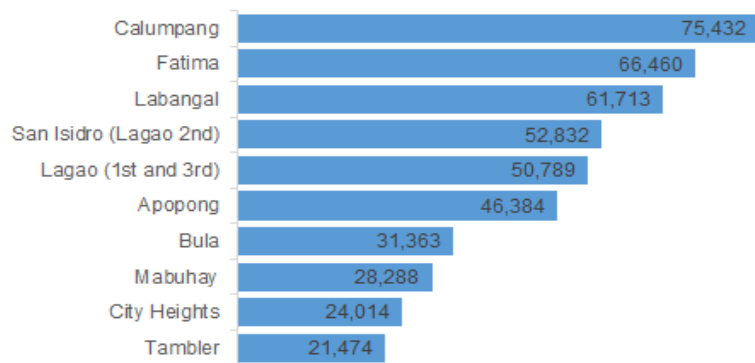


Figure 3-2. Top Ten Most Populous Barangays of General Santos City

3.3. Transport Situation of General Santos City

The City of General Santos has a total of 583.194 km of local roads. Only 27% are made of concrete and 1.8% of asphalt, and the rest are unpaved roads. The city road density per 1000 population is at 0.836 kilometer per population, which is below the benchmark of 2.4 per 1000 population (GenSan LTPRP 2017).

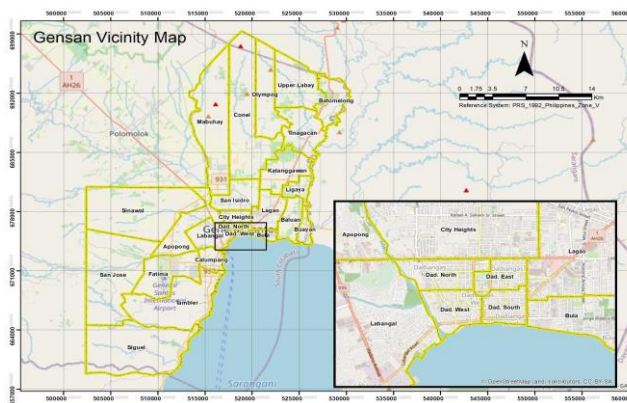


Figure 3-3. Map of General Santos City (City Center inset)

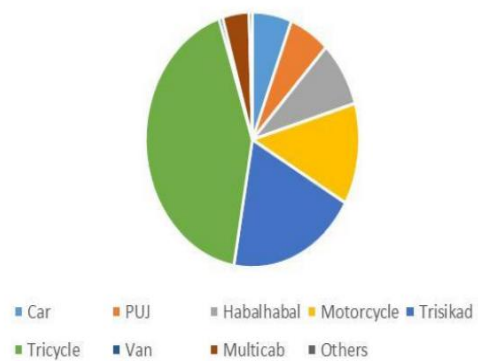


Figure 3-4. Trip Modal Share of General Santos City (GenSan LTPRP 2017)

There are four highways that connect the city to its surrounding municipalities and provinces, which are Digos-Makar Road, Makar-Marbel Road, Makar-Kiamba Road and Digos-Junction-Buayan Airport Road. General Santos City also has its own international airport and a city wharf.

The city has a diverse set of public transportation modes (Figure 3-4). The trisikad is a smaller version of the tricycles which can fit four passengers. The trisikad is mostly found 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).

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).

The number of tricycles, authorized and unauthorized, has been a challenge to improving the overall traffic conditions of the city. The City’s Motorized Tricycle Franchising and Regulatory Board has only registered 4,500 units, while the LTO registered units of tricycle and similarly designed motorcycles with sidecars number about 11,000. A study in 2014 estimated that there are about 42,000 tricycles that operate throughout General Santos City, which could mean there are many unregistered 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).

3.4. Jeepney Routes

As of February 2021, the GenSan LGU has opened fourteen (14) routes, as indicated in Table 3-1, and visualized in Figure 3-5.

