BRT in the Philippines: A Solution to Manila and Cebu Traffic Problems?

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Abstract. Bus Rapid Transit (BRT), where buses run on dedicated roads at high frequency, almost in a metrorail manner, has been adopted as a backbone of urban mobility in the cities of many developing countries. Originally developed in South America (Curitiba, Brazil and Bogotá, Colombia), it has entered Asia with force, from Indonesia (Jakarta’s Transjakarta) to India and China. In the case of the Philippines, where intercity bus transportation is widely used due to the current lack of a railway network, city traffic, especially in Manila, is heavily congested, partly due to a high number of city buses running half-empty, the small proportion of road space relative to the vehicle population, and the insufficient provision of urban rail transportation. This paper examines the current situation of congestion, and its adverse effects, in the two main urban areas of the Philippines, Manila and Cebu, and the plans to implement BRT, looking at the routes chosen, the financing, the schedule of development and the expected outcomes. A major impediment to improvement in traffic conditions in the Philippines is the current boundary system, which coupled with the high number of bus operating companies leads to wild competition on the road, with the strong potential for multiple traffic jams and traffic accidents. Implementing a BRT system to make traffic smooth and fluid will require not only some road work and financing, but also a profound change in the way the bus system operates. It will also require a profound re-evaluation of intermodality between the renovated bus system, the rail system and two iconic Filipino transport modes, the aging jeepney and the lowly trisikel.

1. Introduction

“An advanced city is not a place where the poor move about in cars, rather it’s where even the rich use public transportation” Enrique Peñalosa, mayor of Bogotá, Colombia (1998-2000, 2015-present). Many cities in developing countries, especially in Asia [1], suffer the joint ills of high population growth, high density and rising use of private vehicles, motorbikes or cars, leading to unhealthy levels of air pollution and crippling traffic congestion. The Philippines are no stranger to these trends. Since the 1990’s, the Philippines are coping with an exponential growth.

The country has one of the highest rates of demographic growth in Asia (with a fertility rate above 3, when other countries such as Japan, Korea, China or Thailand have dropped well below the replacement level of 2 children per couple) and, while the population growth, in stark contrast to Japan, happens in all provinces, most of the increase in population happens in and around Metro Manila, which is already the most densely populated metropolises in the world, alongside Dhaka, Bangladesh.

This strong population growth, conjugated to the rise of the living standards of many inhabitants, despite the persistence of poverty, has led to a sharp increase of the motorization rate, which is responsible for the traffic congestion faced by the major urban areas of the country, Metro Manila and Metro Cebu. Alternatives to the private car, such as public transit, are too often dysfunctional and used beyond their
original capacities. This is why Philippine officials have looked for some time at BRT systems as a way to solve some of the mobility problems in the Manila and Cebu metropolitan areas, with two projects under consideration in the National Capital Region, and one in the country’s second largest city.

2. Result and Discussions

2.1. The BRT experience in Latin America and Asia

BRT (Bus Rapid Transit) has been described as “a rapid mode of transportation that can combine the quality of rail transit and the flexibility of buses” [2,3], at a fraction of the cost needed to build an urban railway system [4].

Buses provide essential transport links in many cities, but are generally seen as the poor cousins of subways and trams. They are unreliable, suffering from traffic jams just as much as private cars without any of the sense of control. They also stop frequently, making progress slow, even if the road is clear. BRT systems do away with these problems. They use segregated, dedicated traffic lanes, “busways” inaccessible to other road users except emergency vehicles, in order to improve reliability and escape most delays due to traffic jams. Buses are synchronized with local traffic lights, to give them priority at crossroads (no more waiting for the lights to change). Passengers embark and disembark at bus stations designed to minimize the loss of time at the stop (platform and bus on same level), and they pay the fare when they enter the station, hence reducing the opportunities for fraud and crime against drivers, since they do not handle cash and can focus entirely on their driving.

