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Public Transportation in the Caribbean: Dominance of Paratransit Modes

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Abstract: The use of paratransit modes is one important part of public transportation system in developing countries. Many studies have documented the different types, physical and operational characteristics of paratransit modes in African and Asian developing countries. However, there are few studies on paratransit modes in Caribbean developing countries and their significance in their transportation system. This paper documents the types of modes in the public transportation system in five Caribbean countries; Jamaica, St. Lucia, Barbados, Guyana, Trinidad and Tobago. Although these countries are different in geography, social culture and economic growth, the paratransit systems have developed similarly in each country and share identical cultures around these modes. In some countries, the paratransit modes are the only form of public transportation available. Despite there being a negative culture around paratransit modes in the Caribbean, these modes are more reliable than government-owned buses and more frequently used. This paper focused on the paratransit modes of six Caribbean countries, and provided some factual analysis of the current public transportation system. More studies are needed addressing the provision and development of these paratransit modes in the entire Caribbean. This study would contribute to provide a foundation to future studies aiming to establish a general methodology framework that could assist in solving some of the transportation issues the Caribbean faces, through a system using paratransit modes and policy development.

Keywords: Paratransit Modes, Public Transportation, Developing Countries, Caribbean

1. Introduction

Public transportation is one of the few services that caters to an entire region, regardless of economic status and offers mobility and accessibility to everyone, especially captive public transportation users. Public transportation connects persons in far and rural areas to employment, leisure activities and necessary resources (Basuki Joewono and Kubota, 2008). Developing Countries tend to have transportation unique system characteristics separate from developed countries. One of the main differences is the prevalence of paratransit in the public transportation system. At their most basic form, paratransit modes are shared taxis or minibuses that operate on defined routes, stopping to collect or discharge passengers on demand. The concept of paratransit is intriguing and developed countries attempted to incorporate them into their own public transit system (Rimmer, 1984).

Studies on paratransit modes focused predominantly on Asian and African countries, though paratransit modes are prevalent in many other areas. These are the leading public transportation modes in some islands in the Caribbean region. Across the Caribbean, these modes of transport display many similarities to one another, and other paratransit modes in other developing countries. However, this is an unexplored area in transportation research.

This paper aims to bridge that gap by discussing the public transportation system and the various types of modes, specifically paratransit modes, in 5 Caribbean countries; Trinidad and Tobago, Jamaica, Guyana, St. Lucia and Barbados. These countries consist of 5 islands, and Guyana, which shares land with other countries (such as Venezuela, Suriname, and Brazil). These countries were selected to have representation in the Greater Antilles, Windward and Leeward Islands and Guyana, which has become one of the most dynamic oil producing countries in the 21st century and could drastically increase its GDP in years to come (Panelli, 2019). These countries vary in size, economy, and transportation system and give good depiction of the Caribbean. There is very limited documented data on the public transportation system in the Caribbean, thus the data for this paper was obtained predominantly from interviews and secondary sources.

Furthermore, an analysis of the similarities and differences of these modes and the culture surrounding public transportation in the Caribbean is discussed. The remainder of this paper discusses the background and historical development of the Caribbean, the state of paratransit modes in developing countries as well as the different modes and culture of public transportation in the Caribbean.

2. Background

Developing countries have certain characteristics differentiating them from their developed counterparts, such as extensive poverty and economic vulnerability (Teelucksingh and Nunes, 2010). Though Small Island Developing States (SIDS) are classified as developing countries, SIDS exhibit unique attributes due to geographic, social, economic and environmental characteristics. This is mainly due to their extremely small geographical size and population, insularity, remoteness and limited areas, and natural resources making them highly vulnerable to exogenous impacts (McElroy, Potter and Towle, 1990; Bass, 1993; Briguglio, 1995; Gay, Rogers and Shirley, 2018). Though Guyana is not classified as a SIDS, it shares similar culture and history to the Caribbean islands, and therefore is deemed part of the Caribbean region.

The Caribbean is mainly an arched-shaped group of islands (also includes the South American mainland such as Guyana) between North and South America, as shown in Figure 1.



