Beyond Route Rationalization: Infrastructure and Service Systems for Formalizing Public Transport in Philippine Cities

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Abstract: Public transport modernization in Philippine cities is often framed around route rationalization, fleet modernization, and operator consolidation. While necessary, these reforms are insufficient to deliver reliable, efficient, and shock-resilient services without supporting infrastructure and service systems. This paper proposes a broader framework for public transport formalization that links rationalized routes with five infrastructure domains: passenger facilities, operating facilities, energy systems, digital monitoring, and institutional-financial mechanisms. It argues that formalization should be understood as the transition from fragmented, farebox-driven operations to publicly planned, monitored, and performance-based service delivery. The paper also positions Public Transport Pre-Investment Studies (PTPIS) as an implementation bridge between route plans and infrastructure packages, and reframes service contracting as a long-term reliability mechanism. The framework supports energy security by improving service efficiency, reducing operational waste, and strengthening public transport resilience against external shocks.

Keywords: *Public Transport Formalization, Route Rationalization, Service Contracting, Public Transportation*

1. INTRODUCTION

Public transport remains a central component of urban mobility in Philippine cities. For many commuters, especially those without access to private vehicles, road-based public transport provides daily access to employment, education, markets, health care, and public services. Jeepneys, buses, UV Express services, multicabs, tricycles, and other shared modes form the backbone of daily mobility in many urban and peri-urban areas. However, the sector continues to face persistent challenges, including fragmented operations, route duplication, weak service reliability, variable headways, limited passenger information, poor stop discipline, aging fleets, farebox-dependent operations, and uneven access to formal passenger facilities. Mateo-Babiano et al. (2020) pointed out that Jeepneys, in particular, had been one of the largest group in urban transport of the Philippines, with around 179,000 jeepneys, of which 90% are fifteen years or older also comes with challenges. The continuing population growth in the country significantly affects public transport demand and challenges(Bonifacio et.al, 2025).

In response, Philippine public transport reform has placed strong emphasis on

modernization. Key reform components have included fleet modernization, operator consolidation, local public transport route planning, route rationalization, and the use of service contracting during crisis and recovery periods. This action will provide ease and a dignified livelihood to drivers and operators (Bonifacio, et.al, 2025). These measures are important because many existing route structures evolved through historical franchise decisions, operator initiatives, and informal passenger demand patterns rather than through systematic network planning. Route rationalization, in particular, is necessary to reduce excessive overlap, improve route coverage, estimate appropriate fleet requirements, and align public transport supply with passenger demand.

However, route rationalization alone does not guarantee reliable public transport. A route plan identifies where vehicles should operate, but it does not automatically establish where passengers should safely board, where vehicles should lay over, how dispatching should be controlled, how service frequency should be monitored, where electric vehicles should charge, how operators should be paid, or how government should ensure service continuity during fuel price spikes, disasters, pandemics, or demand disruptions. A rationalized route that lacks stops, terminals, dispatching systems, depots, monitoring tools, and financing mechanisms may remain informal in its actual operation. A plan needs to be further broken down to identify the requirements for coordination and operation between service providers, individual drivers, operators and passengers. The lack of coordination between service providers, individual drivers, and operators resulted in on-street competition that created unsanctioned stops, unsafe driving behavior, and a race between the drivers to operate independently rather than providing good quality of service to passengers (Fillone et. al., 2026). Moreover, modernization becomes a threat to transport groups, as changes could result in job displacement of existing drivers Moya (2023). Thus, a rationalised route that lacks support in stops, terminals, dispatching systems, depots, monitoring tools, institutions, and financing mechanisms may remain informal in its actual operation

This paper argues that public transport formalization should be understood as a broader service system reform. Formalization is not limited to franchise consolidation, legal recognition, or route approval. Rather, it is the transition from fragmented, operator-discretionary, and primarily farebox-driven operations toward publicly planned, infrastructure-supported, data-monitored, and performance-based service delivery. Under this framing, route rationalization is necessary but insufficient. It is the network design layer of formalization, not the complete reform.

The argument is directly linked to the theme of energy security through transport efficiency and reliable mobility. A public transport system that operates with inefficient route duplication, long idling times, irregular dispatch, and poor fleet productivity is more vulnerable to fuel price volatility and external shocks. Conversely, a formalized system can improve energy security by reducing operational waste, improving vehicle utilization, supporting planned fleet transition, and maintaining service during disruptions. Reliable public transport is also an essential resilience mechanism because it protects access to jobs, education, health care, and essential services when households face economic or mobility constraints.

This paper aims to develop a public transport formalization framework for Philippine cities by identifying the infrastructure and service systems required beyond route rationalization. Specifically, it seeks to: (1) define public transport formalization as a service delivery transition; (2) classify the infrastructure domains needed to support formalized public transport; and (3) propose how Public Transport Pre-Investment Studies and service contracting can bridge the gap between route plans and reliable operations.

The contribution is a conceptual and policy framework supported by a focused documentary application. It provides a structure for identifying the complementary systems needed after route rationalization and translating them into a draft PTPIS scope. Davao is used to examine the framework against a documented project design; its investment scale is not assumed to be representative of secondary cities.

2. LITERATURE REVIEW

2.1 Development of Informal Transport Systems

In many developing cities, urban expansion occurred faster than the government's ability to provide planned and publicly operated transport systems. Much of the Global South experienced substantial population growth during the second half of the twentieth century without the corresponding investments in urban transport infrastructure (Cervero, 2013; Perera et al., 2007). As urban areas expanded, the resulting gaps in transport supply, coverage, accessibility, reliability, and safety only widened creating conditions in which privately operated services could emerge and respond directly to the ballooning local travel demand. It is therefore out of necessity that informal transport developed in these regions.

Dick and Rimmer (1986) highlights this by describing Southeast Asian urban transportation systems as products of institutional and historical circumstances, which differ substantially from those of developed nations. This is true across Asia, Africa, and Latin America, where public transport has commonly developed through small-scale ownership and market-based operations. Taking commuters' needs as its primary motivator, these services are characterized by its demand-driven operation, low-capacity fleets, non-fixed schedules, and flexible routing practices devoid of rigid route planning. Collectively, they are varyingly referred to as "paratransit," "low-cost transport," "intermediate technologies," or "third-world transport." In this study, the term "informal transport" is used to describe transport services operating outside the characteristics of a formally planned and regulated public transport system. Examples include jeepneys in the Philippines, angkot in Indonesia, matatus in Kenya, dala-dalas in Tanzania, and minibuses in South Africa and Latin America (Cervero, 2000).

The persistence of these systems is closely related to their ability to respond to local mobility needs. Informal operators can adjust routes and service levels according to demand, allowing them to provide extensive territorial coverage with relatively low capital requirements. Through this mechanism, opportunities are created for small entrepreneurs and individual operators to participate in the transport sector without substantial government investment while simultaneously providing transport supply. As a result, informal transport systems have become deeply embedded in local economies and daily travel behavior in many developing cities (Ferro and Behrens, 2015; Cervero, 2000; Dick and Rimmer, 1986).

Ferro and Behrens (2015) showed the prevalence of informal systems in cities in the Global South by identifying the modal splits of selected motorized transportation modes. Their comparison of developing cities in Latin America, Africa, and Asia shows that paratransit accounts for a large share of road-based public transport in almost all cases. In Manila, for example, paratransit accounted for 78 percent of road-based public transport modal share in the data reported for 1998, compared with just 22 percent for formal services.

Table 1. Paratransit dependency in selected cities' road-based public transport systems.

City, Country	Year	Modal Splits, selected motorized modes			Public road-based modal splits	
		Private Car	Public rail-based modes	Public road-based modes	'Formal'	Paratransit
Latin America						
Caracas, Venezuela	2007	27%	20%	53%	26%	74%
Mexico City, Mexico	2007	21%	14%	65%	11%	89%
Quito, Ecuador	2002	25%	--	75%	10%	90%
Africa						
Abidjan, Ivory Coast	1998	No data	–	100%	37%	63%
Algiers, Algeria	2004	No data	3%	97%	3%	97%
Cairo, Egypt	1998	No data	39%	61%	15%	85%
Cape Town, South Africa	2004	45%	30%	25%	28%	72%
Casablanca, Morocco	1998	No data	--	100%	72%	28%
Dakar, Senegal	2003	No data	2%	98%	5%	95%
Dar es Salaam, Tanzania	2008	13%	--	87%	2%	98%
Nairobi, Kenya	2008	33%	no data	67%	29%	71%
Tunis, Tunisia	2000	No data	28%	72%	100%	0%
Asia						
Jakarta, Indonesia	1998	No data	2%	98%	66%	34%
Manila, Philippines	1998	No data	3%	97%	22%	78%
Teheran, Iran	1998	No data	--	100%	44%	56%

Source: Ferro and Behrens, 2015

The accessibility provided by informal transport also explains why these systems can remain important despite their disorganized formation. Olsson (2012) emphasizes that mobility is essential to social and economic participation, particularly among lower-income populations, and the flexible services that informal transport provides can improve access to employment, education, healthcare, and social activities in locations where formal networks do not provide sufficient coverage. Their ability to adapt to changing travel demand therefore represents an

important strength that formalization efforts need to recognize.

