Prospects and constraints of rehabilitating and expanding Guyana's road network

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RESUMO:

Apesar das grandes obras de reforma durante a última década, a infraestrutura rodoviária da Guiana continua em um estado deplorável. Além do congestionamento do tráfego urbano e uma alta taxa de flexibilidades de trânsito, a má conectividade da rede rodoviária parece estar ameaçando a economia do país. Com base em uma revisão da literatura e em dados coletados de múltiplas fontes, este trabalho busca explorar perspectivas e restrições enquanto a Guiana procura atualizar e ampliar sua rede rodoviária. Enquanto a economia parece se beneficiar da expansão da rede rodoviária, particularmente para a integração sul-americana com a fronteira com o Brasil, a floresta tropical do país pode ser ameaçada. Uma frota sucateada, com veículos usados e recondicionados, aumenta o congestionamento, aumenta o tempo de viagem e é responsável pelas emissões de uma concentração alarmante de dióxido de carbono (CO_2). Nas áreas urbanas, o aumento da capacidade rodoviária pode não ser a solução para as externalidades do setor de transporte. No entanto, as iniciativas para promover a caminhada e o ciclismo nas estradas da Guiana estão em condições deploráveis e inexistentes, respectivamente, mesmo em rodovias recentemente reformadas por financiamento internacional. Esse descuido parece estar em contradição, já que a Guiana se prepara para a transição para uma economia verde.

Palavras-chave: Perspectivas. Restrições. Guiana. Reforma. Ampliação. Rede rodoviária.

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ABSTRACT:

In-spite of major rehabilitation works during the last decade, the road infrastructure in Guyana continues to be in a deplorable state. In-addition to urban traffic congestion and a high rate of traffic facility, poor road network connectivity is presenting a serious threat to the country's economy. Based on a literature review and data gathered from multiple sources, this paper seeks to explore the prospects and constraints as Guyana seeks to upgrade and widen its road network. While the economy will undoubtedly benefit from expanding the road network particularly for south-American integration with bordering Brazil, the country's rainforest could be placed under severe threat. An exploding fleet of second-hand/refurbished vehicles exacerbates congestion, increases travel time and is responsible for emissions of an alarming concentration ofcarbon. In urban areas, increasing road capacity may not be the solution to transport externalities, but provisions for promoting walking and cycling on Guyana's roads are in deplorable conditions and nonexistent, respectively, even on roads that have been recently rehabilitated by international financing. Such an oversight seems in contradiction as Guyana prepares to transition to a Green Economy.

Keywords: Prospects. Constraints. Guyana. Rehabilitating. Widening. Road network.

INTRODUCTION

With the transport sector being one of the strategic areas in which the Inter-American Development Bank wished to engage the Government of Guyana (GoG) during the 2012-2016 period, the Country Strategy that the Bank established with GoG clearly stated:

> [...] Areas for further dialogue with the government include: [...] Transport, to support the shift from rehabilitating the road system to expanding its capacity, improve urban transportation in a sustainable manner, and align legislative regulation, operational aspects, and the restructuring of the sector to improve its efficiency [...] (IDB, 2012, p. 10).

Such engagement goes beyond national integration, as efforts are made to consider feasibility of financing a road and deep-water port in order to facilitate reciprocal movement of goods from Guyana to some Amazonian states of Brazil. With Guyana and the three countries with which it shares geopolitical borders, i.e., Suriname, Venezuela and Brazil being Amazonian countries, transport expansion and up grading can also be analyzed in an Amazonian context, particularly as it relates to the potential socioeconomic benefits and environmental threats.

Even after large-scale rehabilitation works particularly in urban areas, Guyana's roads continue in a deplorable condition, and there are little or no provisions to promote more sustainable mobility options such as cycling and walking. With increased travel time, traffic congestion, road fatalities and CO2 emissions (environmental pollution) being among the many externalities linked to the transport sector, it appears that road expansion may not be the solution, but may rather contribute to an explosive growth in motorization as has been observed in some Latin America countries in recent decades (RIBASPLATA, 2013). Hence, the adoption of congestion pricing, which is touted as an effective form of travel demand management (RIBASPLATA, 2013).With this focus, this paper commenced with a discussion on efforts to upgrade and expand the country's road network. This is followed by a discussion on the urban transport dilemma and road safety, which has been identified as a countrywide problem besetting Guyana. This section is followed by conclusions and recommendations.