Figure 1. Map of the Caribbean Archipelago Source: Abstracted from Vidiani (2006)

The Caribbean is divided into the Greater Antilles and Lesser Antilles. The Greater Antilles consist of Cuba, Jamaica, the island of Hispaniola (that is divided into the Dominican Republic and Haiti) and Puerto Rico. The Lesser Antilles is further divided into the Windward and Leeward Islands. The Leeward Islands span from the Virgin Islands to Dominica, while the Windward Islands span from Martinique to Trinidad and Tobago.

Most of the Caribbean islands have mountainous terrain, which influences the type of road networks that are developed in those areas. Other islands, such as Barbados and Anguilla are not of volcanic origin, and are relatively flat. The Caribbean has influence from many different cultures from colonialism as far back as the 17th century and the early economy of the Caribbean focused on agriculture predominantly crops, such as tobacco, coffee, spices and sugar. At present tourism plays a major role in the economy of many Caribbean islands. The development of the economy in the Caribbean has tailored the public transportation systems to include paratransit modes (Gwilliam, 2008).

3. Paratransit Modes in Developing Countries

The existence of paratransit modes is a common characteristic of the transportation system in developing countries, including Caribbean countries (Pojani and Stead, 2015; Wongwiriya et al., 2016). Paratransit modes, also known as informal transit, are demand responsive, semi-public, locally generated, public transit services that are spontaneous unconventional modes, and in some islands, these modes are the only existing public mode available (Saltzman, 1976; Britton, 1980; Rimmer, 1980; Cervero and Golub, 2011).

Paratransit modes take many forms. They consist of shared taxis and minibuses as well as flexible transportation that offer on demand, door to door service for any origin and destination (Tangphaisankun, Nakamura and Okamura, 2009b; Owolabi and Akinwumi, 2011). These informal modes tend to share similar physical and operational characteristics, even though the origin countries of the modes differ. Paratransit modes are generally classified by two types; motorised and non-motorised. These modes have technical and culture adaptations and tend to dominate the public transportation system in their respective countries (Shimazaki and Rahman, 1996). Paratransit modes, usually fill a market void left by the absence, or lack of accessibility of a public transit service (Kerr, 2018). Despite the demand for paratransit modes, they usually have a poor perception from users. Most studies indicated that users perceive paratransit modes to be unsafe (Shimazaki and Rahman, 1996; Mutongi, 2006; Heinze, 2018). This issue contributes to the argument of eliminating paratransit modes from transportation systems.

Heavily subsidised transit companies were introduced, and they served as essential link in urban transportation. However, the increase in the individual automobile, and the irregularity of public transport operation has impacted the ridership in public transit (Poliak et al., 2017). Moreover, these transit companies do not operate on every route, and are scarce in more rural areas. Paratransit modes meet this void left by stateowned transit companies.

In developing countries, it is common for both government owned public transit and privately owned paratransit to co-exist. However there is a common debate about whether the bus or paratransit is superior and treat these modes as mutually exclusive systems within the public transportation (Silcock, 1986). Nonetheless, Rimmer (1984) highlighted case studies that showed when state-owned and privately owned paratransit operators ply for the same fare, the latter provides equivalent, if not better services, at no subsidy. Despite this, many travelers (both car users and public transportation users) rank public (bus) operators much higher than paratransit modes with respect to safety and comfort (Wright, 2018).

Though many are in favour of the phasing out of such modes, and incorporating more modern bus companies, it is possible for both modes to thrive together in an integrated system (Tangphaisankun, Nakamura and Okamura, 2009; Furlonge, 2016). This is a concept that was once attempted in the United States in the 1980s using the jipney, because they saw the benefits of paratransit modes (Rimmer, 1984). Though this initial attempt was unsuccessful, paratransit modes have reemerged in developed countries using shared taxis in rideshare companies such as Uber and Lyft.

Rideshare companies are becoming more prevalent today, and have started to infiltrate into developing countries. There is a clear difference in the goal of rideshare companies using paratransit modes in developing versus developed countries (Phun and Yai, 2016). In developing countries, the platforms are developed to offer an affordable and efficient transportation service. The focus in developed countries is on convenience and environmental sustainability (Vayouphack, 2020). These companies share very similar characteristics to traditional paratransit modes. Though they boast door-to-door transportation, this is also a characteristic of some paratransit modes and the issue of safety is still a concern to users (Avula and Zou, 2019; Buruhanutheen et al., 2019).