However, it is these same characteristics that create their operational and institutional weaknesses. Fragmented ownership can result in intense on-street competition, route duplication, disjointed networks, fare exploitation, and unbalanced transport supply. Because operators depend heavily on fare revenues, services may concentrate on profitable corridors while less profitable areas receive limited service. Because revenue also varies hourly throughout the day, uncoordinated scheduling and dispatching are also evident, producing irregular headways, excessive vehicle accumulation, and an overall unreliable service (Ferro and Behrens, 2015; Sunio et al., 2019). Thus, while informal transport can provide extensive and adaptable coverage, its market-driven structure does not necessarily produce coordinated or reliable system-wide service.

These limitations become more significant as cities experience further rapid urbanization and increasing motorization. Studies of Southeast Asian cities such as Bangkok and Jakarta identify congestion, inadequate transport infrastructure, and weak integration between transport and land-use planning as major urban challenges (Michael, 1978). Perera et al. (2007) similarly argue that the absence of efficient public transport can contribute to automobile dependence and declining urban mobility. These conditions have encouraged governments to pursue reforms intended to retain the accessibility benefits of public transport while improving its efficiency, reliability, and institutional coordination.

2.2 Public Transport Formalization in the Global South

Public transport formalization can therefore be understood as a response to the limitations of fragmented and predominantly market-driven transport systems. Across the Global South, formalization efforts have generally sought to move public transport toward more coordinated, publicly planned, regulated, and monitored forms of service delivery through common interventions like route restructuring, operator consolidation, infrastructure investment, service regulation, and performance-based operating arrangements. Varying levels of success have been observed depending on the strategies employed and the country's local context.

2.2.1 Indonesia: Integrating Informal Operators into Formal Networks

Indonesia, as perhaps the closest analogue to the Philippine context, provides a particularly relevant example with its historically extensive reliance on informal transport. In 2009, the Indonesian government introduced the revision of the national legal framework through Law No. 22 of 2009 which removed the previous provision allowing individual businessmen to directly provide public transport services. This established a basis for services to be operated by companies or other legal entities. The government, however, witnessed the implementation of this reform to be constrained by delays in updating supporting regulations, demonstrating that changes in formal policy do not automatically result in changes in service organization (Ilahi et al., 2015).

The Indonesian approach subsequently combined network restructuring with the development of formal bus-based systems with the national government supporting the development of Bus Rapid Transit (BRT) systems and other urban transit services in multiple cities. Through the initiative, the government assumes responsibilities related to route planning, fleet requirements, infrastructure provision, licensing, and minimum service standards (Muromachi et al., 2015). The TransJakarta, which marked the transition from predominantly informal-based urban transport toward a scheduled and managed bus system, expanded from a

single dedicated corridor in 2004 to 11 corridors by 2013 (Ilahi et al., 2015). The system established defined operating periods, headways, designated passenger boarding locations, and contracted bus operators. The operators were selected through tendering and were subsequently paid based on their contracts and performance using funds derived from fare collection and government subsidy. By providing a more predictable basis for operator and driver compensation, this arrangement reduced the direct dependence of drivers on passenger competition (Ilahi et al., 2015).

Despite these efforts, however, Indonesia still did not automatically see an improved system-wide performance through formalization. Ilahi et al. (2015) report that road-based public transport ridership in Jabodetabek declined substantially between 2002 and 2010, while the bus fleet remained stagnant between 2007 and 2012 and congestion intensified. The authors attribute part of this outcome to insufficient preparation and inadequate fleet capacity. A BRT corridor alone does not determine service performance and fleet supply; station spacing, feeder arrangements, control centers, and other operating elements also affect the resulting system. This indicates that formalization requires the coordinated development of the network, fleet, operating arrangements, infrastructure, and financial mechanisms rather than the introduction of a formal mode in isolation.

Following the development beyond this point, Jakarta adapted further into another stage of their formalization: the integration of existing informal operators into the formal network rather than complete replacement. The Transjakarta system incorporated informal microbus services, or angkots, through the Mikrotrans program as part of a broader reform effort. The government intended to expand the network coverage, improve service quality, and strengthen multimodal integration through a process that begins with a 10-month pilot program in 2017. Branded as the Ok-Otrip, this program initially integrated two operators covering five routes and 76 vehicles with the Transjakarta network. By the end of the pilot, four operators were managing 21 routes and 497 vehicles. The program subsequently developed into JakLingko, which integrated microbuses with Transjakarta and other public transport modes through a unified fare system (C40 Cities Climate Leadership Group, 2023).

The Jakarta approach placed considerable emphasis on changing the institutional relationship between the city and informal operators. Independent operators were reorganized into cooperatives, allowing multiple drivers and routes to be managed under a common operating structure, and were required to follow predetermined routes, timetables, standard operating procedures, and minimum service standards. Legally binding contracts with DKI Jakarta provided operators with guaranteed monthly income based on vehicle-kilometers rather than passenger revenues, while non-compliance could result in fines or deductions. GPS and CCTV requirements were also provisioned to enable Transjakarta to monitor vehicle and driver behavior, while contracts provided operators with a more predictable revenue stream that could support financing for vehicle renewal (C40 Cities Climate Leadership Group, 2023).

The results reported for Jakarta demonstrate the potential of integrating informal services into a formal network when institutional, operational, and financial reforms are implemented together. Between 2017 and 2022, formal public transport coverage reportedly increased from 42 percent to 82 percent, while daily ridership increased from approximately 300,000 to more than one million passengers. Mikrotrans accounted for more than 60 percent of Transjakarta's network coverage by 2023 (C40 Cities Climate Leadership Group, 2023). The reform also integrated Mikrotrans physically and operationally with other modes and introduced a unified fare system, allowing passengers to transfer between microbuses, BRT, MRT, and LRT through an integrated

ticketing arrangement. Overall, these developments illustrate that formalization can retain the coverage and local accessibility of paratransit while introducing stronger regulation, monitoring, service standards, and financial accountability.

This whole experience emphasizes that transport integration is dependent on sustained institutional coordination that should involve consultation with regional leaders, transport agencies, operators, and transport unions, while the city works with existing operators to establish business plans, performance indicators, routes, and operating standards (C40 Cities Climate Leadership Group, 2023). The city also adopted a phased approach, beginning with a limited pilot before expanding the program. Indonesia reinforces the idea that formalization should be demonstrated through incremental implementation, allowing institutional arrangements and operator participation to develop alongside physical and operational improvements.

2.2.2 Colombia: Formalization through High-Capacity Infrastructure

While Indonesia demonstrates the formalization and integration of paratransit within a developing-city context, the experience of Bogotá, Colombia illustrates the importance of the supporting infrastructure and operational scale of a formal transit system. Bogotá, in the year 2000, introduced TransMilenio: a high-capacity BRT system operating on dedicated carriageways. The system incorporated enhanced stations, smart-card fare collection, advanced control systems, and feeder services, allowing the BRT to provide high-capacity service at a comparatively lower infrastructure cost than rail-based alternatives (Cervero, 2013). By the period examined by Cervero (2013), TransMilenio had grown to approximately 110 kilometers serving substantial passenger volumes.

Bogotá exemplifies a formalization that can produce significant improvements in the organization and capacity of urban public transport by developing dedicated infrastructure, stations, fare systems, control systems, and feeder services as part of the same system. However, it also exhibits the limitations of treating transit investment primarily as a mobility intervention without sufficient integration with surrounding urban development. Cervero (2013) reports that the initial TransMilenio corridors were selected primarily to respond to congestion and provide affordable mobility. It did not consider shaping future land-use development. Many stations were located in roadway medians, while limited station-area planning and incentives for private redevelopment constrained the extent to which transit investment influenced surrounding development.

The experience of Bogotá therefore provides important qualification to the Indonesian cases. A formal transit network can achieve substantial operating capacity without necessarily generating corresponding integration with the surrounding urban environment. Cervero (2013) found that densification around the initial TransMilenio stations was weaker than citywide densification, with stronger development activity observed in some terminal areas where feeder and trunk services created important transfer points. The case suggests that station infrastructure, pedestrian access, feeder connections, land-use planning, and development incentives need to be considered alongside the transit network if formalization is intended to produce broader urban benefits.

2.2.3 Brazil: Integrating Public Transport and Urban Development

A contrasting experience can be observed in Curitiba, Brazil, where public transport and urban

development were planned as interconnected components of the city's long-term development strategy. Cervero (2013) describes how Curitiba's municipal government directed medium- and large-scale development toward BRT corridors and used the Institute for Research and Urban Planning (IPPUC) to coordinate elements of urban growth. A “trinary” road design was adopted by the city to combine BRT corridors with compatible land uses and building densities, while commercial and residential development was concentrated along the transit corridors. As opposed to that of Bogotá, the city used transportation infrastructure as an organizing element of urban development rather than treating the transit system as an independent mobility investment.