GUYANA´S ECONOMY AND EFFORTS TO UPGRADE AND WIDEN THE ROAD NETWORK

In reference to the state of Guyana's economy, the World Bank stated:

> Guyana is a middle-income country, and the third smallest country in South America after Suriname and Uruguay, with about 800,000 inhabitants. Its per capita income in 2015 was US$4,090 (Atlas method). Guyana is well endowed with natural resources, fertile agricultural lands, bauxite, gold and extensive tropical forests which cover more than 80 percent of the country. Guyana has one of the lowest deforestation rates in the world and 90 percent of Guyana's forest remains intact. Most of the country's indigenous population lives in forests on which they depend for their livelihood. About 90 percent of the population lives on the narrow coastal plain, where population density is more than 115 persons per square kilometer.
>
> Agriculture and natural resources are important sources of economic activity in Guyana. In 2015 agriculture, forestry, fishing and mining industries accounted

> for 28 percent of total GDP, and bauxite, sugar, rice, gold and timber made up 83 percent of exports [...]. The economy is expected to grow by around 3.6 percent in 2017–19. Most of this growth is expected to come from continued rapid growth of gold production and rebounding performance in other sectors. The discovery of oil off Guyana's coast holds the promise of increased revenue to finance the country's development needs—but brings with it new challenges that will require careful management of economic, governance, and environmental risks (WORLD BANK, 2017).

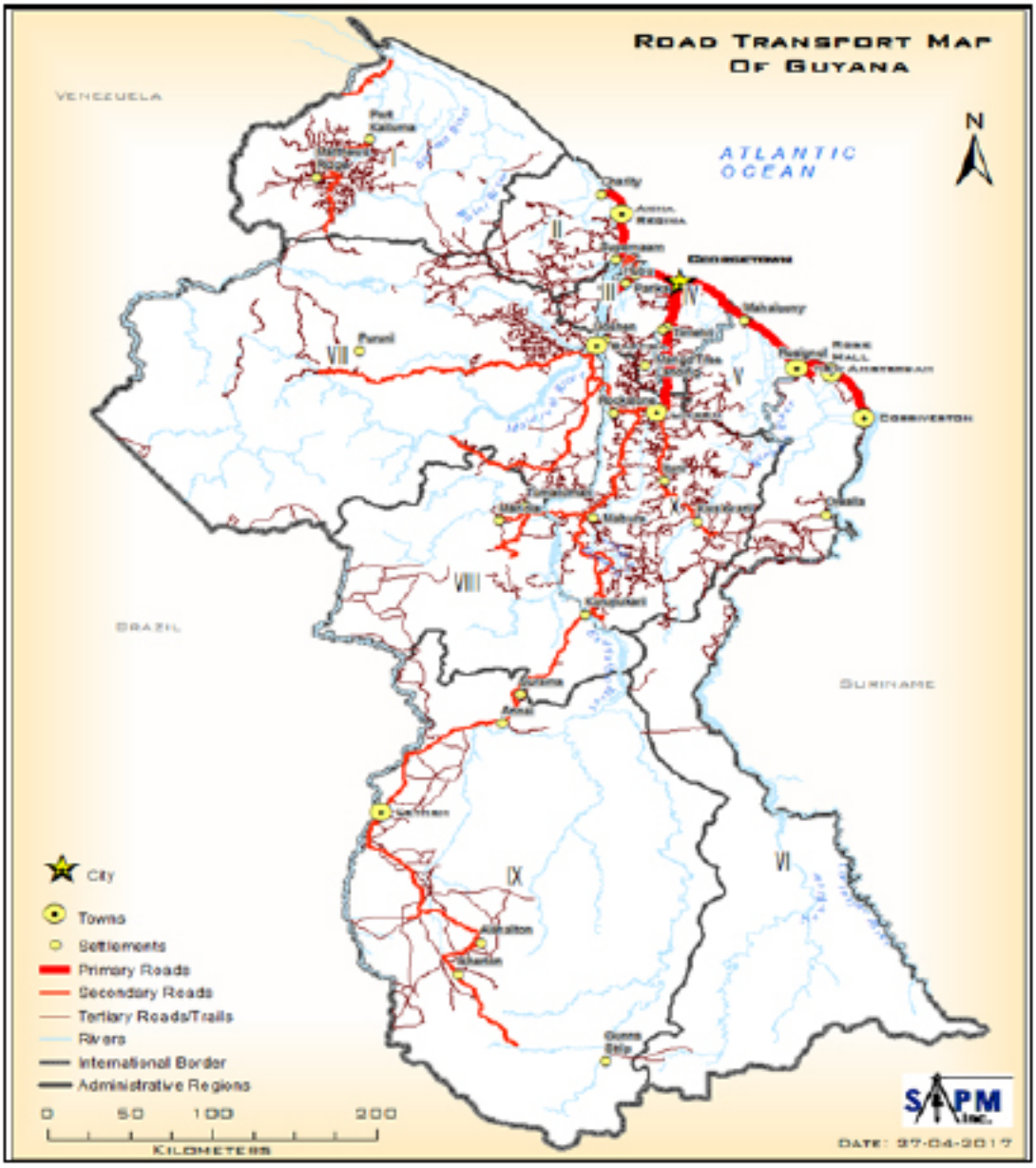
Over the last four decades, Multilateral Investment Institutions (MFIs) including the World Bank and the Inter-American Development Bank (IDB) have invested considerably in transport projects across developing counties including those in Latin American and the Caribbean (MITRIC, 2013). During the period 1997-2012, Multilateral Development Banks (IDB, World Bank (WB), Caribbean Development Bank (CDB), Kuwait Fund) financed, in support of economic development, the rehabilitation of 365km of the country's main road network. The IDB, the major international donor in Guyana, has financed a number of operations including support for the road network upgrade and expansion program (GY-T1078), which was completed on July 25, 2015 (IDB, 2017). As a justification of this Technical Cooperation (TC), the IDB's Plan of Operations Document stated:

> The general objective of the Technical Cooperation (TC) is to contribute to the improvement of the main roads in Guyana. These improvements will enhance urban and suburban mobility and accessibility, and improve operational and safety standards on the roads. [...] The road network of Guyana totals 3,995 km and serves a national fleet of about 82,000 vehicles. The 410 km national main road network consists of six main roads, all of which have two lanes, except for two short segments along the East Coast and East Bank Demerara, which have four lanes. Although the road network of Guyana is one of the sparsest in South America, due to the concentration of the population and the main road network along the coastal plain, most of the population has access to paved main roads. Most of these roads are in fair condition since over the last 20 years GOG has embarked on a progressive rehabilitation of the roadways and structures (bridges, culverts and sluices). [...]Overall, the country's transport system is supported by an inadequate road network, providing little internal and international connections, with highly congested roads in urban areas, low level of service, lack of alternative roadways and costly services. Additionally, in recent years there has been a steady increase in the vehicle fleet traversing the country's roads. This increase along with the creation of new housing schemes outside of Georgetown along the East Bank of Demerara (in the south) and the East Coast of Demerara (in the east), has contributed to congestion along the main roads leading to the city from east and south and also in the city as traffic passes through the city to move between these corridors. These heavily trafficked corridors have safety issues and also experience the most traffic accidents (IDB, 2011, p. 3).

In spite of this recognition, until 2017 primary roads have continued to be located mainly along coastal areas with poor interconnectivity across the country (Map 1).

Unfortunately, eighty-two percent (82%) of minor roads along the coast are unpaved and are in a deplorable condition. Similarly, 79% of interior roads and trails are unpaved with 54% being in deplorable conditions (GOPA and E&A, 2005). Whether due to use of poor quality materials or poor workmanship [or both] the physical conditions of rehabilitated roads have not significantly improved to date.

Map 1: Road Transport Map of Guyana



Source: Ministry of Public Infrastructure, Guyana.

A poor infrastructure has been identified as a major hindrance to faster poverty reduction in many countries, as access to employment opportunities, goods and services become limited (GRIECO, 2015; AGARWAL, 2013; SOCIAL EXCLUSION UNIT, 2003). Improving the transport infrastructure inter alia will be essential if Guyana is to stimulate economic growth and reduce poverty particularly in hinterland regions where trails become impassable during the rainy season. The current transport network offers insufficient mobility and accessibility to investors and thus restricts economic growth and development in many ways. The absence of all-weather primary roads in the hinterland regions where forestry and mining are the main economic activities increases production costs and hurts competitiveness (GOPA; E&A, 2005). Further Guyana's current ability to extract natural resources including gold, timber, diamonds and fertile soils which are located in hinterland regions is jeopardized.

On the other hand, the literature shows that road construction could be threatening to the integrity of Guyana´s rainforests just as has occurred in the Brazilian Amazonian region. Interestingly the government of Guyana has recognized that:

> [...] The sustainable development of the States of Roraima and Amazonas in Brazil are integrally linked to the development of Guyana. In addition to being of the same ecological region Roraima has a long historical link with Guyana. The prospects for trade growth between Guyana and Roraima are promising. Among the many commercial activities with growth potential it can be highlighted that Roraima State can produce and export soybean and soybean meal to Guyana and third markets. Guyana can export to Brazil fertilizer and other agricultural materials. At the same time Roraimaand other Brazilian States can produce on public lands assigned under the land leasing regime of the Government of Guyana contributing to the expansion of the cultivation areas in the geo-economic region and its consolidation as a food production platform to the world [...] (GOVERNMENTOF GUYANA, May 11 2017).