Moreover, drivers for these companies share similar problems to paratransit drivers, that is, competition, safety and income security. These types of companies have proved their ability to disrupt traditional paratransit modes (Simmons, 2018), and thus negatively impact the system. Nonetheless, incorporating technology into traditional paratransit modes, could prove to be fruitful in improving mobility as well as the overall perception of modes (Mulley and Nelson, 2016).

4. Public Transportation Systems in the Caribbean

This paper looks at the public transportation system of six Caribbean countries; namely Barbados, Guyana, Jamaica, St. Lucia and Trinidad and Tobago. These countries consist of five islands, and Guyana, which shares land with other countries (such as, Venezuela, Suriname, and Brazil). These countries were selected to have representation in the Greater Antilles, Windward and Leeward islands and Guyana, which has become one of the most dynamic oil producing countries in the 21st century and could drastically increase its gross domestic products (GDP) in years to come (Panelli, 2019). These countries vary in size, economy, and transportation system and give good depiction of the Caribbean. There is very limited data on the public transportation system in the Caribbean, thus the data for this paper was obtained predominantly from interviews and secondary sources.

4.1 Physical and Economic Characteristics

Tourism is an important contribution to the GDP of these Caribbean countries, as shown in Table 1. Though the national economy of most Caribbean islands is heavily dependent on tourism, some islands are focused on areas such as agriculture, mining and oil and gas. These countries vary in size and population and have their own unique roadways and characteristics.

4.1.1 Barbados

Barbados has a relatively flat terrain, and thus is unrestricted by topography as it relates to roadway construction. There are approximately 1,750 km of roads of which 80% are paved. These roads are classified as Primary (25%), Secondary (14%), Local (41%) and Development (about 20%) (Travers Morgan International, 1996).

Table 1. Physical and Economic Characteristics of the Caribbean Countries

Country	Population /million (World Bank, 2020)	Population density person/km ² (World Bank, 2020)	Surface Area (1000 km ²)	GDP/capita (USD) (World Bank, 2020)	Motor Vehicle/ 1000 people (NationMaster, 2020)	Main Economic Sector
Barbados	0.29 (2018)	668	0.431	17,949.28 (2018)	469	Tourism
Guyana	0.78 (2018)	4	214.9	4,979.00 (2018)	95	Mining and Farming
Jamaica	2.94 (2018)	273	11.00	5,354.24 (2018)	188	Aluminum oxides and ores
St. Lucia	0.18 (2018)	301	0.617	10,566.05 (2018)	166	Tourism

The transport network consists of seven radial highways, along with the Adams-Barrow-Cummins (ABC) Highway, opened in 1989, which consists of both two-lane and dual carriageway sections with at-grade intersections (typically roundabouts), which converge at Bridgetown. The radial highways are further linked to one another by secondary and tertiary roads. In addition, there are some 300 km of private roads. The roads in the public system are usually narrow, ranging from 5.5 to 6.5 meters in most areas (World Bank, 1984).

Additionally, because of increased traffic growth, lack of investment and limited maintenance, the quality of the road system has deteriorated, and large sections urgently need rehabilitation. Traffic volumes in and around Bridgetown are generally high, considering that the roads have only two lanes. The road network within the capital city consists of narrow roads which are restricted by existing buildings and allow limited space for pedestrian traffic. As a result of the high transport demand and the narrow roads, traffic congestion is common, particularly during morning and evening rush hours.

4.1.2 Guyana

Guyana is bound by Suriname, Venezuela and Brazil. Guyana has a relatively small population density as shown in Table 1. Its cities and towns mostly border the coast and the three largest rivers in Guyana; the Essequibo River, the Berbice River, and the Demerara River. This concentration of businesses and communities has influenced the existing road network. Guyana's road network is presently divided into highways, primary roads, secondary roads, tertiary roads, and trails (WFPGeonode, 2019). The Highways are the links from the villages and towns to the capital city, Georgetown, where most of the labour force commutes daily (Kaiteur News, 2015). The Demerara Bridge closes daily to allow for ships to traverse the river, preventing commute between the east and west banks to cross, thus creating queues of vehicles on either end (Demerara Harbour Bridge Corporation, 2020). Additionally, during peak hours, management of the bridge allows only for only one-way traffic flow with priority given to the higher volume along both lanes.