BRT is widely recognized as having originated in Curitiba [5], Brazil, during the 1970’s, under the guidance of architect, then mayor (1971-1975, 1979-1984 and 1989-1992), Jaime Lerner, who later became governor of Parana province (1995-2002). His team designed a system of five main corridors leading from the suburbs to the downtown area, with right-of-ways for high-capacity double-articulated buses, and “tube” stations, while other bus routes were designed either as feeders to the 5 main corridors or links between suburbs. In order to maximize the ridership and limit urban sprawl, urban planning focused on the densification alongside BRT corridors, in a typical TOD (Transit-Oriented Development) philosophy [6]. While other cities in Brazil, such as Rio de Janeiro or São Paulo, were building subway systems, for higher capacity, Curitiba was deemed not large enough to justify the heavy cost of underground rail transit. However, the continued growth of Curitiba has now led to the city being the one with the highest rate of motorization in Brazil, while the bus network starts to show its age with maintenance difficulties and a saturation of the buses.

The second big city to develop a BRT network was Bogotá, the capital of Colombia, where Enrique Peñalosa launched the Transmilenio in the year 2000, based on the same general principles as Curitiba’s Rede Integrada de Transporte [7]. One of the objectives in Bogotá was to reduce air pollution, by replacing hundreds of aging buses running on decades-old routes with a new system where routing was adjusted to fit the main areas of housing and activities. In this much larger metropolis, buses can also run partly on special freeway lanes. It has allowed Bogotá to boast of a capacity of 35,000 to 40,000 peak passengers per hour per direction, making it the most efficient of all BRT systems in the world for mass mobility [8].

The success of BRT in these pioneer cities led to the rapid diffusion of the model across Latin America (Mexico City 2005, Buenos Aires 2011), then Asia (Kunming, China, in 1999, Jakarta, Indonesia in 2004, Tehran, Iran, in 2008, Ahmedabad, India in 2009, Bangkok, Thailand, in 2010) and the rest of the world (Nantes, France, in 2006, Istanbul, Turkey, in 2007, Lagos, Nigeria, and Auckland, New Zealand in 2008, etc) [9, 10].

As of October 2017, a total of 207 cities in six continents have implemented BRT systems, accounting for 5,468 km (3,398 mi) of BRT lanes. 32.1 million passengers used BRT worldwide every day in 2017. Latin America [11] remains in the lead, with 19.5 million passengers per day (Brazil 10.6 million, Colombia 3.1 million, Mexico 2.5 million, Ecuador 1.1 million) using BRT systems in 54 cities (21 in Brazil, 7 in Colombia). Asia comes in second place to South America, with 20 cities in China (4.4 million passengers per day), 7 in India (340,000 pax/day) [12, 13], 3 in Iran (2.1 million pax/day) and 13 others. One of the largest networks is the Transjakarta in Indonesia (370,000 pax/day) [14, 15] with 12 corridors across the metropolitan area, up to now the largest city in the world without a metrorail system. BRT appears in many developing/emerging countries as a tool to lift public transport out of the “informal” into perceived
modernity [16, 17]. It can have substantial effects in reducing the environmental impact of city transport [18, 19, 20], and in this way is comparable to trams in Europe and the USA for the image of a city and the “success” of a mayor’s mandate [21, 22].

2.2. Manila’s and Cebu’s transportation deficiencies

Metro Manila (17 constituent cities and municipalities) has grown from 7.9 million residents in 1990 to 12.9 million in 2015 (+ 62%), while the population of Metro Cebu (13 cities and municipalities) has climbed during the same quarter of a century from 1.454,000 people to 2.849,000 (+ 96%). These numbers do not account for the high growth of provinces adjacent to Metro Manila (Bulacan to the north, Cavite and Laguna to the south, Rizal to the east), where suburban sprawl eats away at farmland and new subdivisions and business parks generate traffic often bound for Metro Manila on crowded freeways such as SLEX (South Luzon Expressway), NLEX (North Luzon Expressway) and Cavite Expressway.