A review of the Brazilian literature unveiled the social and environmental impacts of large-scale projects in many sectors including mining, logging and agriculture following the expansion of the transport networks in the Brazilian Amazon (GREENPEACE, 2006; HETCH, 2005; NEDSTAD ET. AL., 2005; FEARNSIDE, 2000; NEPSTAD ET.AL, 1999).

Among measures to be considered to arrest access problems, Guyana may want to consider: (1) make travel more affordable, (2) reduce the need to travel, (3) ensure safer streets and stations and (4) improve physical accessibility and availability [SOCIAL EXCLUSION UNIT, 2003).

It can be argued that the failure to invest in the road network in the hinterland garners high opportunity costs for Guyana particularly as the country experiences erratic commodity prices for sugar and rice and is dependent on mining and logging to correct the shortfall in the absence of economic diversification (GOPA; E&A, 2005). Consequently Brazilian investments are perceived as to guarantee sucesso econômico for Guyana´s hinterland and possibly economy at large. Approximately sixty-six percent (66%) of Guyanese living below the poverty line are said to be concentrated in hinterland communities where there is limited connectivity to road networks and trails become impassable during the rainy season (GoG, 1999). Thus investing in an all-weather road that will link Linden to Lethem could significantly unlock the economic potential of the southern regions of Guyana since the reduction of transportation costs could stimulate increase trade and other unexplored economic opportunities that could accrue from bilateral cooperation between Guyana and northern Brazilian states including Pará, Roraima and Amazonas.

In support of such integration, the IDB has granted a TC to mainly support the preparation of studies required for the establishment of a land transport link on the Brazil-Guyana border at Lethem, and the construction of a Deep Water Port along Guyana's coast (IDB, 2013). This TC is currently in the implementation phase, and is justified on the notion that:

> [...] Guyana shares its borders with two northern Brazilian states; the States of Roraima and Para, and has traditional ties with the State of Amazonas, whose capital city, Manaus is the primary economic zone of northern Brazil. Currently, there is little trade between these states and Guyana, although there have been

> a number of trade and investment discussion between Governments of the two countries. Amongst the challenges faced by Brazil in fostering cross border integration is the access to sea ports for trade facilitation. However, the geo-strategic location of Guyana presents Brazil, whose emergence as an economic influence in the Western Hemisphere, with the potential to increase its trade with other countries. The states of Roraima and Amazonas are land locked with no direct access to ocean going shipping ports and uses the Atlantic ports in Brazil via the Amazon River and Venezuela for trade [...].
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> Over the years, the Governments of both countries have been working towards their enhancement of trade, economic and physical integration. Both countries are signatory to the Treaty of Amazonian Co-operation of 1978, which seeks, among other things, to ensure harmonious (sustainable) development of signatory countries. This cooperation has so far resulted in a paved road in Roraima, Brazil, up to the Takatu River border and the bridging of the Takatu River in 2009, at the border with Lethem. In June 2001 Brazil signed a Partial Scope Agreement with Guyana which provided preferential access to a wide range of goods. In June 2013, Guyana and Brazil, under MERCOSUR (South American regional trading bloc), under the Union of South American Nations (UNASUR), met to establish a Framework Association Agreement, which addresses political, economic and trade, amongst other cooperation issues.
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> It is intended that the proposed land link will join the northern states of Brazil through the Guianas and facilitate shipping access from port(s) in Guyana for imports and exports to and from Roraima, and the Amazonas, with the northern Atlantic, the Caribbean, and North and Central America region. The development of this land transport link between the two countries and the development of a deep water port is also seen as critical in the fostering of this integration process for the Caribbean region as a whole, which has a large trade deficit with Brazil, although only importing 5% of its total imports from Brazil. Guyana, being a founder member of CARICOM (Caribbean Community), and being part of CARICOM's Single Market and Economy (CSME) is in a position to advance the integration between Brazil and CARICOM countries. It is envisioned that Guyana's integration with Brazil will open up foreign markets to Guyana's exports, improve transportation costs, while at the same time, increasing competitiveness through increased economies of scale, and also, increasing the flexibility of labor supply which will result in less unemployment. The objectives of this Technical Cooperation are to support Guyana's integration efforts with countries in South America and thus improve the competitiveness of the country. This will be achieved through the establishment of a land transport link between the Brazil-Guyana border at Lethem in the south, and a Deep Water Port along Guyana's coast, in the north [...] (IDB, 2013, p. 1-3).