4.1.3 Jamaica

Jamaica has over 15, 000 kilometres of road (National Works Agency, 2012) that is densely configured. However, many of the nation's roads are not of a good quality. A 2005 study on the condition of the island's roadways, concluded that only 12% of the network could be categorised as "good" (Tarre and Persaud, 2019). Much of Jamaica's main arterial road network developed gradually from the era of horse-drawn carriages and bridle roads to the age of the motor vehicle (World Bank, 1983). Due to its genesis, a high proportion of the main road network was not originally constructed to specific

engineering standards resulting in considerable variation in the standards of alignment, construction and drainage. Because of these inconsistencies, many of the roads have been maintained on a piecemeal basis, further accentuating the uneven, fragmented nature of the network (World Bank, 1983). Additionally, traffic volume has been steadily increasing over recent years. This has led to congestion problems in major towns and capitals across the island.

However, the Government of Jamaica undertook several projects to improve mobility and accessibility to urban, suburban and rural communities (Government of Jamaica, 2009). In 2009, it was reported that more than 75% of households in Jamaica, do not own a motor vehicle, emphasising the importance of public transportation in Jamaica. Nonetheless, Kingston Metropolitan Transport Region (KMTR) implemented different traffic management strategies, with proposals for congestion mitigation for the other parishes (Government of Jamaica, 2009). Highway 2000, planned as a public-private partnership, features a four-lane controlled-access, tolled motorway which consists of an East-West link and a North-South link that aims to establish and efficient motorway axis. The highway is the largest infrastructure project undertaken in the English-speaking Caribbean (NROC, 2020) and the only country on this list with an active toll road that can be accessed by both public and private vehicles. Also, there is a Northern Coastal Highway Improvement Project (NCHIP), which links Negril in the west to Port Antonio in the East (Government of Jamaica, 2007; Caribbean Development Bank, 2017).

4.1.4 St. Lucia

St. Lucia is a small island with relatively underdeveloped infrastructure which the government has gradually continued to invest in and modernise it since the mid-1990s. There are over 1,200 kilometres of roads, marred by unpredictability; particularly in the interior, where many may be narrow, curvy, steep, unpaved and vulnerable to landslides and storm damage. The rugged, mountainous topography has largely influenced the layout of its road networks (Mycoo, Griffith-Charles and Lalloo, 2017). The concentration of main roads and highways is focused along the coast and other lower lying areas, in an effort to avoid the mountainous interior that also holds several protected forest reserves. However, there are no alternative routes crossing the island between the coasts, which increases vulnerability to occasional hurricanes, landslides and flooding (Philogene-Mckie, 2019).

4.1.5 Trinidad and Tobago

Trinidad has two major transport corridors; the East-West Corridor and the North-South Corridor. Historically, these transport routes were influenced by the nation's sugar and oil industries for mining and shipping. The topography of the land was also important to where residential areas were developed, as the East-West corridor settlements lie on the flat land at the foothills of the Northern Range (Leung, 2009). Trinidad has the unique feature of having a restricted lane called the Priority Bus Route (PBR). The PBR is the main linehaul public transportation route for the East-West corridor. Emergency vehicles also have special preference along this route. The PBR can provide a designated, free-flowing stream of public transport vehicles, offering a time and fuel efficient route alternatives. Trinidad is the only country on the list with this type of road.

Tobago is the second island within the republic of Trinidad and Tobago, located 35 km north of Trinidad. Tobago has one highway, the Claude Noel Highway (CNH) that links many popular destinations and hubs in western Tobago (Anthony, 1997). The CNH and the primary roads to the east, west and south of the highway lie on relatively flat land around the coast. These lower capacity roads allow for multiple lanes to operate. However, the roads to the north of the highway, extend uphill and are usually described as narrow and winding.

4.2 Public Transportation Modes

There are 3 main types of public transportation modes in the countries listed; state-owned buses, minibuses and shared taxis. In this paper, the focus is strictly on shared taxis used for public transportation. Traditional private taxis that are metered, are not included. Excluding Barbados, the other islands have ferry systems. Ferries are sometimes used as an alternative to road transportation, and can be classified as a public transportation mode, in countries like Trinidad and Tobago and Guyana. In the island of St. Lucia, the ferry is used for inter-island transportation, to Dominica, Guadeloupe and Martinique. Trinidad and Tobago have a similar ferry. Jamaica and St. Lucia also use the ferry for tourism. While most ferries are privately owned, Trinidad has a government-owned ferry.