These efforts contributed to strong transit use and efficient utilization of the BRT corridors. Cervero (2013) reports that 45 percent of motorized trips in Curitiba were made by transit and that development along the transit corridors supported relatively balanced directional passenger flows while also associating the experience with lower congestion costs and environmental benefits. However, Curitiba also demonstrates that successful integration of transport and urban development does not automatically resolve all accessibility and equity concerns. Cervero (2013) notes that much of the city's social housing was developed away from the principal transit corridors, leaving some lower-income households in locations with poorer access to the formal transit system.

2.2.4 Comparative Synthesis

Taken together, the experiences of Indonesia, Colombia, and Brazil show that public transport formalization can take different forms depending on the conditions of the existing transport system and the objectives of reform. Indonesia provides examples of restructuring fragmented operators, developing formal BRT systems, establishing minimum service standards, and more recently integrating existing angkot operators into a coordinated public transport network. Bogotá, on the other hand, demonstrates the role of dedicated infrastructure, stations, fare collection, control systems, and feeder services in establishing high-capacity formal transit. At the same time, its experience shows that investment in transit infrastructure alone does not guarantee integration with surrounding land development. Curitiba presents a more comprehensive approach. There, transit infrastructure, land-use planning, development controls, and institutional coordination were implemented as part of a long-term urban development strategy.

Despite these differences, several common requirements emerge across the cases. First, formalization requires a shift from fragmented operating decisions toward a coordinated system. Routes, schedules, operating standards, and service responsibilities must be clearly delineated. Second, physical infrastructure is necessary to translate planned services into actual operations. Jakarta's designated stops and integrated facilities, Bogotá's dedicated corridors and stations, and Curitiba's transit-oriented corridors all demonstrate that formalization requires infrastructure beyond the vehicle itself.

Third, monitoring and information systems become increasingly important as governments assume a greater role in determining and verifying service delivery. Jakarta's use of GPS, CCTV, performance monitoring, and contractual standards illustrates this relationship particularly clearly. Finally, financial arrangements are necessary to sustain service provision. The cases demonstrate different approaches to this challenge, including Jakarta's kilometer-based contracts and Bogotá's dedicated fuel-tax revenue for TransMilenio infrastructure. Public subsidies identified across Asian cases provide another mechanism for supporting service delivery (Cervero, 2013; C40 Cities Climate Leadership Group, 2023; Muromachi et al., 2015).

Collectively, these international cases demonstrate that formalization involves more than establishing a planned route. A reliable public transport service requires corresponding passenger facilities, operating arrangements, monitoring systems, and financial mechanisms. This provides an important basis for examining the Philippine modernization experience.

2.3 Philippine Public Transport Modernization

Investigating the case of the Philippines, the public transport sector reflects many of the characteristics observed in other Global South cities. It is highly diverse and predominantly road-based, consisting of jeepneys, buses, UV Express services, multicabs, tricycles, and other forms of paratransit. These services provide essential connections to employment, education, healthcare, markets, and other urban opportunities and among these modes, the public utility jeepney remains one of the most prominent forms of public transportation. Sunio et al. (2019) estimate that jeepneys account for approximately 40 percent of person trips in Metropolitan Manila, demonstrating their continuing importance to urban mobility.

Typical to the Southeast Asian landscape, the sector has historically developed through individual franchise applications and market-driven operations rather than comprehensive network planning. Route allocation has largely depended on the initiative of private operators seeking viable services, resulting in fragmented networks, route duplication, and weak integration between transport services. Sunio et al. (2019) note that approved routes may lack coordination because franchises have historically been granted through administrative processes that do not necessarily consider system-wide network efficiency.

The traditional boundary system further shapes the operational behavior of public transport services. Under this arrangement, drivers pay operators a fixed daily amount and retain the remaining revenues after fuel and operating expenses which then encourages competition for passengers, prolonged vehicle circulation, irregular dispatching, and unsafe operating practices. Because earnings depend largely on passenger volumes, drivers often compete directly on the street, resulting in service irregularities and inefficient fleet utilization.

This behavior has led to the deprioritization of innovative technological practices. Vehicle quality and fleet age had become a growing concern through the years as updating them would translate to just another financial negative for the operators. Enabled by the absence of a comprehensive motor vehicle inspection system, Sunio et al. (2019) report that approximately 90 percent of jeepneys nationwide are more than fifteen years old, raising concerns regarding safety, environmental performance, and service reliability. Aging fleets, combined with increasing urban congestion and inefficient operating practices, further limit the ability of the existing system to provide consistent service.

These structural conditions have motivated the Philippine government to pursue a more comprehensive modernization agenda. The Public Utility Vehicle Modernization Program (PUVMP), launched in 2017, introduced reforms covering fleet modernization, route rationalization, operator consolidation, regulatory reform, and the adoption of modern transport technologies. Establishing its foothold, the Department of Transportation issued the Omnibus Franchising Guidelines to support the planning and identification of public transport services and to alsp strengthen coordination between national agencies and local government units.

Within this broader program, route rationalization has become a central component of public transport reform. Recognizing that many existing routes evolved through historical franchise decisions rather than systematic planning, the government initiated Local Public

Transport Route Plans (LPTRPs) and route rationalization studies to align public transport supply with travel demand. Route rationalization seeks to reduce unnecessary route duplication, improve service coverage, estimate fleet requirements, and establish more efficient public transport networks. Sunio et al. (2019) emphasize that route rationalization is a necessary step because it provides the basis for determining appropriate transport modes and service levels according to passenger demand.

Operator consolidation represents another major component of the reform. This involves the consolidation of operators into cooperatives or corporations which aims to improve management capacity, facilitate fleet financing, and promote more organized operations. Modernized vehicles are also required to incorporate technologies such as GPS, automated fare collection systems, and onboard surveillance equipment to improve service monitoring, passenger safety, and operational efficiency.

Despite these reforms, implementation challenges remain. Financial barriers associated with fleet replacement, institutional capacity constraints, and resistance from affected operators have complicated the transition process. More importantly for the present study, modernization has often focused on vehicles, routes, and organizational structures while comparatively less attention has been given to the infrastructure and service systems necessary to support formalized operations. Route rationalization identifies where services should operate, but it does not necessarily determine where passengers should board, where vehicles should lay over, how fleets should be dispatched, or how service performance should be monitored.

Much like Indonesia, Colombia, and Brazil, the Philippine experience therefore reflects a gap also identified in international formalization literature. A rationalized network provides an important planning foundation, but it does not by itself constitute a complete public transport service. Supporting passenger facilities, operating infrastructure, energy systems, digital monitoring, and sustainable service delivery mechanisms are needed to translate planned routes into reliable operations.

2.4 World Bank - DOTr Approach to Public Transport Modernization

In 2014, Philippines Transport Infrastructure Development Framework Plan was developed to provide support in implementation of a strategized approach and help identify public transport needs (World Bank, 2014). The framework begins with goals and objectives established through consultation with transport agencies and stakeholders, then, identification of performance is measured based on available data to determine system needs and evaluate potential strategies. Resource allocation is then incorporated into the planning process to prioritize and program projects, programs, and policies, with continued monitoring of progress toward established targets (World Bank, 2014).

However, the implementation of World Bank-supported transport projects also illustrates the challenges of translating transport plans and frameworks into operational services. In the Cebu BRT Project, delays in major procurement packages, prolonged vacancies in key technical and financial positions, and partial cancellation of loan proceeds affected implementation progress. The project faced outstanding requirements related to universal accessibility, traffic management, and operational readiness. These challenges demonstrate that achieving planned transport improvements requires not only route and infrastructure planning, but also adequate institutional capacity, financing, procurement, and operational support (World Bank, 2026).

In line with the current action for modernization, recent coordination between the World

Bank and Department of Transportation aims to improve the connectivity and mobility of the country. According to Iloilo Today (2026), the area-focused PTMP which will be piloted in Iloilo City, goes beyond vehicle replacement and franchise consideration. The new model approach develops reasonable fit-for-purpose routes based on travel patterns of the target area, enhances public transport accessibility, improves commuter experience , and strengthens the City's Local Public Transport Route Plan (LPTRP).

Building on these existing approaches, the importance of a formalized process for translating transport demand into actual service provision becomes evident. Changes in routes, operators, vehicles, or modernization programs should not alter the fundamental need to provide an appropriate level of public transport service for a given area. Taken together, these World Bank-supported approaches share several elements with the proposed framework, particularly the use of transport demand and performance information to guide planning, the consideration of institutional and financial requirements, and the need to monitor implementation.

However, the existing approaches primarily provide broader planning, modernization, and project implementation frameworks. The proposed framework creates approaches by focusing more specifically on the transition from a planned or rationalized route to a deliverable and sustained public transport service. It therefore addresses the implementation requirements that need to accompany route planning and modernization so that identified transport needs can be translated into actual service provision. The next section examines these requirements and the literature supporting their role in formal public transport systems.

2.5 Infrastructure Requirements of Formal Public Transport

Formal public transport systems require passenger, operating, energy, digital, and institutional infrastructure. Passenger infrastructure is the most visible component of this transition and includes stops, shelters, waiting areas, terminals, transfer hubs, sidewalks, crossings, lighting, signage seating, ramps and real-time information. These facilities make the system legible, safe, accessible, and comfortable for passengers while also supporting operational discipline by defining where boarding and alighting should occur.