Prior to the approval of this TC, the WTO (2009) emphasized the importance of export diversification and improvements in physical infrastructure for the fostering of greater cross-border linkages between countries that border with Guyana – such as Brazil. While Guyana's external trade policy is widely coordinated within CARICOM including external trade negotiations with third countries Guyana commenced establishing greater trade linkages with Brazil, Venezuela and Suriname in the decades following the Amazonian Co-operation Treaty of 1978. In 2009, the WTO forecasted that trade ties between Guyana and Brazil was expected to improve upon the upgrading of an all-weather road link from the mining town of Linden to Lethem, which borders the Brazilian State of Roraima and Pará. Also, through collaboration and partnership with

Brazil, a bridge across the Takutu River linking the Guyanese border town Lethem with the Brazilian town Bonfim has been completed and was formally opened to Guyana-Brazil road traffic in 2009. Together the Linden-Lethem road link, the Takutu Bridge, the Berbice River Bridge and the Canawaima Ferry, which connects Guyana and Suriname, substantially improve Guyana's transport infrastructure and interconnectivity with its mainland neighbours. This stands to further strengthen its continental integration process and open new economic opportunities as people, investment capital and technology continue to move across geopolitical borders.

The agricultural sector, which contributes approximately 21% of Guyana's GDP annually, is also stymied by the inadequate transportation network due to poor mobility and accessibility. Some communities closer to the border with Suriname along the Berbice and Corentyne rivers have little or no access to markets because of missing or blocked road/trail connections and thus are forced to rely on limited/small river transport services. Improvement of the road network in those areas especially if trails are upgraded to all weather roads will provide access to more than 40,000 acres of fertile agricultural land in Regions 5 & 6, thus, allowing significantly more agricultural output to reach markets at a lower cost (GOPA; E&A, 2005). This would improve revenue generation for farmers, food security of neighbouring communities, create enterprise and employment and alleviate income poverty in these areas.

Road construction and rehabilitation projects planned for the period 2015-2020 are expected to ensure that 238 km of roads rehabilitated and 451km of roadway stretching from Linden to Lethem rehabilitated with 150 structures that offer greater access to arable agricultural lands and forestry. Similarly access to mining concessions will also be improved. Given the potential of the Rupununi Savannahs for development in agriculture, such interconnectivity seems to be of paramount economic interest to the past and current governments and Brazilin investors. However, care must be taken to avoid the pitfalls of expanding road networks across Guyana's hinterland regions, which account for 67.76% of the country's total land mass (GUYANA BUREAU OF STATISTICS, 2014). On the Brazilian end, Nepstad et al (1999) have attributed road construction as one of the major factors behind rapid occupations of the Brazilian Amazon by loggers who have also been responsible for widespread forest degradation.

Concerning agriculture, Fearnside (2000) stated that high international prices for soybean have provoked a number of national initiatives for support of expanding cultivation in the Amazon region and, in other areas in Brazil. Among these support mechanisms, through public financing, are government programmes and plans for the construction of roads, highways etc., to increase the economic performance of the soybean industry. With Brazil being the leading Amazonian exporter of soybean to North America, mechanisms have also been put in place to ensure greater and easier market access by financing the construction of the Boa-Vista-Georgetown (Guyana) road. Fearnside indicated that these networks of roads, which allow soybean farmers greater access to suitable land for expanding the cultivation of soybean, present a major threat of accelerating the rate of environmental degradation either directly, indirectly or through accumulated impacts.

Other efforts have also commenced for a great network of roads to link a number of South American countries that have direct and indirect interest in soybean cultivation and export, or wider trade interests. Thus, there is an important, international, dimension in the political ecology of the Pan-Amazon rainforest taken as a whole in its

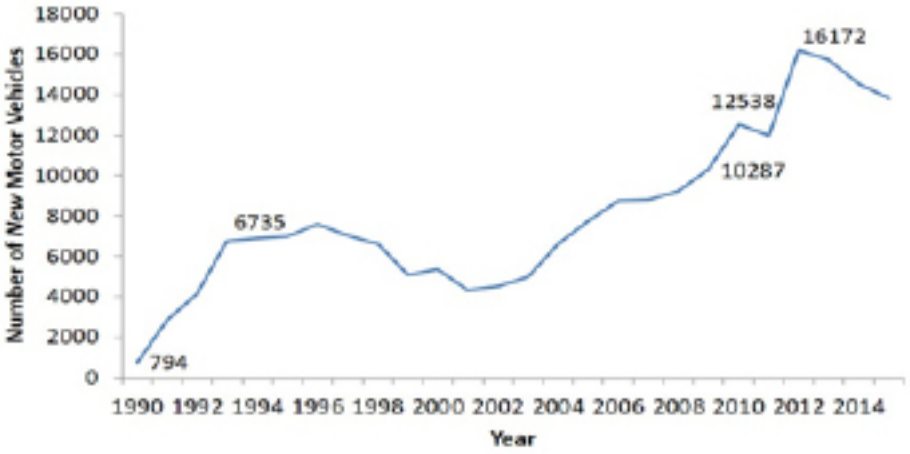
geopolitical context. What appears to be commencing in Guyana is a replica of what has previously occurred in Brazil, where socioeconomic and political factors significantly influenced the mobility of capital and people for frontier expansion as it is widely believed that forested areas could permit capital accumulation from logging, mining and agricultural activities (SCHMINK & WOOD, 1987). While Guyana´s hinterland regions are yet to witness severe environmental pressures from logging and agricultural expansion, small scale mining does pose a serious threat to the environment in response to a high level of mobility among Brazilian miners, who have rejuvenated small scale mining in Guyana (CORBIN, 2012; BYNOE ET AL, 2008). While greater road connectivity stands to guarantee economic benefits, the environmental externalities could perhaps be greater, particularly in the presence of poor environmental monitoring by requisite agencies with weak institutional capacity to enforce environmental regulations in the hinterlands. Given that mining is the major cause of deforestation and its associated environmental damage in Guyana, it seems worrisome that the Low Carbon Development Strategy has not at least recognized the potential environmental threats that developments in the transport sector could have as a result of making the rainforest more accessible to unregulated activities in logging, mining and possibly agriculture, thus, undermining the very overall aim of the strategy.