4.2.1 The Minibus

The most common, and widely used type of public transportation mode in the islands is the minibus. This type of paratransit mode, has a local variant amongst the different islands, as displayed in Table 2. This is a privately owned public transportation mode that is found in all six islands. This mode is referred to as the 'maxi taxi' in Trinidad and Tobago (see Figure 2), the ZR Van and the mini bus in Barbados, while Guyana, St. Lucia, and Jamaica identify the vehicle as the minibus (see Figure 3). Interestingly, similar vehicles types for the minibuses are used in these countries, and this shares a culture of 'naming' and decorating the vehicles for ease of identification.

Common	Local	Country	Ownership	Vehicle Type	Seat	Route	Fares	Stops
Terms	Variant		_		Capacity	Options		_
Minibus	Maxi taxi	Trinidad and Tobago	Private	Jiangsu Joylong, Toyota HiAce, Nissan Urvan, Toyota Coaster, Mitsubishi- Rosa	15-24	Line haul	Varies by route/Fixed fare on given route	On Demand
	Minibus	Guyana		Toyota HiAce	15		Fixed fare	
	ZR Van Minibus	Barbados		Toyota Hi-Ace Hino Acme	11 24		Fixed fare	
	minibus	Jamaica		Toyota HiAce,	15		Varies by route/Fixed fare on given route	
	minibus	St. Lucia		Toyota HiAce	14		Varies by route/Fixed fare on given route	
Taxis	Route Taxi PH Taxi	Trinidad and Tobago	Private	Varied	4-8	Line haul Feeder routes	Varies by route/Fixed fare on given route	On Demand
	Taxi	Guyana				Line haul	Varies by supplier	
	Hackney Taxi/ Route Taxi	Jamaica				Line haul Feeder Routes	Varies by route/Fixed fare on given route	
Bus	PTSC Bus	Trinidad and Tobago	State	-City Champion, Higer Bus, Hino Acme, Mitsubishi Rosa, Thomas Cummins Bus, Volvo Caio, Zhengzhou Yutong	24-45	Line haul	Varies by route/Fixed fare on given route	Fixed
	Transport Board Bus	Barbados		Hino- Acme Mercedes- Marcopolo Mercedes- Caio	28-40		Fixed fare	
	JUTC	Jamaica		-Golden Dragon XML, Volvo VDL, Jonckheere		1	Varies by route/Fixed fare on given route	

Table 2. Physical and Operational Characteristics of Public Transportation Modes in the Caribbean



Figure 2. Minibus paratransit mode in Barbados: (a) ZR Van, and (b) minibus Sources: (a) Griffith, 2014. (b) Welchman Hall Gully Barbados (2016)



Figure 3. Minibus modes in (a) Jamaica; (b) St. Lucia, and (c) Guyana Sources: (a) Caribya (2004); (b) Stephen (2017); (c) Guyanese Times Inc (2018)

In Trinidad and Tobago, there are six different route of maxi taxis in operation. These are differentiated by coloured bands on the maxis and link the main cities to residential communities. The ZR vans in Barbados are white with a maroon stripe and holds a maximum seating of 11, while the minibuses are yellow with a blue stripe and has a capacity of 24. Both ZR vans and minibuses are identified by a number displayed on them, specifying the route as well as a sign showing their route. In Guyana, the colourfully decorated minibuses do not have visually distinguishing characteristics specifying the route.

Similar to Barbados, the route numbers are displayed on the vehicle. St. Lucia identifies the minibus by an 'M' on their license plate, route bands that vary by colour and with the use of a number-letter combination or the name of the general area to identify their destination. The minibus in Jamaica carries a red license plate marked "PPV" (Public Passenger Vehicle). These vehicles can be colourfully decorated, with a unique name branded on the vehicle. The minibuses in these islands use similar vehicles, which is usually the Toyota HiAce. Additionally, most of the minibuses have a maximum seating capacity of 11-15 (see Figure 4).