Table 3-1. GenSan City New Routes (From ICTRANS, 2021)

Route Name	Route Nodes and Links	Route Length (Km)
ROUTE 1: CBD – PUROK SARIF MUCSIN	Via P. Acharon Boulevard – Pioneer Avenue – Quezon Avenue – Laurel Avenue – Quirino Avenue – Magsaysay Avenue – Pioneer Avenue – Acharon Boulevard – J.P. Royeca Avenue – Vice Versa	8.31
ROUTE 2: CENTRAL PUBLIC MARKET – PUROK 7 BATOMELONG	Via Santiago Boulevard – J. Catolico Avenue – Maharlika Highway – Vice Versa	19.06
ROUTE 3: CENTRAL PUBLIC MARKET – KATANGAWAN	Via Santiago Boulevard – J. Catolico Avenue – Nursery Road – Vice Versa	11.18
ROUTE 4: CENTRAL PUBLIC MARKET – OLYMPOG	Via Santiago Boulevard – National Highway – Leon Llido Street – NLSA Road – Conel Road – Vice Versa	14.64
ROUTE 5: CENTRAL PUBLIC MARKET – MABUHAY	Via P. Acharon Boulevard – Pioneer Avenue – Roxas Street – National Highway – Aparente Street – NLSA Road – Dacera Avenue – Vice Versa	12.41
ROUTE 6: NORTH LOOP	Via Dacera Avenue – NLSA Road – Leon Llido Street – Tionsgon Street – National Highway (A& B)	15.15
ROUTE 7: CBD LOOP	Via Bulaong Terminal – Osmeña Street – Quezon Avenue – Magsaysay Avenue – Santiago Boulevard – J. Catolico Avenue – National Highway – Mangga Street (A & B)	6.95
ROUTE 7: CBD LOOP	Via Bulaong Terminal – Osmeña Street – Quezon Avenue – Magsaysay Avenue – Santiago Boulevard – J. Catolico Avenue – National Highway – Mangga Street (A & B)	6.95

ROUTE 8: CENTRAL PUBLIC MARKET – DARBCI	Via P. Acharon Boulevard – Pioneer Avenue – Osmeña North – Bulaon Avenue – National Highway – Maharlika Highway – Vice Versa	9.05
ROUTE 9: BUAYAN – LANTON, APOPONG	Via Lagao – Buayan Road – National Highway – Pendatun Avenue – Osmeña North – Bulaong Avenue – National Highway – Maharlika Highway – Marcos Avenue – Vice Versa	17.34
ROUTE 10: DOÑA SOLEDAD – LAGAO PUBLIC MARKET	Via Maharlika Highway – National highway – Bulaon Avenue – Laurel Avenue – Santiago Boulevard – San Miguel Street – J. Catolico Avenue – Arradaza Street – Calima Street – NLSA Extension – Ardonia T. – Vice Versa	12.87
ROUTE 11: CALUMPANG – LAGAO PUBLIC MARKET	Via Rizal Street – Makar-Massim Road – P. Acharon Boulevard – Pioneer Avenue – Magsaysay Avenue – J. Catolico Avenue – Arradaza Street – Calima Street – NLSA Extension - Ardonia T. – Vice Versa	12.20
ROUTE 12: CALUMPANG – SAN JOSE	Via Fil-Am Road – San Jose Road – Vice Versa	14.03
ROUTE 13: AIRPORT – CENTRAL PUBLIC MARKET	Via Fil-Am Road – Maharlika Highway – National Highway – Bulaong Avenue – Osmeña Street – Pendantun Avenue – Pioneer Avenue – P. Acharon Boulevard – Vice Versa	16.87
ROUTE 14: CALUMPANG – SIGUEL	Via Rizal Street – Makar-Maasim Road – Vice Versa	14.37