Empirical evidence from public transport systems supports the importance of passenger infrastructure. Shi et al. (2021), using a quasi-experimental design, found that BRT stations with upgraded amenities experienced higher passenger boardings than comparable stations without improvements. The upgraded amenities included covered shelters, benches, lighting, bicycle parking, landscaping, real-time passenger information, and accessibility improvements. This finding is relevant to Philippine cities because it shows that stop and station quality can affect public transport use, not merely passenger comfort.

Al Sanafi (2022) similarly argues that modern bus stops should be treated as essential transport infrastructure rather than simple waiting spaces. Innovations such as solar-powered systems, CCTV, Wi-Fi, charging stations, digital information displays, and real-time vehicle tracking can improve safety, comfort, and service reliability. While not all features may be feasible for every Philippine city, the broader implication is that public transport stops can function as small mobility hubs that integrate passenger facilities, information, security, and operations.

Passenger infrastructure, however, cannot operate independently from vehicle-side facilities. Formalized services require terminals, depots, layover areas, dispatch points, maintenance facilities, driver facilities, and control systems. These facilities provide the physical basis for implementing planned headways, fleet assignments, route schedules, and vehicle

availability. Without appropriate operating infrastructure, a route plan may establish where vehicles are expected to travel without establishing where and how those vehicles can be managed before, during, and after service.

Energy infrastructure is similarly connected to the operational requirements of modernized fleets. As public transport systems transition toward electric or cleaner vehicles, charging depots, grid readiness, maintenance capacity, and energy management become necessary components of the service system. These requirements must be considered together with route length, service frequency, vehicle range, and daily vehicle-kilometers. Energy infrastructure is therefore not separate from route planning but forms part of the operational system needed to sustain the planned service.

Digital and data infrastructure provides another layer of support. Sunio et al. (2019) note that modernized vehicles are expected to include GPS, automatic fare collection, and CCTV systems, which can improve security, reliability, monitoring, and data gathering for future route planning, the same system exemplified by Indonesia and few other countries ahead of the formalization initiatives. These systems are necessary because formalization requires the government and operators to verify whether planned service is actually delivered. Without digital monitoring, service regulation remains reactive and complaint-driven.

The literature therefore indicates that formal public transport requires more than a route network and a modern vehicle fleet. Passenger access, vehicle operations, energy continuity, and service monitoring must operate together to support reliable service delivery. These physical and digital requirements also depend on institutional arrangements that determine who provides the service, who is responsible for its performance, and how the costs of maintaining the service are sustained. This leads to the role of service contracting as an institutional and financial mechanism within formalization.

2.6 Service Contracting

Service contracting provides an institutional and financial mechanism through which the government can support the delivery of planned public transport services that is particularly relevant in systems where operators remain heavily dependent on farebox revenue. In a farebox-dependent system, operators and drivers have direct financial incentives to maximize passenger revenue. This creates incentives for passenger chasing, long terminal waiting, irregular dispatching, concentration on high-demand corridors, and service withdrawal during low-demand periods. Such behaviors undermine service reliability and make public transport vulnerable to external shocks.

In contrast, service contracting changes this relationship by allowing the government to purchase defined public transport output from operators. These outputs may include vehicle-kilometers, completed trips, service hours, headway, compliance, route completion, minimum service coverage, and emergency service continuity. Rather than providing financial assistance without a direct service obligation, the government shifts the policy frame from subsidizing operators to procuring public transport service.

The Philippine experience demonstrates the potential of this approach. Amidst the COVID-19 pandemic, service contracting was used as a public transport recovery measure by the government. Sunio et al. (2022) evaluates this measure as a policy response for public transport recovery and demonstrates its relevance as a mechanism for maintaining service and supporting operators during crisis conditions. While its initial application was associated with emergency and

recovery needs, the experience provides a basis for considering how service contracting could be developed as a longer-term instrument for service reliability.

Tan and Valdez (2023) ties the effectiveness of service contracting on the availability of reliable service data through their examination on the use of electronic device outputs for assessing service quality in the Philippine Service Contracting Program. Through their work, they demonstrate how electronic data can support monitoring, verification, and performance assessment. This directly relates service contracting to digital monitoring systems: GPS tracking, dispatch records, and service dashboards can provide the evidence needed to verify whether contracted service outputs have been delivered.

Building further the importance of contract design and incentives, Hensher and Stanley (2010) argue that bus concession contract design affects operator behavior and service outcomes. Poorly designed contracts may fail to improve service quality, while well-designed arrangements can align operator incentives with public objectives such as reliability, efficiency, safety, and passenger satisfaction. This suggests that the value of service contracting depends not simply on the existence of a financial payment but on how service obligations, monitoring requirements, incentives, and performance standards are structured.

Service contracting therefore complements the physical and operational requirements of formalization. A government may identify routes, establish stops, provide terminals and depots, and install monitoring systems, but service reliability still depends on an institutional mechanism that ensures operators have both the obligation and the financial basis to deliver the planned service. Conversely, a service contract cannot function effectively if the infrastructure required to deliver and monitor the contracted service does not exist.

For Philippine cities, service contracting can consequently be viewed not only as a subsidy mechanism but also as a component of reliability infrastructure. It can provide a means of purchasing defined service outputs, maintaining minimum service levels, supporting socially necessary routes, stabilizing operator revenue, and protecting mobility during external shocks. Its integration with infrastructure and monitoring systems allows formalization to extend from route planning toward sustained service delivery.

3. METHODOLOGY

3.1 Research Design

This study uses a qualitative framework-building approach. It does not estimate quantitative effects of route rationalization, infrastructure investment, or service contracting. Instead, it develops an analytical framework for identifying the infrastructure and service systems required to formalize public transport in Philippine cities. The framework is developed through policy review, literature synthesis, gap analysis, functional decomposition, and a diagnostic application to Davao City using official project documents.

The method has five steps. First, the study identifies dominant components of Philippine modernization: LPTRP preparation, route rationalization, fleet modernization, operator consolidation, and service contracting. Second, it reviews literature on formalization, paratransit reform, passenger infrastructure, service contracting, and sustainable mobility transitions. Third, it identifies the implementation gaps that remain when route rationalization is treated as the main output. Fourth, it groups these gaps according to the service functions required to convert a route

plan into delivered service. Fifth, it applies the framework to a case-city diagnostic to demonstrate how the five domains can structure a draft PTPIS work program.

The framework should be read as an analytical classification, not a statistically derived typology. The number and boundaries of the domains are judgment-based but traceable: they come from decomposing public transport service delivery into passenger access, vehicle operations, energy continuity, performance monitoring, and institutional-financial accountability.

Table 2. Methodological steps used in developing the framework

Step	Purpose	Output
Policy/program review	Examine how Philippine modernization frames planning, franchising, fleet modernization, and service support	Reform baseline
Literature synthesis	Review formalization, infrastructure, contracting, and mobility transition literature	Conceptual grounding
Gap identification	Identify what route rationalization does not settle by itself	Implementation gap matrix
Functional decomposition	Group gaps by the function needed to convert routes into service	Five-domain framework
Diagnostic application	Apply the framework to the case city	Draft PTPIS work program

3.2 Evidence Base and Analytical Framework

The paper draws from secondary evidence and the authors' public transport planning experience rather than newly collected primary survey data. Sources include Philippine policy instruments, PTMP and PUVMP studies, LPTRP practice, literature on public transport reform, infrastructure studies, service contracting literature, and selected Philippine program examples. These sources support framework development and diagnostic application, not statistical impact claims.

The diagnostic application uses the Department of Transportation's May 2023 Strategic Procurement Planning document and the Asian Development Bank's June 2023 project announcement for Davao (DOTr, 2023; ADB, 2023). Davao is selected because these documents describe identifiable facilities, systems, and implementation arrangements that can be mapped to the five domains. They are treated as dated statements of project design, not as evidence of current completion or operating performance. The literature review is a narrative synthesis, not an exhaustive systematic review.

The unit of analysis is the documented project design, with a focused draft PTPIS scope for the Toril terminal and depot interface. For each domain, the assessment records a documented provision, the service question it raises, and the evidence needed to support an investment or operating decision. Missing detail in the reviewed sources is classified as unverified, not as proof that the project lacks the component. The proposed study tasks are distinguished from documented project provisions in Tables 7 and 8.

The five domains were derived by asking five service-delivery questions. Where do passengers board, alight, wait, and transfer? Where do vehicles dispatch, lay over, turn around, and undergo maintenance? How are fuel or charging needs sustained? How is service delivery observed and verified? Who pays, operates, monitors, and enforces? These questions produced the passenger, operating, energy, digital and data, and institutional-financial domains, respectively.

The domains are not mutually exclusive. A terminal can be both passenger and operating infrastructure; a GPS device can support monitoring and payment verification. The categories are used as a planning checklist to reduce the risk that route rationalization is treated as complete reform when key implementation systems remain unresolved.