URBAN TRANSPORTATION DILEMMA

In recognition of the transportation issues (such as congestion, increased CO2 emissions, road traffic fatalities and increased travel time) in the Capital City, the Ministry of Public Infrastructure is expected to launch a Sustainable Urban Transportation Study (GoG, 2014). This study is expected to provide a comprehensive assessment of current practices regarding parking, public transportation use and traffic management in-order to advance recommendations for transport management in Georgetown. Through institutional strengthening for effective implementation of this management plan it could be expected that there would be improvements in existing access routes for Georgetown, improved road safety and traffic flow management.

Approximately 90% of the population resides on the narrow coastal plain where demographic density is more than 115 persons per square kilometre (WORLD BANK, 2017). In the absence of a public transportation system, privately owned personal vehicles provide mobility for commuters across the entire country. At the national level, there has been an increase in the acquisition of private vehicles in response to economic growth during the past two decades. The number of vehicles that ply the roadways has increased from 42329 in 2000 to 110635 in 2013 (PATTERSON, 2015). During this period there has been an average annual growth of 7% and corresponds to approximately 148 vehicles per 1000 persons (PATTERSON, 2015). This increase occurred with only minor improvements in capacity of both urban and rural roads and limited provisions for pedestrians and cyclists. This problem is compounded by an annual registration of new and second-hand vehicles, which has been in excess of 10, 000 for the last decade (Figure 1 below).

Figure 1: Annual Registration of New Motor Vehicles 2000-2015



Source: Guyana Revenue Authority, 2016.

Statistics have shown that the urban population has almost progressively declined from 93.4% in 1980 to 90% in 2012. Thus, it can be deduced that, the explosion in the acquisition of motorized vehicles is not because of increased urbanization, but by an increased in the acquisition among households.

More than 90% of Guyana's fleet of vehicles is believed to be reconditioned, some of which were manufactured since 2000. These vehicles are not particularly fuel-efficient and therefore emit higher levels of greenhouse gases and have fewer safety features than vehicles manufactured using the rigid production guidelines which are imposed on manufacturers in North America and Europe. It therefore means that a vehicle in Guyana emits at minimum 10% more greenhouse gases (GHG) than a new vehicle. For example the Toyota Corolla (2005) is estimated to consume 3.4 gallons per 100 miles and produce 306 grams of CO_2 per mile compared to its 2016 model, which is estimated to consume 2.9 gallons per 100 miles and produce 260 grams of CO_2 per mile. The difference in fuel economy and CO_2 emissions for the 2005 model (4.3 gallons per 100 miles and produce 386 grams of CO_2 per mile) compared to the 2016 model (3.8 gallons per 100 miles and produce 346 grams of CO_2 per mile) are somewhat similar. New government regulations will seek to mitigate the impact on the environment.

New imports regulations, which came into effect as of 1 May 2016, restrict the importation of second-hand vehicles that are more than eight (8) years old from the date of manufacture to the date of importation. New regulations also include significant incentives for persons to purchase newer vehicles that are "environmentally friendly" (KAIETEUR NEWS, 2016). This will allow for incremental improvement in the vehicle fleet in Guyana with respect to fuel efficiency, the level of GHG emissions, as well as improved safety features. However, if there is little expansion of road networks and unattractive incentives for dispersion of human settlements particularly in hinterland regions with extremely low demographic densities, current importation rate of vehicles could create serious problems due to traffic congestion which is more pronounced around the Capital City.