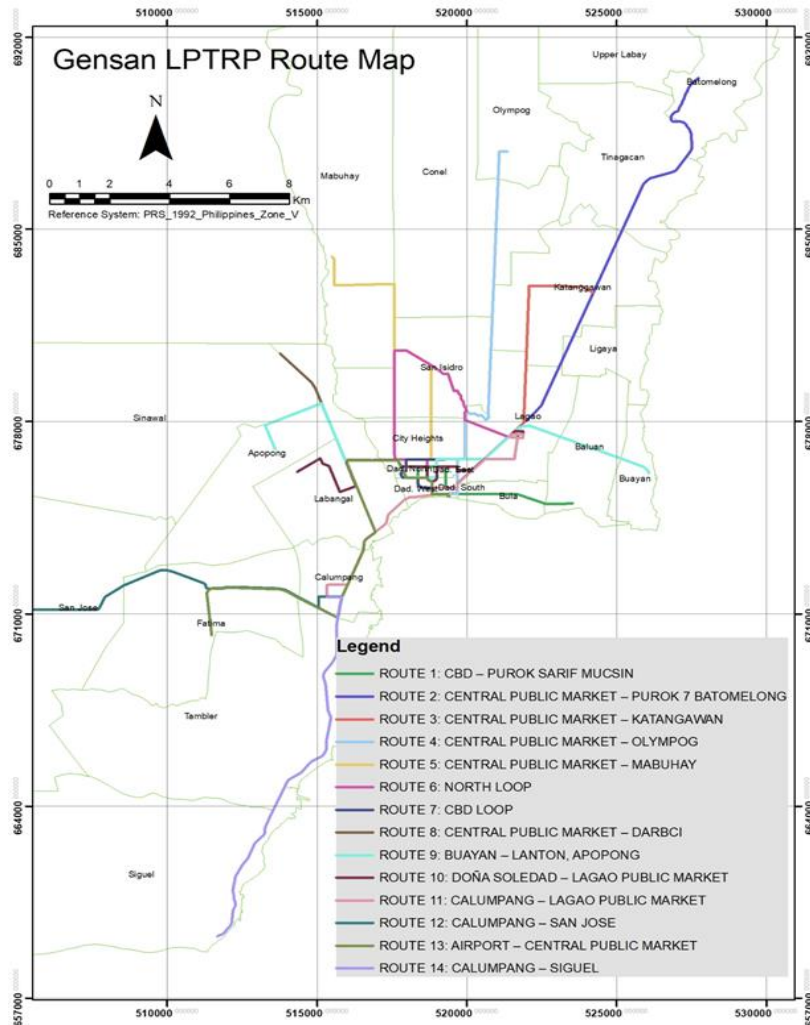


Figure 3-5. GenSan City LPTRP route map

3.5. PUVMP Adoption in General Santos City

The PUVMP aims to transform the Philippine public transportation sector through its ten components namely: (1) regulatory reform; (2) local public transport planning; (3) route rationalization; (4) industry consolidation; (5) fleet modernization; (6) financing; (7) vehicle useful life program; (8) pilot implementation; (9) stakeholder support and consultation; and (10) communication and awareness raising. The PUVMP’s overarching goal is to reduce the reliance on private vehicle use towards environmentally sound mobility solutions which includes high quality public transportation systems. At the core of the program is the OFG. While the OFG stipulates the requirements of road-based public transportation modes, the policy also details tactical and operational requirements for routes and the selection of operators. Likewise, the policy specifies the requirements for fleet modernization such that public vehicles should be low-emitting and follows ergonomic standards. The OFG requires public transport vehicles to be at least Euro 4 compliant.

In compliance with the OFG, GenSan’s largest operators: LADO Transport Cooperative (LADO TransCo) and Metro-GenSan Transport Cooperative (MGTC), became two of the first adopters of “modern” jeepneys, including both new Euro 4 jeepneys and electric jeepneys. The two cooperatives are members of the Public Transport Association of GenSan (PTAG). 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.

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.

3.6. 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).

3.7. Inventory of PTAG Public Transport Fleet and Service Structure

As of January of 2021, PTAG has 301 jeepneys, with 51 electric jeepneys, 30 modern Euro-4 diesel jeepneys, and 220 of them being traditional jeepneys. The largest cooperative is the Apopong Lagao Jeepney Operators and Drivers Transport Service Cooperative (ALJODTSCO) that owns 85 traditional jeepneys. The smallest cooperative is the Rajah Buayan Transport Cooperative (RBTC), with one (1) electric jeepney and three (3) traditional jeepneys. Among these, SafeTravelPH tracked 83 vehicles, or 27.5% of the total units.

There are 245 drivers that comprise the membership of PTAG, 96 of these drivers are registered with SafeTravelPH, a rate of 39%. These were included in an inventory as shown in Table 3-2.

Table 3-2. 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 prioritize cooperatives became 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.