Five domains are retained as a practical level of aggregation. Energy could be included within operations, but it is separated because fleet technology introduces specific supply, charging, and continuity decisions. Digital systems could also be treated as operating tools, but they support passenger information, government oversight, and payment verification as well. Institutions and finance are grouped because service obligations require both an accountable body and a funding arrangement. These boundaries reflect the authors' analytical judgment and remain open to refinement through further applications.

Equity, safety, and resilience are considered across all five domains rather than treated as separate asset groups. Route design and fleet requirements provide the planning inputs, while workforce and management capacity are considered within operating and institutional arrangements. The classification therefore organizes complementary service functions; it does not establish that five is the only valid categorization.

Table 3. Derivation of the five domains from service delivery functions

Service delivery question	Primary function	Derived domain
Where do passengers board, alight, wait, and transfer?	Access, safety, legibility, transfer quality	Passenger infrastructure
Where do vehicles start, wait, turn around, dispatch, and undergo maintenance?	Operational control and fleet availability	Operating infrastructure
How are vehicle energy needs and fleet technologies sustained?	Fuel/charging continuity, energy efficiency, fleet transition	Energy infrastructure
How is service delivery observed, verified, and communicated?	Monitoring, passenger information, evidence-based regulation	Digital and data infrastructure
Who is responsible, who pays, who enforces, and under what agreement?	Governance, financing, contracts, standards	Institutional-financial infrastructure

Figure 1 summarizes the relationship between the reform components discussed in this paper and the proposed service framework. Fleet modernization, operator consolidation, and route rationalization establish important conditions for reform, but a planned network still requires

supporting systems for day-to-day service delivery. The five domains organize those requirements and link them to access, operations, energy continuity, information, and accountability. The figure is a simplified analytical representation, not an exhaustive inventory of the official modernization program. Table 2 shows the research sequence used to develop and apply the framework, while Table 3 explains its functional classification.

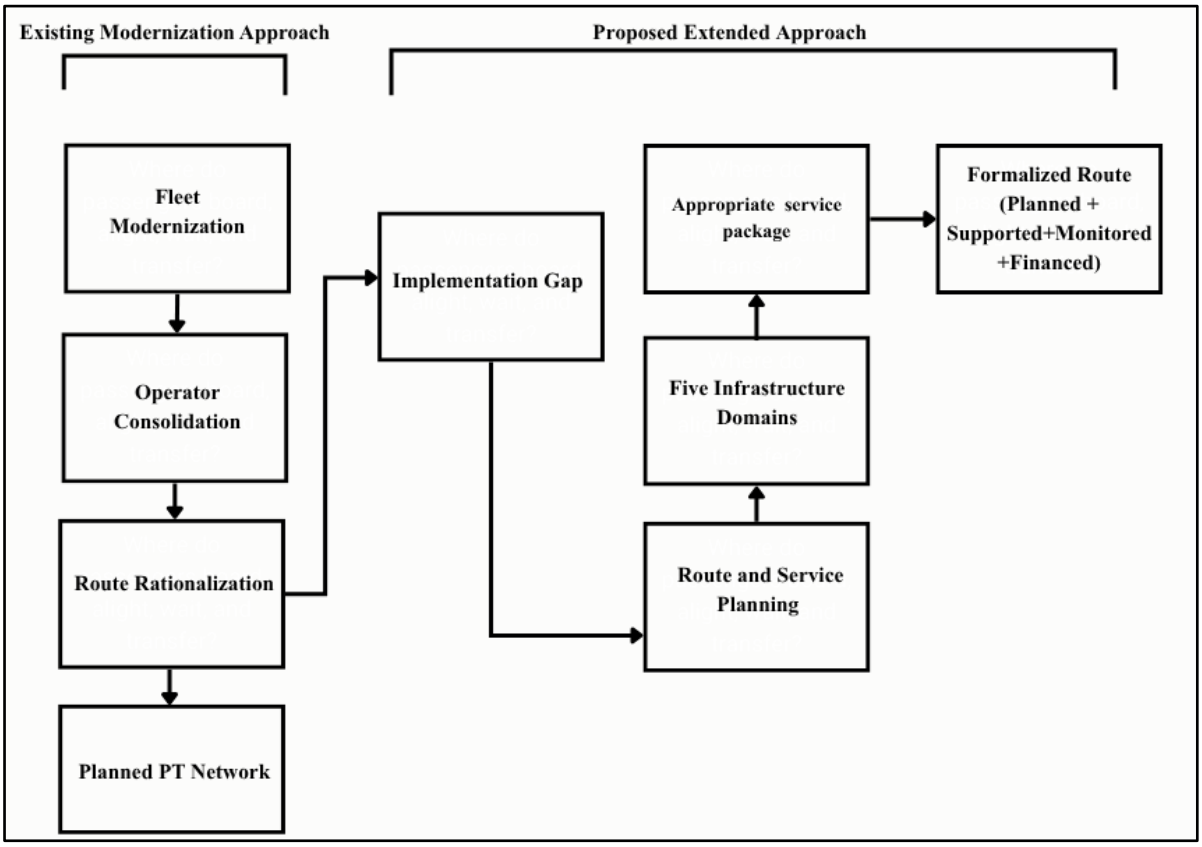


Figure 1. Existing PUV Modernization Approach vs. Extended Formalization Approach

3.3 Scope and Limitations of the Method

The framework is intended for planning and policy use. It does not replace detailed engineering design, financial analysis, operations planning, cost-benefit analysis, or feasibility study. It also does not claim that all domains must be implemented at the same scale in every city. Smaller cities may begin with stop marking, route signage, terminal organization, manual dispatch logs, and basic GPS monitoring. Larger cities may require depots, transfer hubs, passenger information systems, charging infrastructure, automated fare systems, and performance-based contracts.

The case-city application is diagnostic. It does not establish that the proposed infrastructure package has been implemented or evaluate before-and-after service impacts. It demonstrates how the framework can organize documented project components and develop a draft PTPIS agenda. Davao's investment scale limits direct transferability to secondary cities; field evidence and stakeholder assessment are still needed to test the framework's adequacy, affordability, and effects on different users.

4. PUBLIC TRANSPORT FORMALIZATION FRAMEWORK

4.1 From Route Network to Service Delivery System

A central proposition of this paper is that a public transport route is not yet a public transport service. A route is a spatial alignment. A service is a planned, operated, monitored, financed, and passenger-facing mobility product. Route rationalization identifies where vehicles should operate, but formalization determines how those vehicles will deliver reliable service.

A rationalized route becomes a formal service only when several additional elements are defined. These include stopping locations, terminal arrangements, operating schedules, dispatching rules, fleet assignments, passenger information, fare arrangements, operator obligations, monitoring systems, and financing mechanisms. Without these elements, a rationalized route can remain informal in practice. Vehicles may still wait until full, compete for passengers, stop anywhere, bunch along high-demand sections, skip low-demand segments, or withdraw service during shocks.

The distinction between route planning and service planning is therefore critical. Route planning asks where services should go. Service planning asks how frequently they should operate, during what hours, with what fleet, from which terminals, using which stops, under what operating rules, and with what monitoring and payment mechanisms.

4.2 Five Infrastructure Domains for Public Transport Formalization

This paper proposes five infrastructure domains required to support public transport formalization in Philippine cities: passenger infrastructure, operating infrastructure, energy infrastructure, digital and data infrastructure, and institutional-financial infrastructure.

Passenger infrastructure includes stops, shelters, terminals, transfer hubs, sidewalks, crossings, lighting, signage, seating, ramps, and other facilities that allow users to access public transport safely and predictably. In many Philippine cities, flexible boarding and alighting practices are common. While this flexibility can reduce walking distances for some users, it can also create safety risks, reduce operating speed, increase conflicts with traffic, and weaken service reliability.

Operating infrastructure includes depots, layover spaces, dispatching points, control centers, maintenance areas, driver facilities, and terminal management systems. These facilities support the actual production of service. Without operating infrastructure, planned headways and fleet assignments are difficult to implement.

Energy infrastructure includes fuel supply systems, electric vehicle charging stations, depot power connections, grid capacity, energy management systems, and maintenance equipment for new vehicle technologies. Energy infrastructure is especially important as fleet modernization increasingly includes electric or cleaner vehicles. Route length, daily vehicle-kilometers, charging time, and depot location must be coordinated to avoid service interruptions.

Digital and data infrastructure includes GPS tracking, automated vehicle location, passenger counts, fare data, route registries, dashboards, dispatch records, complaint systems, and passenger information platforms. These systems allow the government and operators to verify whether planned services are being delivered.

Institutional-financial infrastructure includes service contracts, operating standards, public budgets, data-sharing agreements, regulatory capacity, enforcement protocols, and public service

obligation mechanisms. These systems sustain the service beyond the physical construction of infrastructure.

4.3 Minimum Infrastructure Package for Formalized Routes

The framework can be translated into a minimum infrastructure package for formalized routes. This package does not imply that every city must immediately invest in large terminals, advanced intelligent transport systems, or expensive depots. Rather, it identifies the minimum set of questions that should be answered after route rationalization. Table 4 below shows the minimum required infrastructure for certain outputs, thereby making formalization more operational. This helps shift the question from what route should be authorized to which service should be delivered and what infrastructure or system is required to deliver it.