This growth comes into a metropolitan area (Manila), which is one of the most densely settled of the world and sorely lacking in road space. Nevertheless, the emerging middle class has embraced the private car for commuting and multiple activities beyond the journey to work, following an American pattern of auto-led urban expansion [23] in this former colony of the United States, where the motorbike has remained a secondary mode of transport, unlike in Malaysia, Indonesia or Vietnam [24]. The heavy concentration of provincial bus terminals alongside the circumferential EDSA highway [25, 26], coupled with a favored location of office building clusters and shopping malls alongside that same thoroughfare, makes it a perennial site for traffic jams, despite the fact that jeepneys are banned from using EDSA on two thirds of its length [27, 28].

Rail transit has been implemented with four lines currently in service. A suburban rail operated by Philippine National Railways takes people from the Tutuban Station in northern Manila to Calamba (Laguna province), with a few overcrowded trains running at slow speed across squatter areas, such as the Santa Mesa section of the tracks. Three elevated metro lines offer metropolitan service which is clearly under par for such a large and dense urban area, in terms of the number of lines, the number of stations, the number of trains, the overall capacity of each train and the speed of these trains. This makes for an unpleasant public transit experience, even more when the trains break down. The trains of LRT 1 and MRT 3 run well above their stated capacity, which leads to long waiting lines for would-be passengers and suffocating crowded conditions on board the trains. Only the LRT 2 line, which strangely enough offers the biggest trains, operates in an adequate manner and provides acceptable commutes, for a much smaller number of commuters. Adding to the woes of the metrorail system is the poorly implemented connection between the different lines, at Cubao, Quezon City (lines 2 and 3), EDSA / Taft (lines 1 and 3 in the South), Roosevelt / North Avenue (lines 1 and 3 in the North) and Doroteo Jose / Recto (lines 1 and 2), as well as the connections with the PNR line (Blumentritt in northern Manila, EDSA/Magallanes in Makati). A ray of hope exists however with the current construction of a new transfer station in Quezon City for passenger connections between lines 1, 3 and the future line 7 now being built).

Insufficient and mediocre rail transit, slow road traffic, frequent flooding of the streets, heavy pollution from the old engines of jeepneys and trisikel concur with mostly narrow streets, the flow of trucks to and from the maritime port located near the old center of the city, and the high growth of motorization to create very difficult mobility conditions throughout metropolitan Manila, a situation already denounced twenty years ago [29]. The gap of affordability is increasing between flood-safe neighborhoods well served by quality transit and roads, and many areas in Greater Manila which are inundated and difficult to reach [30]. Traffic jams are less damaging to the economy and the quality of life of Cebu residents than in Manila, but the high growth of “Cebboom” in the last two decades is now leading to a rapid deterioration of the mobility of residents in this city too.

Given the poor situation of mobility in both metropolitan areas, several policies have been attempted to tame traffic. New roadways with overpasses have been built, such as the soon to be opened SLEX-NLEX link that will hopefully relieve some of the pressure on North-South traffic alongside EDSA. But many studies have shown all over the world that building many new roads is not a good long-term solution to traffic woes. A second set of policies has been implemented with poor results, attempting to limit the
number of vehicles on the road, either through alternate license plate schemes (Unified Vehicular Volume Reduction Program, easily handled by cheaters and neglected by some municipalities in a context of weak metropolitan governance) [31], the removal of unregistered public transit vehicles (“colorum” buses), a “bus segregation scheme” alongside EDSA (A buses to Alabang stopping on A stops, B buses to Baclaran stopping at alternate B stops), the planned transfer of provincial terminals to peripheral bus transit centers, as is done in Seoul or Surabaya, for example.

Local municipalities such as Manila are also active today in clearing up streets from vendors encroaching on the roadway. But the legendary disrespect of many Filipinos for following the rules, especially traffic rules, including on the hours of work for bus and jeepney drivers, has not made much difference in the quality of traffic within the metropolitan areas [32] and is a source of numerous accidents [33]. A proposed phase-out of the iconic jeepneys is currently a topic of protest by the owners and drivers of these ubiquitous vehicles, bound to be replaced with clean electric vehicles, in order to improve the air quality in the city, as well as the safety of passengers, and reduce the fossil fuels consumption in the country [34, 35]. On the software side, different telecommunications technologies have been tested to improve the flow of traffic, such as smart phone applications for passengers and bus scheduling algorithms. These tech solutions have proven effective in other places, but bus operators seem slow in introducing them for day-to-day service, since they are often running their businesses at thin margins in a context of cutthroat competition between operators [36, 37] and may not be keen in investing on high-tech equipment for their vehicles.