3.8. 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 TransCo 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

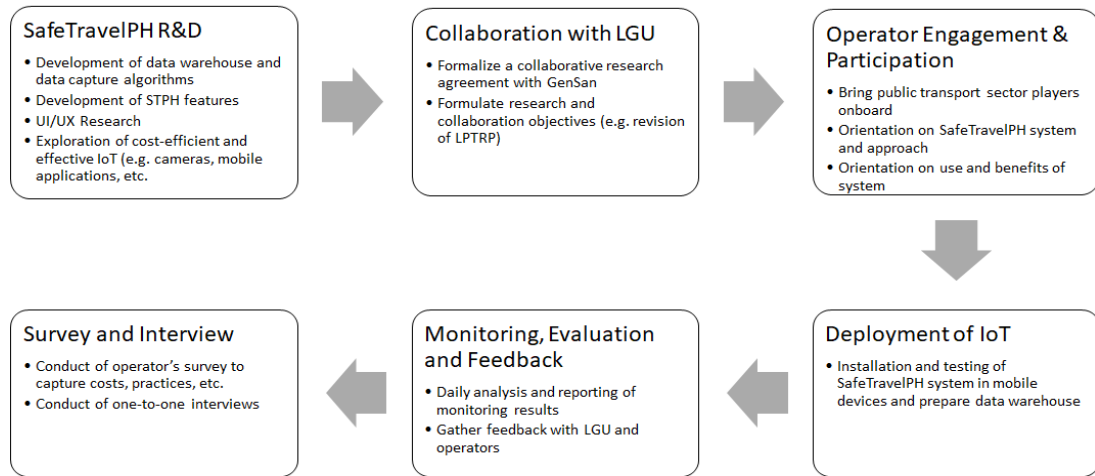


Figure 4-1. Research framework

Figure 4-1 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:

- 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.
- 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.
- Operators were then engaged, oriented, and encouraged to participate in view of the PSO's thrust in improving public transport support and services.
- 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.
- 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.
- 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.

These six (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.

4.2. 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 4-1: 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

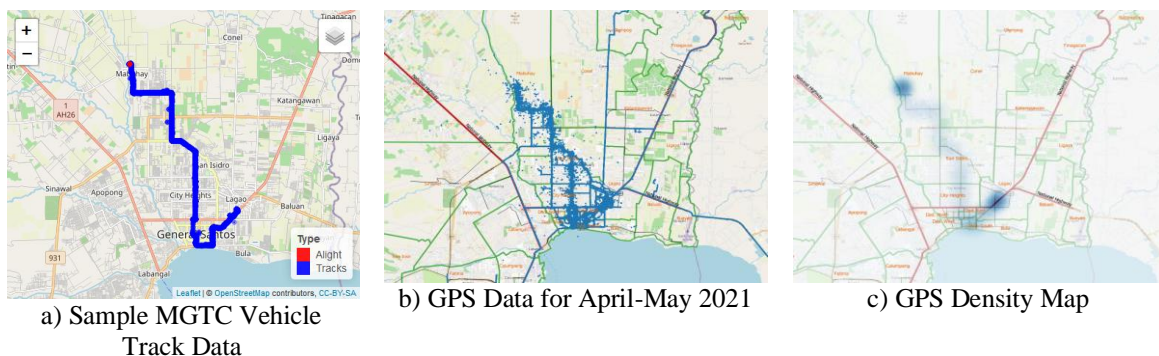


Figure 4-2: SafeTravelPH vehicle tracking feeds of MGTC Route 5 in GenSan

4.3. 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.² 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 4-3 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

² 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.

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.