Table 4. Minimum infrastructure package for formalized routes.

Reform Output	Minimum Requirement
Rationalized route alignment	Stop locations, terminal points, transfer points
Fleet size estimate	Depot or terminal, maintenance plan
Proposed headway	Dispatching system, monitoring protocol
Proposed service span	Driver scheduling, operating budget, service contract
Fleet modernization	Energy supply and charging stations for electric vehicles
Route hierarchy	Passenger information, transfer design, fare integration
Franchise or operating authority	Performance standards, enforcement mechanism

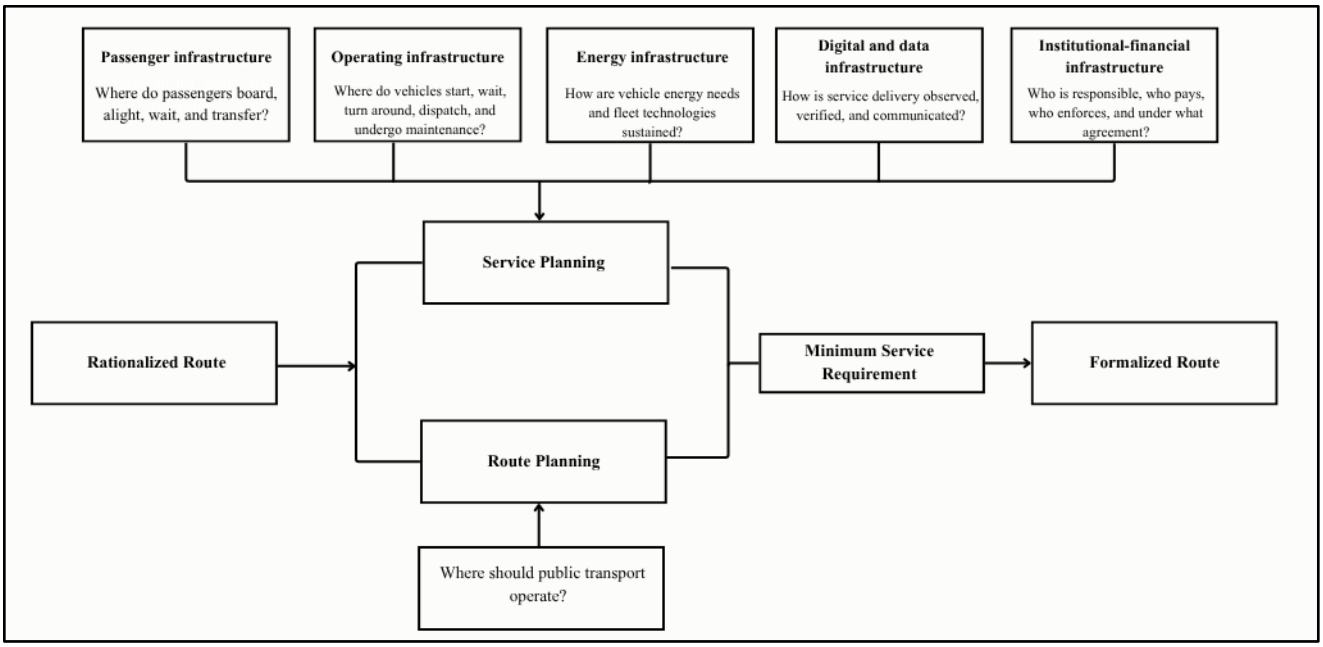


Figure 2: Route Rationalization to Formalized Service Framework

The overview of the public transport formalized framework is shown in Figure 2. It starts by identifying implementation gaps which were then used to identify the questions or demands to operation. The framework considers questioning how the rationalized routes function in different service deliveries, rather than identifying just where the routes should operate. The formulated questions are then organized and identified as five infrastructure domains which will be set to minimum service requirement. The minimum service requirement will serve as a support for the implementation of the formalized, reliable, financed, and planned route.

5. APPLICATION TO SECONDARY PHILIPPINE CITIES

5.1 Common Implementation Gaps

The proposed framework is particularly relevant to secondary Philippine cities. These cities often have public transport systems that are less complex than Metro Manila's but still face significant issues with route overlap, terminal congestion, informal stops, weak data systems, limited institutional capacity, and uneven access to passenger facilities. In many cases, local governments are expected to prepare route plans but may have limited resources to implement the infrastructure and systems needed to support those plans.

The common implementation gap is that route rationalization produces a map and fleet requirement, but not always an investment package. For example, a route may be restructured to improve coverage, but the city may not have identified stop locations or transfer hubs. Fleet size may be calculated, but operators may lack depots or maintenance facilities. The plan may recommend modern vehicles, but charging or refueling infrastructure may not be available. Service reliability may be desired, but there may be no GPS monitoring, dispatching control, or service contract.

Table 5. Route rationalization outputs and additional infrastructure needs.

Formalization Issue	Route Rationalization Output	Additional Infrastructure and System Needed
Excessive route overlap	Revised route alignment	Stop hierarchy, dispatching, monitoring, enforcement
Irregular headways	Fleet size estimate	Terminal dispatch, control points, GPS tracking for monitoring
Informal stopping	Proposed service corridor	Designated stops, signage, shelters, stop compliance measures
Weak transfer integration	Network-integrated map	Transfer hubs, pedestrian access, passenger information, wayfinding maps
Farebox dependence	Franchise allocation	Service contracting, performance payments, public service obligation funding
E-jeepney or e-bus transition	Fleet replacement plan	Charging depots, grid readiness, maintenance system
Poor passenger information	Approved routes	Route maps, service schedules, digital information channels

This application shows that secondary cities suggest that secondary cities need a

formalization pathway that is practical and phased. A city may begin with low-cost interventions such as stop marking, route signage, terminal organization, manual dispatch logs, and GPS-based service monitoring. Over time, these can be upgraded into shelters, transfer hubs, control centers, automated fare systems, and performance-based contracts.

5.2 Public Transport Pre-Investment Study as an Implementation Bridge

A Public Transport Pre-Investment Study can bridge the gap between route rationalization and implementation. In this paper, PTPIS is defined as a planning study that converts public transport route plans into prioritized infrastructure, operating, energy, digital, institutional, and financing packages.

The PTPIS should begin with a baseline assessment of existing service. This may include route alignments, observed headways, travel speeds, boarding and alighting locations, terminal activity, passenger demand, waiting conditions, and fleet availability. The study should then assess the proposed route network and identify the infrastructure needed to operate it.

A PTPIS should not be limited to capital infrastructure. It should also identify operating requirements, monitoring requirements, and financing arrangements. For example, a terminal may need physical improvements, but it may also need dispatch rules, queue management, data reporting, and enforcement. An electric fleet may require charging stations, but it also requires charging schedules, grid assessment, maintenance capacity, and contingency plans.

Table 6. Proposed Public Transport Pre-Investment Study Components.

Component	Objective	Outputs
Baseline service assessment	What services operate today and how do they perform?	Existing service profile
Route service plan	What routes, headways, fleet, and service spans are required?	Route-level service specifications
Passenger infrastructure plan	Where should passengers board, alight, wait, and transfer?	Stop and terminal investment list
Operating infrastructure plan	Where will vehicles be dispatched, maintained, stored, and turned around?	Depot, layover, dispatch, and maintenance plan
Energy and fleet plan	What energy systems are required for the planned fleet?	Charging, refueling, grid, and maintenance requirements
Digital monitoring plan	How will service delivery be verified?	GPS, dashboard, passenger information, and data-sharing plan
Institutional-financing plan	Who pays, who operates, who monitors, and who enforces?	Implementation, contracting, and budget framework

Through this approach, PTPIS becomes the implementation bridge between planning and investment. It helps cities avoid the common problem of producing route maps without the clear pathways for stops, terminals, depots, energy infrastructure, digital systems and service contracts.

5.3 Documentary Application to Davao City

The Davao application uses the five domains to examine a documented reform package and identify a focused pre-investment study scope. The 2023 project announcement describes sheltered

and lighted stops, depots and terminals, a mixed electric and diesel fleet, bus location and fare collection systems, and performance-based operations. It also includes capacity support and assistance for affected transport workers (ADB, 2023). These are planned provisions, not measured service results.

The procurement document identifies a Toril depot and terminal within a package that also includes Bunawan and Calinan terminals. Separate packages cover corridor works, electric-bus depots, fleet procurement, and systems integration (DOTr, 2023, pp. 1–2). This makes the Toril terminal and depot interface a useful bounded example: passenger movements, vehicle circulation, supporting systems, and implementation responsibilities must be coordinated even when delivered through different packages. Table 7 applies the domains to the citywide design and identifies questions for that interface.