The past administration of Benigno Aquino gave the impression of not paying much attention to transportation issues, whether in Metro Manila or in the ports and airports, with a clear lack of investment into infrastructure, except for some roads. The new Duterte administration, despite the attention it has given to the “war on drugs” and conflicts with Islamic jihadists in Mindanao and the communist NPA guerrilla in the countryside, has pledged to develop new infrastructure at a much higher pace, under the slogan “build, build, build”. After many reports and reviews, especially from JICA (Japan International Cooperation Agency), a multi-pronged program to tackle transportation deficiencies in the country, especially in Metro- and Mega-Manila, has been started. It includes several projects for underground subway lines and above ground monorails, particularly to link the airport with the major CBDs of Makati, Bonifacio Global City (BGC) and Ortigas, planning for a new airport (site to be decided, either a transfer to Clark in Pampanga province and the creation of a brand-new facility, possibly on reclaimed land in Manila Bay, as was done in Osaka, Nagoya, Seoul or Hong Kong), possible transfer of port facilities to the under-used maritime gateways at Batangas and Subic Bay. It also includes the BRT plans for both Manila and Cebu.

2.3. Plans for BRT in Manila

The experience of other cities, either running BRT as the centerpiece of their mobility plans (Curitiba, Bogotá, Jakarta) or as an added element to a mix of transportation options (Rio de Janeiro, Beijing, Guangzhou) has been a source of interest for Philippine transportation planners. It is widely agreed that the sheer capacity of a bus gives it obvious advantages over the smaller jeepneys (20 to 30 passengers) or AUV (Asian Utility Vehicles) or FX shared taxis (8 passengers) operating on the same routes, as is the case in Manila alongside Taft Avenue or the España Blvd – Quezon Ave– Commonwealth Ave corridor (E-Q-C) linking Manila and Quezon City. Thus, in the past, numerous studies have been undertaken [38] to identify BRT corridors and to be aware of travel trends within Metro Manila. BRT could be deployed on routes radiating outwards beyond the semi-circular EDSA, alongside the shores of Manila Bay (Paranáque, Las Piñas, Cavite) with possible extension to Dasmariñas to the south (“line 5”), towards Rizal province (Cainta, Taytay, Angono, Binangonan) to the east, and alongside the C-5 circumferential route from SLEX to Commonwealth Avenue through Taguig, Pasig, Makati and Quezon City.

The MMUTIS study (Metro Manila Urban Transport Integration Study) was conducted in 2000 in order to set up a master plan for the Metro Manila transport system for the period 2000-2015. This plan envisioned new roads, viaducts, interchanges, highways but also transport systems such as the Tramway or the BRT. In the end, line 2 of the LRT was set up according to this schema as well as the extension of the LRT1 line
in order to connect it with the MRT-3 in Quezon City and “close the loop”, but nothing was done about the BRT project.

The US Agency for Development Assistance (USAID) pre-feasibility study in 2007 aimed to identify roads within Metro Manila on which it would be interesting to implement BRT, using criteria such as growth potential, current congestion, availability of dedicated right-of-way, demand or will of local authorities to put in place the BRT. The 2 choices being made are the Lerma-Fairview line on Commonwealth Ave in Quezon City and the EDSA corridor. But this plan never saw the light of day, since the Lerma-Fairview corridor was reserved for the line 4 LRT/MRT, and the EDSA line already had the MRT system and the presence of a competing BRT could affect its profitability. Although it did not lead to implementation, the USAID study could serve as a blueprint for future BRT development.

In 2009 a study was launched for the cities of Taguig and Makati to try to stop the strong growth of private vehicles, which would have the effect of dissuading some investors from settling in these two cities of Metro Manila. Thus the proposal to install a BRT along Ayala Avenue in downtown Makati, the main business hub of the country, was advanced as a few months earlier the Ayala Loop extension project of the MRT was canceled.