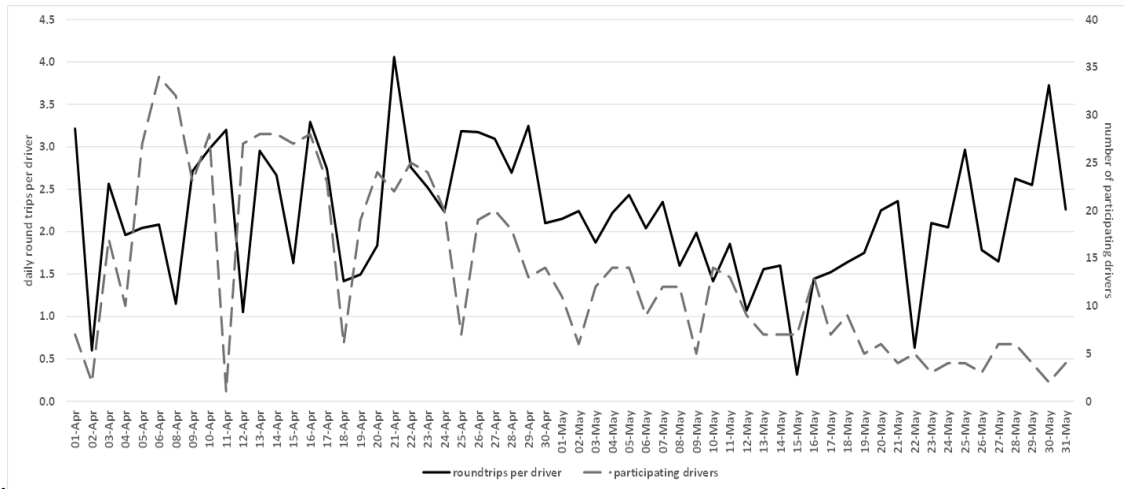


Figure 4-3: Daily roundtrips per participating driver for MGTC in April and May

In contrast, Figure 4-4 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.

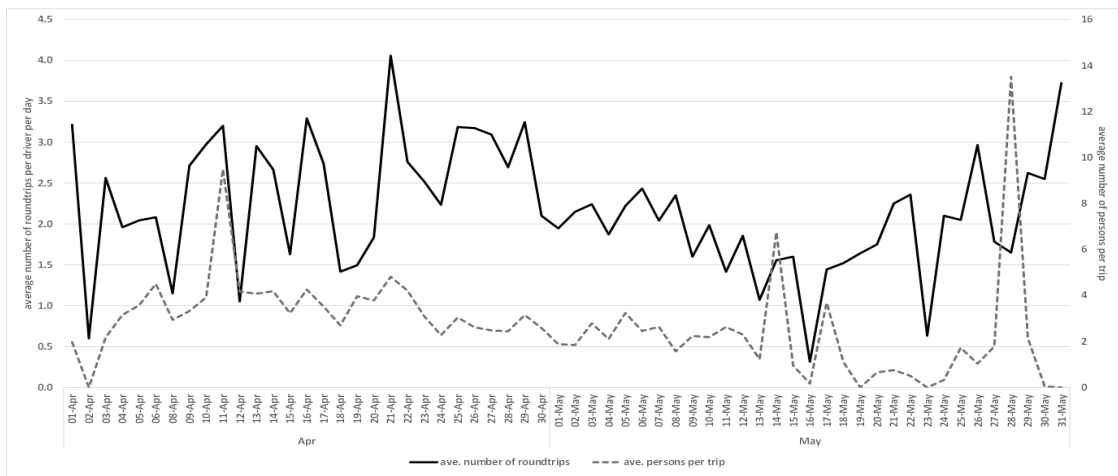


Figure 4-4: Daily round trips and passengers per trip per vehicle per day for April and May

4.4. 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 5-2 shows the costs indicated in the survey and validated through

the interview.³

Table 4-2: MGTC costs of modernization

Source	Unit	Number of Units	Unit Amount (PhP)	Total Amount (PhP)
<u>Capital Expenditure</u>				
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
Slow charging station plus office construction	per station	1	150,000 - 250,000	150,000 - 250,000
<u>Operational Expenditure</u>				
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	per vehicle per year	135	60,000 ⁴	8,100,000

Other identified sources of costs have yet to be disclosed by the key informant as of the writing of this paper. These costs would be included in an updated analysis of this study and would cover: (1) Repairs and maintenance of parts; (2) Electricity consumption of offices; (3) Electricity consumption from charging station; (4) Fuel consumption; (5) Staff remuneration; (6) Association dues and management fees; (7) Business registration fees; and (8) Building permits and requirements.

Likewise, in the interview, 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 during the pandemic. This constrains the cooperative's compliance under their Notice of Selection⁵ (NOS) 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,

³ This is an initial list as some information are pending as of writing this version of the paper

⁴ This amount is based on LADO TransCo's response. Jeepney insurance is accredited by the LTFRB and would be the same for most vehicles.

⁵ 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.

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.

5. DISCUSSIONS

5.1. Complexities in modernization and the nuances of sequenced implementation

It is clear from this study that 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.

5.2. 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.

5.3. 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.

5.4. 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.

5.5. 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.

6. 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.

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 LTRFB 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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