Figure 4. Maxi Taxi Trinidad and Tobago; (a) yellow band maxi, and (b) green band maxi Sources: (a) NGV Journal (2016), and (b) Ghouralal, (2019)

Trinidad and Tobago, as well as Barbados are the only countries on the list that have reported minibuses with a larger capacity. The fares are usually dependent on the distance travelled. However, in Barbados the fare is fixed, for every route. These minibus vehicles are usually line-haul modes that run on specifically identified fixed routes and will pick up and drop off passengers anywhere along the route traversed.

4.2.2 Shared Taxis

Shared taxis are another form of public transportation mode found in different Caribbean islands. Trinidad and Tobago, Guyana and Jamaica, which are the main countries on the list that have shared taxis as a competitive mode of public transportation. In St. Lucia, there are a few registered private taxis that operate as public transportation modes on feeder routes, within the suburbs of the main town, however locals do not typically view these taxis as public transportation modes. These vehicles are usually 5-seater sedans or 9 seater small minivans. More recently, the 9-seater minivan is more prominently seen, since they can hold more passengers per trip. In Trinidad and Tobago, these shared taxis operate on either feeder routes, from the PBR, along the east-west corridor. Highway taxis in both islands operate as line-haul modes. In Tobago, the shared taxi service operates island wide, and also has the convenience of being available through phone call, through the taxi services (see Figure 10). Registered route shared taxis can be identified by the H on their license plate and have defined routes, and terminals in these areas. There is a growing number of illegally operating taxis, locally known as PH taxis that do not carry the H license, but are registered as private cars with the P license. These illegal taxis compete with registered taxis as well as operate along routes and in areas that the registered taxis do not. The absence of the H license, allows the PH Taxi to ply where taxis are restricted, which gives them more benefits than the legal service providers (Furlonge, 2016).

Shared taxis are very popular in Guyana. These taxis are hired from taxi services or have hubs at popular locations such as hotels, schools etc. These shared taxis, will transport a single group of passengers. There are cases of carpooling where a hired taxi will complete more than one job in a single trip, once given the consent of the passengers. The hired taxis do not have a specified route, and can actually be hired through phone call or text message, similar to international rideshare companies, without the app platform. The shared taxis are considered part of the public transportation system and are an alternative to the minibus.

Route shared taxis operate in almost every part of Jamaica. Like their local minibus, these taxis have the PPV license plate and will usually have 'Route Taxi' branded on the vehicle. These modes do follow a set route, like Trinidad and Tobago, and have defined terminals in the various towns. Similar to Trinidad and Tobago, these taxis wait until they are full to begin their journey. The fares are fixed (depending on the location) but are much cheaper than hiring a private chartered taxi. There are also cases of private vehicles, operating as route taxis without the regulated PPV license, like the PH in Trinidad and Tobago.

4.2.3 Bus

Barbados, Jamaica and Trinidad and Tobago have the highest GDPs and have state-owned bus companies in operation alongside the paratransit modes. These state owned bus companies are subsidised by the government and overall have a smaller fare than their paratransit competitors. These bus companies share similar features in that they operate along fixed routes and stop at fixed points, unlike the minibuses and shared taxis. These companies are The Public Transport Service Commission (PTSC) in Trinidad and Tobago, The Transport Board Bus Company in Barbados and The Jamaican Urban Transport Company (JUTC) in Jamaica (see Figure 5). In Trinidad and Jamaica, the PTSC and JUTC have legal rights to use the PBR and Toll roads respectively.



Figure 5. State-owned bus companies; (a) PTSC- Trinidad, (b) JUTC- Jamaica and (c) Transport Board- Barbados Sources: (a) PTSC (2020), (b) NICEPNG (2018), and (c) Alleyne (2019)

Though the countries have their unique history and culture, they share similar paratransit modes. Furthermore, in countries where both paratransit and public transit are available, the former is still more popular (Steer Davis Gleave, 2008; Johnson, Koebrich and Singer, 2019) despite being more expensive than the bus. Paratransit modes are valuable to the overall transportation system of those countries and have been for years. Given this, these modes have developed similar social behaviours and customs around them.