These three studies have paved the way for BRT projects in Manila by laying the foundations of the work for several important issues such as the choice of routes or the location of stations. In December 2016, the Philippine Transport Department presented three BRT projects: EDSA, the circular route C-5 from SLEX to Commonwealth Avenue through Taguig, Pasig, Makati and Quezon City and parts of the aforementioned E-Q-C, from downtown manila to Quezon Circle (leaving open the future of Commonwealth Avenue, the widest thoroughfare of Metro Manila). In the context of high density of the built environment and overall small road space, the availability of wide boulevards and avenues allowing for dedicated right-of-ways to implement BRT transit are quite limited. These corridors are also heavily traveled by buses (PUB, Public Utility Buses, in bureaucratic terms, while jeepneys are PUJ, Public Utility Jeepneys) and AUV, with a strong demand in mobility by office workers and shopping mall patrons and employees in the case of EDSA, students for E-Q-C, office workers and students for C-5.

Figure 1. EDSA’s BRT project
EDSA’s BRT project was approved and signed by Philippine President Rodrigo Duterte during the first meeting of the National Authority for Economic Development (NEDA) on September 14, 2016. The project is estimated at 711 million US dollars, with 200 million dollars – 28% of the total - already pledged by the China-led Asian Infrastructure Investment Bank) and will be implemented in 3 years between 2018 and 2021. According to NEDA, the project aims to provide an alternative to the LRT-1 / LRT-2 and MRT-3 system in Metro Manila, and to reinforce the public transport system with a route along the EDSA already served by the MRT-3.

The 48.6-kilometer journey along the EDSA will go from Monumento to Roxas Boulevard with dedicated lanes between Ortigas Business District, Bonifacio Global City and Makati Business District. Extensions away from EDSA will connect to the Ninoy Aquino International Airport (NAIA) and the BGC business hub. The establishment of this EDSA BRT involves the creation of dedicated lanes on the route as well as the installation of the 63 stations and terminals that will make up the line. There will be one dedicated BRT lane per direction, and 2 dedicated BRT lanes per direction at the stations level. The project also aims to set up high-capacity buses to repair the error made with the undersized LRT-1 and MRT-3. The BRT EDSA stations will be located on the median lane and below the MRT stations, which will allow connections between the two transit systems. EDSA’s BRT will follow Bogotá’s business model, where existing bus companies are prioritized in the tender. EDSA’s project sponsors hope this new bus system will allow more than 1.6 million people to travel every day, three times more than the MRT-3.

Figure 2. The Quezon Avenue BRT project

The 12.3-kilometer Quezon Avenue BRT is a project linking Manila City Hall to the Quezon Memorial Circle. Its development was approved by former President Benigno Aquino III in January 2016, but will have to be re-evaluated by the new government of Rodrigo Duterte before its implementation planned between 2019 and 2022. The project aims to install a safe, reliable and comfortable BRT system that could serve 300,000 users a day along España Boulevard and Quezon Avenue. It will operate as a metro by traveling passengers on dedicated lanes along the linear avenue of Quezon Avenue, which leads to Quezon
Circle, where students of the University of the Philippines can connect to local jeepneys to reach the campus. It will also allow for intermodality, since several stations of the future BRT will be linked to metrorail stations: MRT-3 at Quezon Avenue, LRT-1 at Carriedo and Central Terminal LRT-2 at Legarda, a busy station used by students of the “University Belt” of Manila. The reservation of dedicated tracks, the purchase of equipment (280 buses), the setting up of 16 stations or the construction of tracks dedicated to this BRT mean that the cost of setting it up is estimated at 109.4 million dollars, of which $ 64.6 millions will be provided by the World Bank and the CTF (Clean Technology Fund). The rest of the budget will be financed by the Philippine Government, which will bring the equivalent of $ 44.8 million. From the point of view of the configuration of the tracks and the stations, it is the same one as for the BRT EDSA, that is to say a lane dedicated to the BRT between the stops and two lanes at the stations. The potential ridership is estimated at 300 000 passengers per day.