Congestion on the roadways is therefore inevitable in Guyana given the 150% increase in motor vehicles on the roadways in the past decade. Congestion is more evident in Georgetown, the country's commercial hub, where there is a high demand for better services including

health, employment, entertainment and education. In the Guyanese context congestion is a condition that arises because more people wish to travel at a given time than the transportation system can accommodate. In spite of establishing housing schemes in suburban and rural areas, households from those areas are still sadly obliged to access urban centres on a daily basis for many reasons including gainful employment and to conduct even the most basic business transaction. While the road network, although small, may accommodate the increase in vehicles, serious congestion arises when an estimated 100 vehicles require access every 90 seconds at specific times each day.

Traffic congestion is aggravated by poor spatial planning as is expressed by business establishments scattered haphazardly in residential communities without provisions for customer parking. Disembarking stock at some facilities oblige large containers to park for as long as two weeks in some instances along road shoulders thus reducing the capacity of already narrow inner city roads which creates bottlenecks in traffic. The policy of making several of these streets accessible to traffic from only one direction simply widens the areas affected since it has no impact on the volume of traffic. Scheduled and unscheduled road closures with no warning signs to alert drivers, road works with no police or lollipop men/women to direct traffic, poorly coordinated or malfunctioning traffic lights and impatient and inconsiderate drivers all contribute in varying degrees to traffic congestion which can be highly time consuming.

At present, congestion costs to the national economy or the individual are unknown. However, delays influence arrival times at employment, meetings and education centres resulting in productivity losses. Further, it increases fuel consumption due to wasted fuel and air pollution resulting from increased idling, acceleration and decelerating. This may also increase the cost of maintenance for vehicles. Poor road transport planning and congestion may also interfere with the mobility and accessibility of emergency vehicles, as drivers ignore signals in their own bid to move ahead in congested traffic. Impatient motorists may also engage in aggressive driving which nets collisions on the roadways thus posing a further risk to road safety.

Applying the theories of supply and demand to the transportation sector NOLAND & LEM, (2000) contended that increases in road capacity do not, reduce traffic congestions, but instead promote vehicle use, thus leading to increasing traffic volumes and congestions. As a consequence, the promotion of walking, ride-sharing, cycling and use of public transport are among the alternatives in alignment with Travel Demand Management (TDM) strategies (TRANSPORT CANADA, 2010; GOODWIN, 1999). The main TDM measures are vehicular restrictions and congestion pricing (RIVASPLATA, 2013). In this context, Guyana may want to explore the Avoid-Shift-Improve approach for urban transport management at the national level. In this paradigm shift, long and unnecessary motorized travel could be avoided, shift the growth trend for motor vehicles and improve the technical and operational management of transport activities (DALKMANN & RRANNIGAN, 2007). However, provisions for complimentary TDM strategies for the promotion of walking and cycling on Guyana's roads are in deplorable conditions and nonexistent, respectively, even on roads that have been recently rehabilitated by international financing. Such TDM provisions would have been complimentary to the goals set in the Low Carbon Development Strategy for a reduction in the emission of CO_2 in the transportation sector (OFFICE OF THE PRESIDENT, 2010). In their absence, road safety continues to be a major problem across Guyana.

ROAD SAFETY AND FATALITY: A COUNTRYWIDE PROBLEM

As prolonged travel time is, traffic fatality is yet another externality associated with Guyana's transport sector despite exorbitant sums of monies spent on education awareness campaigns at the national level. Careless driving in all its manifestations is visible on a daily basis particularly during peak traffic hours. Drivers appear to be very impatient with a distinctive "I'm first" attitude that lends itself to a variety of traffic infractions that are careless and dangerous to road users. A blatant disregard for road traffic regulations results in drivers who deliberately speed through red lights, ignore traffic signs, overtake at traffic lights and misuse lanes to gain an advantage over other drivers at crowded intersections.

Respect for law enforcement is almost absent as delinquent drivers proceed with their narcissistic road use even in the presence of the traffic police. Unfortunately, statistics for persons charged for careless and/or dangerous driving tell a different story for the period 2000-2015. The number of persons charged fluctuated erratically for both careless and dangerous driving during this period with 5654 in 2000 and 4343 in 2015 respectively. During the period 2009-2012 less than 1000 persons were charged with either careless or dangerous driving annually, while in 2015 only 561 and 540 persons were charged with careless and dangerous driving respectively (see Table 1).

Table 1: Number of Persons Charged with Road Traffic Violations 2000-2015

Year	Speeding	Drinking under the influence (DUI)	Hand-held mobile telephone (DUMT)	Careless driving	Dangerous driving
2000	1162	58	119	5654	4343
2001	2276	54	121	4133	5231
2002	115	35	181	20	1785
2003	741	19	210	162	2371
2004	2247	64	310	4044	2518
2005	6414	23	421	4336	2822
2006	4228	42	650	3126	2144
2007	3489	36	701	2436	2231
2008	21224	52	712	2638	347
2009	18206	197	821	824	514
2010	15362	1099	866	936	748
2011	11572	1027	1167	843	906
2012	14838	885	950	748	829
2014	19075	902	1586	2421	1694
2015	21476	2192	1128	561	540
Total	164654	7289	11152	34843	30904

Source: Traffic Department Guyana Police Force 2015.