5. The Paratransit Mode Culture in the Caribbean

Public transportation is an important aspect of the livelihood and progression of a nation and in SIDS and developing countries, paratransit modes play an essential part of their public transportation. In countries such as Guyana and St. Lucia, where there is no governmentowned public transit system, paratransit modes are the only alternatives to captive travelers. Travelers are therefore forced to tolerate the culture and behaviour of the paratransit modes. Islands such as Barbados, Jamaica and Trinidad and Tobago have state-owned bus alternatives, the paratransit modes in these systems are still preferred. Often times, the nonsubsidised paratransit, is used more frequently than the subsidised government bus, which has cheaper fare, but is often viewed as unreliable (Robinson, 2013). This may be due to the lack of available buses to service all the routes (Jamaica Observer, 2017; The Barbados Advocate, 2019). Though cheaper, the unreliability of the government owned buses, forces travelers to use the paratransit modes, even though they are not seen as the most comfortable alternative and makes the private car more attractive. This lack of confidence in the overall public transportation system can be linked to the constant increase in vehicle ownership (Furlonge, 2007; Government of Trinidad and Tobago, 2012; Robinson, 2013).

Paratransit modes are commonly criticised for being unsafe and dangerous. With the exception of Trinidad and Tobago and St. Lucia, the countries have reported that the minibuses in particular are constantly overcrowded, and this behaviour is encouraged by drivers and conductors. Vehicles can often be seen with passengers sitting on top of each other, with no seatbelts, and people standing in a packed vehicle. There have also been incidents of both drivers and passengers being robbed and physically harmed (St. Lucia Times, 2019). This further promotes the narrative that these types of modes are unsafe, and inevitably glorifies owning a private vehicle. The minibuses are known to drive competitively and recklessly, endangering passengers and other drivers. With no standard salary for minibus drivers or conductors, their income is dependent on the number of passengers carried in a day. This creates competition between drivers to obtain as many passengers as possible, perpetuating the reckless driving. Many accidents have occurred with these modes, and some have caused fatalities (Barbados Free Press, 2012; Emanuel, 2020).

Moreover, there is a general culture of loud and offensive music, alcoholism and colourful vocabulary (Fenty, 2014; Guyanese Times Inc, 2018), again strengthening the unfavourable opinion of these modes. Nonetheless, these paratransit modes are a profitable system though the culture is viewed negatively. Despite the challenges and negative behaviour the paratransit community exhibits, its advantages cannot be disregarded and these modes are still frequently used in the public transportation system.

Paratransit modes have emerged and remain in the Caribbean due to their reliability being driven by profit and economic growth. This drives the operators to work longer hours, increase their frequency of operation and increase the vehicles that service a particular route, therefore reducing the waiting time for travelers on that route. Furthermore, the unscheduled nature of the system allows for the operation on routes, that are used by the paratransit service providers and are not serviced by the state-owned systems, giving a more demand driven approach for travelers (Salazar, 2015). As a result, areas that have a need for the service can be quickly addressed rather than waiting for governmental intervention. From the operator's perspective, it provides opportunities of employment to poor or low-skilled workers, thus stimulating socioeconomic growth.

Government-owned public transport in the researched territories is either non-existent, inefficient or struggles to provide comprehensive coverage to large sections of the population. Many residents live a significant distance away from the cities, which are typically focused on business activity. There may be few transfer hubs to provide ease of accessibility to communities further away from the city centres. The paratransit modes avoid the deficiencies of the main transportation system which does not service the less populated areas. Modes like the shared taxi in Trinidad and Tobago, Guyana and Jamaica are also more convenient for the elderly and disabled, as they offer more flexibility and comfort in reaching their final destination.

Captive travelers require a dependable mode of transportation to comfortably and safely conduct their daily activities. In some cases, the ridership of paratransit modes is more than double the ridership of the government bus company (Steer Davis Gleave, 2008; Wright, 2018; Dolcy, 2019). This has raised the question, whether the government needs to provide its own public transportation alternative. Both Guyana and St. Lucia have shown that their unsubsidised paratransit system can operate without a state-owned bus. Furthermore, the government buses tend to have low technical performance and output due to a lack of incentive (Salazar, 2015).

Rideshare companies have also become very popular in developed countries and their service is slowly trickling down to developing countries. Such platforms are popular in areas of Asia and Africa. Trinidad and Tobago, Barbados and Jamaica are the only Caribbean countries discussed in this paper that have local rideshare apps available for the public. There was a period of time when Uber was present in Trinidad and Tobago, but that was short lived. Though rideshare platforms are a relatively new concept to the Caribbean, Guyana has a similar system integrated into their public transportation system, by the means of their shared taxi public transportation service.