Since its financing is already in place, when the EDSA BRT is still looking for funds beyond AIIB’s contribution, the Quezon Avenue BRT is likely be the first one put into service. As for the C-5 BRT, funding has not been found yet, which pushes further back its implementation.

2.4. Cebu’s BRT project

As with the BRT in Manila, the BRT in Cebu has long been discussed. First in 1992, when the province of Cebu launched a study on the public transport systems of Greater Cebu. This study showed that a LRT system was not viable for the city of Cebu and that it would be more interesting to set up a BRT system. The BRT system, which at that time still existed in just a handful of cities around the world, was booming in Curitiba, so the officials of Greater Cebu and went to Curitiba in 1996 in order to observe the operation of the BRT and to share knowledge with Brazilian officials. The BRT project was studied for almost 10 years in order to insure quality service. The project took a step forward in 2008 when the city of Cebu asked the World Bank to finance the development of BRT in the Grand Cebu and requested French RATP’s (the Paris transit authority) and technical assistance to study an implementation proposal, as the need for better mobility became more urgent.

The city of Cebu has indeed experienced a sharp increase in population over the last 30 years, while substantial increases in the standard of living have exploded the number of vehicles running the roads of Greater Cebu, leading to heavy congestions mainly during rush hour. Public transport in the Grand Cebu is mainly road transport, since the city has no metro or tramway system. According to CITOM (Cebu City Traffic Operation Management), there are more than 8300 Jeepneys, 6000 taxis and 950 buses in Cebu. Public transport in Cebu is dominated by PUJ (Public Utility Jeepneys), while major bus companies run their vehicles on the main arteries outside the city center but they do not return in the city center, hence leaving little choice to the inhabitants in terms of mode of transport. Because of this unique mode of transport the Jeepneys abound in the city center and their increase in numbers has not been followed by an improvement of the infrastructures. In addition, jeepney drivers in Cebu, as those in Manila, drive in a very unruly way, which further increases congestion. Other problems are pedestrians walking on the roads because of vehicles parked in an anarchic way, and roads encroached by informal merchants.

In response to these problems and the lack of a real public transit system, the Cebu Government decided to set up a BRT system, at a cost of $ 214.6 million, to reduce congestion. Cebu's BRT was expected to become the first operational BRT system in the Philippines, with the final phase of implementation in 2017. However, construction is expected to start only at the end of 2017 and finish in 2019. Cebu BRT aims to provide residents with an efficient, reliable service that should be able to carry 330,000 passengers a day through 176 buses spread over a 16-kilometer route that includes 33 stations. The route of the BRT is already known and it will extend for 16 kilometers between Bulacao and Talamban, using dedicated lanes between Bulacao and Ayala Mall (11 km) then normal routes between Ayala Mall and Talamban (5 kilometers).
3. Conclusions
Implementing a BRT system will probably entail a profound reorganization of the structure of the bus industry, with a consolidation of the dozens of local companies into a handful of operators with the size needed to offer quality service and proper maintenance of their fleet, while being able to reach the government’s objectives in terms of service to the public (frequency, safety, punctuality) and environmental improvement (reduced gas emissions as in Bogotá) while saving on fuel with less idle time and rationalized routes (Bogotá again) [39].

Choices made in the Philippines appear as intermediary between the pure BRT system of Curitiba and the open-ended BRT system of Guangzhou, China, where buses use dedicated lanes on a central section before serving other areas where they mix again with other traffic. In the case of Cebu, it is somewhat surprising that the airport, which will grow in coming years to help decongest Manila’s NAIA airport, is not better served by the upcoming metropolitan transit buses, at a time most airports in Asia aim at good rail service, which is also planned for Manila with a subway loop. In the National capital Region, the impending development of BRT must be planned with a profound reorganization of the entire transport system, since the current push for the modernization of jeepneys is a golden opportunity to re-think the routes of these vehicles in their new shape, as well as the lowly tricycles and pedicabs providing coverage of the neighborhoods to streets not open to larger vehicles. The transfer of most provincial bus terminals to integrated suburban locations is another opportunity to improve connectivity between the networks for the benefit of the traveling public.