Table 7. Five-domain assessment of Davao's documented project design

Domain	Documented provision	Question requiring verification at Toril
Passenger	Stops and shelters (ADB, 2023); Toril terminal and corridor works (DOTr, 2023).	Do walking routes, crossings, boarding areas and transfers connect safely within and beyond the terminal?
Operating	Toril depot and terminal package (DOTr, 2023).	Can circulation, layover and dispatch accommodate the service plan without conflicts with passenger movements?
Energy	Mixed propulsion fleet (ADB, 2023); separate electric-bus depot packages (DOTr, 2023).	Which fleet serves Toril, where is it fueled or charged, and what happens during supply disruption? Electric charging at Toril is not assumed.
Digital and data	Bus location and fare systems (ADB, 2023); integration package (DOTr, 2023).	Can terminal dispatch records be matched to vehicle and trip identifiers to verify completed service?
Institutional-financial	Performance-based operations and transition assistance (ADB, 2023); agency roles (DOTr, 2023).	Who owns, operates, maintains, monitors and funds each interface, and how are affected workers included?

5.4 Draft PTPIS Scope for the Toril Terminal and Depot Interface

The proposed study boundary comprises the Toril terminal and depot, their immediate pedestrian and vehicle access, and the routes using those facilities. The purpose is to determine whether the planned service can operate through this interface and what coordinated works and operating arrangements are needed. This is an author-developed scoping exercise, not the project's official PTPIS or a claim that its existing preparation omitted these tasks. Site boundaries, route assignments and baseline values require confirmation with the implementing agencies.

Table 8. Draft PTPIS work program for the Toril interface

Work item	Evidence and analysis required	Decision output
Baseline and service plan	Confirm route assignments; collect boarding, transfer, running-time and headway data across peak and off-peak periods; inventory approved plans.	Route-specific trips, fleet, service span and terminal demand assumptions.
Passenger infrastructure	Audit walking access, crossings, boarding and waiting areas; observe passenger movements and consult users, including persons with disabilities.	Prioritized access and boarding improvements; accessible transfer layout.
Operating infrastructure	Map circulation and layover; estimate berth demand from arrivals and dwell times; test dispatch and maintenance arrangements.	Compatible terminal and depot layout with dispatch rules and staffing needs.
Energy infrastructure	Confirm propulsion and daily vehicle duties; assess fueling or charging arrangements, supply capacity and disruption scenarios.	Energy service plan and any required investments, conditional on fleet allocation.
Digital and data	Review vehicle, route and trip identifiers, dispatch logs and system interfaces; specify data quality and reporting responsibilities.	Monitoring specification for trip completion, headways and exceptions.
Institutions and finance	Confirm asset and service responsibilities; estimate capital, maintenance and operating costs; assess funding and worker transition arrangements.	Responsibility matrix, costed packages and draft performance obligations.

The study would compare the documented design baseline with a coordinated interface option developed from the site and service assessment. Options should be assessed against passenger access and safety, service reliability, lifecycle cost, energy continuity, implementation readiness, and impacts on users and workers. These criteria should be reviewed with local stakeholders before weights or thresholds are adopted. Capital works and recurring operating costs must be shown separately; neither a budget nor a preferred option can be established from the two source documents alone.

Sequencing follows the dependencies revealed by the framework. Route assignments and service requirements first establish passenger and vehicle demand. Access, circulation, layover and energy requirements then inform compatible facility designs. Data responsibilities and funding arrangements must be agreed before performance obligations can be monitored and sustained. A terminal improvement package is therefore incomplete if it specifies physical works without a dispatch, monitoring and maintenance arrangement.

For a subsequent pilot, the monitoring plan could measure completed trips as a share of scheduled trips, the distribution of observed headways, passenger waiting time, accessible boarding-area availability, and energy use per vehicle-kilometer. Headway tolerances and reliability targets should be agreed after the baseline assessment. Comparable before-and-after observations would be needed to evaluate performance; none are available in this documentary application.

5.5 Findings and Transferability

All five domains can be mapped to the documented Davao design. The more useful finding is that their dependencies become visible at a bounded interface: boarding arrangements affect dwell and dispatch; fleet allocation determines energy needs; and service verification requires agreed records and accountable institutions. The framework therefore produces a structured set of study tasks rather than merely a list of assets. However, the presence of a planned provision says nothing by itself about its adequacy or performance.

For secondary cities, this structure can be applied at a smaller scale, such as a single terminal or route group. The appropriate package may involve marked stops, safer crossings, organized layover, manual dispatch records and a funded maintenance arrangement. Davao supports the logic of coordinated preparation; it does not establish the affordability or effectiveness of replicating its investment scale. Field application in a secondary city remains necessary to test that transferability.

6. SERVICE CONTRACTING AS RELIABILITY INFRASTRUCTURE

6.1 From Subsidy to Service Procurement

The Service Contracting Program is frequently categorized as a subsidy due to its provision of financial payments to operators and drivers. While this characterization is accurate, it is essential to recognize that service contracting functions as a procurement mechanism through which the government acquires outputs of public transport services.

This distinction is significant, as a subsidy primarily offers financial support, whereas a service contract establishes specific obligations. Under the terms of a service contract, operators receive compensation for delivering defined services in accordance with agreed-upon standards. These standards may encompass vehicle-kilometers, trips, service hours, headway compliance, route completion, and minimum service coverage. Additionally, the contract may stipulate penalties, incentives, reporting requirements, and standards for passenger service.

Within the Philippine context, service contracting has demonstrated its value during crisis situations. Notably, during the COVID-19 pandemic, it served as a mechanism to provide economic relief and sustain road-based public transport services (Sunio et al., 2022). The subsequent policy imperative should be to institutionalize this mechanism as a reliable long-term tool rather than viewing it solely as a temporary measure.

6.2 Contractible Service Outputs

A well-structured public transportation system constitutes the foundation of our communities, thriving on precise service outputs that not only inform service contracts but also enhance performance monitoring. We may concentrate on significant metrics, including:

1. Total vehicle kilometers traveled;
2. Completed trips;
3. Service hours in operation;
4. Compliance with scheduled headways;

5. Timeliness of dispatch;
6. Successful route completions;
7. Minimum service area coverage;
8. Off-peak service options;
9. Passenger capacity;
10. Accessibility-friendly alternatives; and
11. Emergency responsiveness

Commencing with metrics such as vehicle kilometers or completed trips serves as an effective approach to initiate service contracts. As our operations expand, it is advisable to broaden these agreements to encompass critical factors such as reliability, passenger experience, safety, energy efficiency, accessibility, and overall resilience, thereby ensuring that all stakeholders benefit.

6.3 Service Contracting Program (SCP) 2.0 Framework

The paper introduces the SCP 2.0 framework, which positions service contracting as an essential element of reliability infrastructure. This framework is founded on five key design principles: First, service contracting must be both route-based and service-plan-based. Compensation should be directly linked to established routes, service spans, vehicle specifications, and headways. Second, the framework should operate on a performance-based model. Operators ought to be compensated based on the verified delivery of service outputs rather than merely for participation in a program. Third, it is imperative to prioritize socially necessary services. This includes off-peak trips, feeder routes, services catering to low-income communities, areas with limited transportation alternatives, and routes serving schools, hospitals, markets, and employment hubs. Fourth, the framework should leverage digital monitoring tools. The incorporation of GPS tracking, dispatch logs, passenger counts, and service dashboards will enhance the verification processes. Fifth, it should be integrated with infrastructure investment. A contracted route requires supporting components such as stops, terminals, depots, passenger information systems, and monitoring frameworks.

Table 9. Proposed shift from SCP 1.0 to SCP 2.0

Dimension	SCP 1.0	SCP 2.0 Proposal
Primary framing	Subsidy or emergency support	Service procurement and reliability mechanism
Payment basis	Per kilometer or trip support	Verified service outputs and performance indicators
Planning basis	Eligible routes and operators	Route service plans and minimum service levels
Monitoring	Program compliance reporting	GPS, dispatch, and service dashboard
Targeting	Broad relief to drivers, operators, and passengers	Socially necessary service and resilience corridors
Duration	Temporary or program-based	Multi-year public service obligation mechanism
Link to infrastructure	Limited	Integrated with stops, terminals, depots, and digital systems

This reframing positions SCP to effectively support the overarching formalization agenda. Instead of regarding service contractings as an isolated subsidy program, they can be integrated into the institutional and financial framework of a reliable public transportation system.

7. DISCUSSION

7.1 Energy Security

Energy security in public transportation is often examined in relation to fuel supply, fluctuations in fuel prices, and advancements in fleet technology. Nevertheless, the design and operational aspects of the service equally influence energy security. A public transportation system that features duplicated routes, irregular dispatch schedules, prolonged idling periods, and low passenger load productivity tends to operate inefficiently in terms of energy usage. Conversely, a system that incorporates planned routes, adheres to disciplined stop protocols, utilizes enhanced dispatching techniques, and employs suitable fleet assignments can significantly reduce operational waste.

The proposed framework enhances energy security through three principal avenues. First, it facilitates more efficient vehicle deployment by integrating route rationalization with fleet assignment and dispatch strategies. Second, it advances the energy transition by mandating the inclusion of charging, depot, grid, and maintenance planning as fundamental components of formalization. Third, it promotes resilience by enabling governmental entities to sustain minimum service levels during instances of fuel price volatility or disruptions.