Though this is only a dial up system, where patrons pay with cash, there is capacity to digitise this service. In Trinidad and Tobago, Barbados and Jamaica these rideshare companies are used as an option when going to social gatherings, and as a cheaper alternative to hiring private taxis for these events. However these rideshare services have the potential to be alternatives to using the public transportation maxi taxi, route shared taxi service, ZR or minibus for every day travel. This new option in the transportation system, could supply travelers with a safer environment. Thus, rideshare companies can threaten the livelihood of the current and traditional paratransit operators.

In spite of the negative culture of the paratransit modes, the governments in these territories have acknowledged the pivotal role in the transportation system and their ability to pragmatically adapt to the local market, and thus have provided incentives to ensure that the paratransit system continues to thrive, by establishing transfer hubs, maintaining infrastructure such as the PBR in Trinidad, relaxing enforcement on infringements, such as speeding and overloading of passengers and giving subsidies on vehicular fuels (NGC CNG Company Limited, 2017; St. Lucia Times, 2018). Nonetheless, the issues of safety and comfort with the paratransit systems need to be addressed to create a more attractive alternative to captive travelers and private car users.

6. Conclusion

This paper has highlighted the essential role that paratransit modes play in some Caribbean territories. The islands in this study vary in size, population, GDP and yet, share similar physical and operational characteristics in the public transportation system, especially the paratransit modes.

Despite its many shortcomings, the paratransit systems evident in the Caribbean countries highlighted in this study can offer a solution to some of the transportation problems in those countries, and be an instrumental part of the public transportation system in developing countries. Without the financial aid necessary to construct and maintain an efficient public mass transit system; populations are forced to create their own solutions, restricted by available resources. The existing paratransit modes presented in this overview, form part of this solution. Nonetheless, people are still largely dissatisfied with the quality of service provided by them. While paratransit can provide a solution, it needs to be optimised; and properly integrated into the transportation system. It is necessary for governments to make the public transportation a priority and to invest in an efficient and well-planned system that can work in harmony with the organically growing paratransit system. An integrated approach utilising both the government-owned bus company and the paratransit modes can be a profitable and efficient and intervention by the government to skillfully manage this integrated system is necessary.

Future work should consist of research into different solutions to the problems faced by the transportation system, such as, the suitability of a bus rapid transit system, improving law enforcement around the public transportation system and improvement of public transportation transfer hubs. More studies could focus on possible policy changes to improve the system overall. However, in order to accomplish this, data is needed. In this manuscript, it is acknowledged that there is a shortage of readily available data in the Caribbean, particularly in the smaller islands. Data is not only necessary to make any relevant changes, but it is something that needs to collected regularly to see trends and understand changes.

While census data is already collected in the Caribbean, it is suggested that the data be collected more frequently, and information on transportation should be integrated in. Data such as amount, and cost of vehicles in a household, and average cost per trip of both car and public transportation users could be very useful. Cost of vehicles versus mean income of the population and vehicle ownership percentage can indicate how transportation choices are made, as well as how much people are willing to spend on the convenience of a private car and the quality of the public transportation system.

Transportation studies, such as travel demand studies, trip pattern data, and ridership data need to be conducted. Having a better understanding of how much trips people make per day, the amount of transfers from one transit mode to another can highlight inefficiencies within the system and where to focus on for improvement. Likewise, any proposed solutions should undergo a feasibility study to ensure that the solution is reasonable and sustainable. Attempts should be made to forecast potential conditions so that measures can be proactive rather than reactive.

Moreover, satisfaction surveys are important. Questions should be asked with the aim of determining the consensus on qualities like comfort; safety; travel times; costs; reliability; and accessibility. This information can guide improvement projects and give a view of why individuals make certain choices. Getting direct feedback from consumers can aid in ensuring that the investments made to the system are prioritised in the areas that are most highly demanded.

This paper provides a foundation of information for the public transportation system of five Caribbean countries. It can be viewed as an introduction for further research on public transportation in the Caribbean, focusing on policy and improving the quality of usage and of public transportation.

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