Figure 3. Cebu’s BRT system
References

[1] Barter P 2000, Urban Transport in Asia: Problems and Prospects for High-Density Cities, *Asia-Pacific Development Monitor, 2*, 1, 33-66

[2] Deng T, Nelson J 2011, Recent Developments in Bus Rapid Transit: A Review of the Literature, *Transport Reviews, 31*, 1, 69-96

[3] Maeso-Gonzalez E, Perez-Ceron P 2014, State of art of bus rapid transit transportation, *European Transport Research Review, 6*, 2, 149-156

[4] Currie G 2006, Bus transit oriented development: strengths and weaknesses relative to rail, *Journal of Public Transportation, 9*, 4, pp. 1-21

[5] Lindau L A, Hidalgo D, Facchini D 2010, Curitiba, the cradle of Bus Rapid Transit, *Built Environment, 36*, 3, 274–282

[6] Cervero R, & Dai D 2014, BRT TOD: Leveraging transit oriented development with bus rapid transit investments, *Transport Policy, 36*, 127-138

[7] Duarte F, Rojas F 2012, Intermodal Connectivity to BRT: A Comparative Analysis of Bogotá and Curitiba, *Journal of Public Transportation, 15*, 2, 1-18

[8] Gilbert A 2008, Bus Rapid Transit: Is Transmilenio a miracle cure?, *Transport Reviews, 28*, 4, 439–467

[9] Heddebaut O, Finn B, Rubael S, Rambaud F 2010, The European Bus with a High Level of Service (BHLS): Concept and Practice, *Built Environment, 36*, 3, 307-316

[10] Hidalgo D, Gutierrez L 2013, BRT and BHLS around the world: Explosive growth, large positive impacts and many issues outstanding, *Research in Transportation Economics, 39*, 1, 8-13

[11] Hidalgo D, Carrigan, A. 2010, BRT in Latin America: high capacity and performance, rapid implementation and low cost. *Built Environment, 36*, 3, 283-297

[12] Tiwari G, Jain, D 2010, Bus rapid transit projects in India cities: a status report, *Built Environment, 36*, 3, 353-362

[13] Ponnaluri R 2011, Sustainable Bus Rapid Transit initiatives in India: The role of decisive leadership and strong institutions, *Transport Policy, 18*, 1, 269-275

[14] Ernst J 2005, Initiating Bus Rapid Transit in Jakarta, Indonesia, *Transportation Research Record, 1903*, 20-26

[15] Joewono T B 2012, The causal relationship of the service quality of the TransJakarta Busway, *Public Transport, 4*, 2, 77-100

[16] Thynell M, Mohan D & Tiwari G 2010, Sustainable transport and the modernisation of urban transport in Delhi and Stockholm, *Cities, 27*, 6, 421-429

[17] Venter C 2013, The lurch towards formalisation: Lessons from the implementation of BRT in Johannesburg, South Africa, *Research in Transportation Economics, 39*, 1, 114-120

[18] Wright L, Fulton L 2005, Climate change mitigation and transport in developing nations, *Transport Reviews, 25*, 6, 691–717

[19] Matsumoto N 2006, Analysis of policy processes to introduce Bus Rapid Transit systems in Asian cities from the perspective of lesson-drawing: cases of Jakarta, Seoul, and Beijing, in A. Morishima & al, *Air Pollution Control in the Transportation Sector: Third Phase Research Report of the Urban Environmental Management Project*, Kanagawa, Institute for Global Environmental Strategies, 351-375

[20] Hook W, Kost C, Navarro U 2010, Carbon dioxide reduction benefits of Bus Rapid Transit Systems: Learning from Bogotá, Colombia; Mexico City, Mexico; and Jakarta, Indonesia, *Transportation Research Record, 2193*, 9-16

[21] Hodgson P, Potter S, Warren J, Gillingwater D 2013, Can bus really be the new tram?, *Research in Transportation Economics, 39*, 1, 158-166

[22] Boquet Y 2017, The renaissance of tramways and urban redevelopment in France, *Miscellanea Geographica - Regional studies on development, 21*, 1, 5-18