The paper does not claim that formalization will universally lead to a reduction in total energy consumption. The relationship between these factors is contingent upon variables such as ridership, vehicle technology, load factors, operating speeds, route design, and service frequency. However, the framework indicates that the likelihood of improving energy security increases when fleet modernization is coupled with operational discipline, comprehensive infrastructure planning, and robust performance monitoring.

7.2 Transport Efficiency

Transport efficiency should not be assessed solely through vehicle speed. In the context of public transportation, efficiency pertains to the capacity to transport individuals while utilizing less road space, energy, time, and public financial resources, all the while ensuring accessibility and reliability.

Route rationalization can enhance efficiency by eliminating unnecessary duplication and refining the overall network structure. However, the benefits derived from rationalized routes are contingent upon the effectiveness of their implementation.

The strategic placement of stops can reduce random interruptions and enhance predictability. Well-designed terminals and dispatching systems can mitigate bus bunching and excessive waiting times. Furthermore, depots and maintenance facilities can improve fleet availability. The integration of digital monitoring can assist in identifying missed trips and instances of unreliable service. Service contracting can ensure the continuous operation of routes, even in circumstances where farebox revenue is insufficient.

In summary, achieving transport efficiency necessitates a comprehensive approach that integrates routes, infrastructure, operations, data, and finance. An exclusive focus on route rationalization as a strategy for reform may lead to unrealized opportunities for enhancing efficiency.

7.3 Reliable Mobility

Reliability serves as a fundamental dimension of public transport quality. For passengers, reliable mobility translates to predictable waiting times, successful trip completions, clear routing, safe boarding processes, and reasonable transfer conditions. For operators, it signifies stable service assignments, manageable dispatching operations, and predictable revenue streams. For governmental entities, it denotes the capability to provide mobility as a public service rather than relying solely on fluid market conditions.

The proposed formalization framework enhances reliability by identifying the essential systems required to ensure predictable service delivery. The passenger infrastructure improves system transparency, the operating infrastructure facilitates controllability of services, the digital infrastructure enhances visibility of performance metrics, and the institutional-financial infrastructure guarantees that service obligations are both enforceable and adequately funded.

7.4 Resilience to External Shocks

External shocks encompass a range of events, including pandemics, fluctuations in fuel prices, typhoons, floods, road closures, economic disruptions, shortages of drivers, and power outages. Systems that are informal or poorly formalized exhibit greater vulnerability due to their heavy reliance on daily passenger revenue and operator discretion. Consequently, when demand diminishes or costs escalate, service provision may decline rapidly.

In contrast, a formalized public transport system demonstrates greater resilience since it enables the government to set minimum service obligations, support essential routes, monitor disruptions effectively, and procure services when market incentives prove inadequate. Therefore, service contracting is not merely a mechanism for subsidies; it functions as a resilience tool that helps sustain mobility during periods of crisis.

Furthermore, digital monitoring significantly contributes to enhancing resilience. During disruptions, the utilization of GPS data, passenger information systems, and service dashboards can assist authorities in identifying service gaps, rerouting services as necessary, and conveying changes to passengers. Infrastructure planning can also bolster resilience by strategically positioning terminals, depots, and stops away from high-risk areas or by designing contingency operations.

7.5 Equity and Just Transition

The process of formalization must be assessed through the framework of equity and a just transition. The modernization of public transport systems can place financial burdens on operators and drivers if there is insufficient financing, cooperative development, and institutional support. Gatarin (2024) underscores the importance of ensuring that the modernization of the Filipino jeepney not only enhances environmental and service standards but also safeguards livelihoods. In a similar vein, Mateo-Babiano et al. (2020) identify transitional challenges that must be addressed

to achieve sustainable formalization.

Equity concerns for passengers emerge when route restructuring results in increased transfers, longer walking distances, or extended waiting times. Dailisan and Lim (2021) indicate that certain commuters may encounter additional transfers under the proposed route modernization. This finding emphasizes that passenger infrastructure and service reliability are not ancillary issues; they are fundamental equity requirements. A route plan that necessitates additional transfers must be accompanied by safe and comfortable transfer facilities, accessible pedestrian pathways, comprehensive route information, and dependable connecting services.

Consequently, formalization should not solely strive to establish efficient routes; it must also ensure the preservation of affordability, access, livelihoods, and service quality. Public transport reforms that neglect these elements run the risk of creating technically sound networks that are socially challenging to implement.

7.6 Fiscal and Institutional Feasibility

The proposed framework also recognizes that formalization depends on the government's capacity to sustain financing and coordination across all identified domains. The transition from route rationalization to a fully supported service delivery system requires not only capital investments in passenger, operating, transport, and energy infrastructure, but also recurring spendings for service contracting, monitoring, maintenance, enforcement, and institutional coordination, as seen above. This creates an important adoption risk, particularly for local governments with limited fiscal and technical capacity.

The Philippine experience with service contracting particularly illustrates this challenge. While the SCP initiative demonstrates the feasibility of government-supported service procurement, the program being deployed originally as a pandemic response to help maintain road-based services by providing financial support shows its crisis-oriented origins that highlight the difficulty of treating public transport support as a predictable, long-term expenditure. Transforming service contracting from an emergency intervention initiative to a standalone reliability mechanism would require a stable financing structure with proper institutional arrangements for procurement and performance monitoring.

However, it’s important to understand that this constraint does not invalidate the proposed framework; rather, it establishes fiscal and institutional capacity as a precondition for implementation. The five domains are not to be interpreted as requiring simultaneous and uniform investment across all cities, instead, should be understood as formalization requiring phased completion based on the local needs and available resources. This may be implemented by starting off with relatively low-cost interventions such as designated stops, route information, organized dispatching, and basic service monitoring before progressing toward larger investments in terminals, depots, charging infrastructure, digital systems, and performance-based contracts.

A practical implication is that the proposed PTPIS should also function as a prioritization instrument. Rather than assuming that all identified infrastructure can be funded immediately, the PTPIS should distinguish between essential and priority investments and identify potential sources for capital and operating expenditures. This would allow cities and national agencies to match the scale of formalization with available fiscal and institutional capacity while maintaining the broader service-delivery objective of the framework.

7.7 Limitations and Future Research

The framework remains an interpretive classification. The Davao application demonstrates how it can organize documented project provisions and generate a focused draft PTPIS scope, but the same exercise does not establish that the five domains are exhaustive, uniquely preferable, or causally related to better service. The assessment relies on two 2023 project documents and does not verify current implementation status, facility adequacy, operating performance, or stakeholder acceptance.

Further research should apply the framework to a secondary city using field observations, passenger and operator input, route and GPS records, and investment and operating cost data. Competing classifications should be examined for omitted functions and unnecessary overlap. Before-and-after evaluation, with a suitable comparison where feasible, would be needed to test changes in waiting time, service completion, energy use, affordability, and equity. The draft Toril scope provides a starting structure for such work rather than a completed feasibility study.

8. CONCLUSIONS AND POLICY RECOMMENDATIONS

This paper argued that public transport formalization in Philippine cities should not be reduced to route rationalization, fleet modernization, or operator consolidation. These reforms are necessary, but they are insufficient to deliver reliable, efficient, and shock-resilient public transport without supporting infrastructure and service systems.

The paper proposed a public transport formalization framework composed of five infrastructure domains: passenger infrastructure, operating infrastructure, energy infrastructure, digital and data infrastructure, and institutional-financial infrastructure. It also proposed PTPIS as an implementation bridge between route plans and investment packages. Finally, it reframed the SCP as a long-term reliability mechanism through which the government can purchase measurable public transport service outputs.

The central policy implication is that route rationalization should be treated as the first layer of reform, not the final output. Each rationalized route should be accompanied by a service plan, stop plan, terminal or dispatch plan, fleet and energy plan, monitoring plan, and financing plan. Without these, formalization may remain incomplete.

First, national agencies and local governments should define a minimum infrastructure package for formalized routes. This should include stops, terminal arrangements, dispatching protocols, route information, and service monitoring.

Second, PTPIS should be institutionalized as a bridge between LPTRP outputs and actual infrastructure investment. These studies should prioritize stops, terminals, depots, charging facilities, digital systems, and service contracting needs.

Third, where fiscally and institutionally feasible, service contracting should be progressively reframed from temporary subsidy to public transport service procurement. The government should prioritize the purchase of verified service outputs such as vehicle-kilometers, completed trips, service hours, headway compliance, and minimum service coverage. Such arrangements should be supported by stable financing mechanisms and periodic assessment of fiscal sustainability.

Fourth, public transport modernization should be evaluated using service performance indicators. These should include waiting time, headway adherence, trips completed, stop

compliance, fleet availability, passenger load, service span, transfer quality, and continuity during disruptions.

Fifth, local government capacity should be strengthened. Cities need support in data collection, route planning, stop design, terminal planning, digital monitoring, contract management, stakeholder engagement, and enforcement.

The broader conclusion is that formal public transport is not created by route approval alone. It is created when planned routes are supported by infrastructure, operations, monitoring, finance, and institutions. For Philippine cities, the next phase of modernization should therefore move beyond route rationalization toward infrastructure and service system formalization.

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