[23] Rubite C, Tiglao N 2004, Development of a Car Ownership Model in Metro Manila, *Philippine Engineering Journal, 25*, 1, 35-50, http://ovcrd.upd.edu.ph/pej/article/view/2347
[24] Mohamad J 2005, Urban transport and growth management strategies: A tale of two Southeast Asian Cities at the dawn of the new millennium, Geografia Malaysian Journal of Society and Space, 1, 11-22, http://ejournal.ukm.my/gmjss/article/view/17778
[25] Boquet Y 2013, Bus transportation in the Philippines, Proceedings of the 18th Hong Kong Society for Transportation Studies conference, « Travel Behaviour and Society », The University of Hong Kong, Hong Kong, 511-518
[26] Boquet Y 2013, Battling congestion in Manila: the EDSA problem, UNESCAP Transport and Communications Bulletin for Asia and the Pacific, 82, 45-59, http://www.unescap.org/tdtw/Publications/TPTS_pubs/bulletin82/b82_fulltext.pdf
[27] Boquet Y 2015, MetroManila’s competing business districts; Edge Cities, Philippine style ?, in R Rachmawati, G Pomeroy & D Mokherjee, (eds.), Rapid Urbanization and Sustainable Development in Asia, Proceedings of 13th International Asian Urbanization Conference, Yogyakarta (Indonesia), Universitas Gadjah Mada, Badan Penerbit Fakultas Geografi, 291-302
[28] Roquel K, Fillone A 2015, Current Public Transport Service Operating Characteristics Along Epifanio Delos Santos Avenue (EDSA), Metro Manila, EASTS Conference paper, Cebu, September 2015, http://www.dynamicglobalsoft.com/easts2015/program/pdf_files/1557.pdf
[29] Ramirez-Villoria A 1998, The impact of transportation on urban quality of life, Philippine Planning Journal 29, 2, 58-61
[30] Abad R, Banister D, Fillone A, Hickman R 2016, Investigating the relationship between housing affordability and mobility in Metro Manila, Philippines, 23rd Annual Conference of the Transportation Science Society of the Philippines Quezon City, Philippines, 8 August 2016, http://ncts.upd.edu.ph/tssp/wp-content/uploads/2016/08/Abad-et-al.pdf
[31] Boquet Y 2014, Les défis de la gouvernance urbaine à Manille, Bulletin de l’AGF, 91, 4, 461-478
[32] Regidor J 2013, Traffic congestion in Metro Manila : is the UVVRP still effective ?, Philippine Engineering Journal, 34, 1, 66-75
[33] Santos J, Lu J 2016, Occupational safety conditions of bus drivers in Metro Manila, the Philippines, International Journal of Occupational Safety and Ergonomics, 22, 4, 508-513
[34] Vergel K, Tiglao N 2013, Estimation of Emissions and Fuel Consumption of Sustainable Transport Measures in Metro Manila, Philippine Engineering Journal, 34, 1, 31-46
[35] Boquet Y 2017, Phasing out the jeepney? A Philippine mode of transport at the crossroads of society, culture and sustainability, in A. Chen & N.N. Sze (eds), Transport and Society, Proceedings of the 22nd International Conference of Hong Kong Society for Transportation Studies, Hong Kong Polytechnic University, 471-478
[36] Briones R, Gundaya D, Domingo S 2015, Diagnostic Report on the Bus Transport Sector, Makati, PIDS Discussion Paper Series, No. 2015-02, 20 p., https://www.econstor.eu/handle/10419/127034
[37] Llanto G, Gerochi H 2016, Competition for the market: A policy framework for improving bus operation along EDSA, PIDS Policy Notes, n° 2016-14, 9 p.
[38] Cassany H 2017, BRT à Manille et Cebu : un nouvel Investissement pour le futur, unpublished Masters Dissertation, Dijon, Université de Bourgogne, Department of Geography, 84 p.
[39] Hidalgo D, Pereira L, Estupiñan N, Jimenez P L 2013, TransMilenio BRT system in Bogota, high performance and positive impact – Main results of an ex-post evaluation, Research in Transportation Economics, vol. 39, n°1, pp. 133-138