There may be several reasons including limited institutional capacity of the Guyana Police Force to address this problem. The commencement of a traffic campaign in 2015 with the use of closed-circuit television camera (CCTV) is expected to address the provision of evidence for legal actions against offenders of traffic laws. As of 2015, the campaign has captured in excess of 3100 traffic offences (RAMJATTAN, 2015).

Road fatalities exceed 100 persons yearly and there is a fatality rate of 15.6 persons per 100000 population (Table 2) placing road accidents among the top ten leading causes of death in Guyana for the years 2006-2009 (PAN AMERICAN HEALTH ORGANIZATION (PAHO), 2012).

Table 2: Traffic Accidents and Fatalities in Guyana 2000-2015

Year	Damage	Minor	Serious	Fatal	Fatalities
2000	1293	773	500	133	165
2001	1358	741	522	144	161
2002	1314	726	489	133	158
2003	1208	614	492	161	173
2004	1221	673	541	158	169
2005	1219	655	440	155	182
2006	1186	618	492	140	164
2007	1111	650	429	169	207
2008	938	550	354	99	113
2009	1070	531	364	98	117
2010	784	471	348	101	115
2011	791	502	321	106	115
2012	784	434	318	102	110
2013	668	454	336	103	112
2014	627	441	351	135	146
2015	638	400	318	94	118
Total	**16210**	**9233**	**6615**	**2031**	**2325**

Source: Traffic Department Guyana Police Force, 2015.

Consistent with trends observed in Guyana, the World Health Organization (WHO) stated that road accidents is the leading cause of death among the 15-29 years cohort of the world's population (WHO, 2015). While data on the age cohorts most affected in Guyana is unavailable, a fatality rate of 100 per 100000 population is below the average for low-income countries as well as the global average which were estimated in 2015 to be 24.1 and 17.4 respectively (WHO, 2015) Table 3.

Table 3: Fatalities due to road accidents, 2015

Countries	Fatality Rates per 100 000 population
Guyana	15.6
World	17.4
Middle income countries	18.4
Low income Countries	24.1
High income countries	9.2

Source: WHO, 2015.

During the decennium 2000-2010, 1377 persons were killed in fatal accidents among whom 199 or 14.5% were children and 568 or 41.2% pedestrians (ROOPLALL, 2011). The World Health Organization (WHO), stated that road users, which include pedestrians and cyclists and drivers of motorized two wheelers, claim approximately 46% of traffic deaths at the global level (WHO, 2009). Half a decade later, in 2015, the WHO reported::

> [...] Road traffic injuries claim more than 1.2 million lives each year and have a huge impact on health and development. They are the leading cause of death among young people aged between 15 and 29 years, and cost governments approximately 3% of GDP. Despite this massive – and largely preventable – human and economic toll, action to combat this global challenge has been insufficient [...] .
>
> [...] Road traffic injuries place a heavy burden on national economies as well as on households. In low- and middle- income countries they particularly affect the economically active age group, or those set to contribute to family, society and the workforce in general. Many families are driven deeper into poverty by the loss of a breadwinner, or by the expenses of prolonged medical care, or the added burden of caring for a family member who is disabled from a road traffic injury [...] The economic costs also strike hard at a national level, imposing a significant burden on health, insurance and legal systems. This is particularly true in countries struggling with other development needs, where investment in road safety is not commensurate with the scale of the problem. Data suggest that road traffic deaths and injuries in low- and middle-income countries are estimated to cause economic losses of up 5% of GDP. Globally an estimated 3% of GDP is lost to road traffic deaths and injuries [...] (WHO, 2015, p. 10).

Curbing this trend is the key to improving human well-being and social equity on road networks. Evidently, such mortality, caused by external factors, could have been avoided. The cost of medical care for victims of road accidents exceeds GYD $100M or an equivalent of US$ 500000 annually at the Georgetown Public Hospital Corporation (GPHC) alone (KAIETEUR NEWS, 2016). Given the loss of productivity to the economy, loss of family income and funeral expenses resulting from fatalities, the aggregate cost is expected to be much higher. Unfortunately there is no known study that has assessed the economic costs of traffic-related deaths on Guyana's economy.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, it must be reiterated that rehabilitating and/or widening Guyana's current road network will present several prospects and challenges. On the positive side, Guyana could expect economic benefits that would accrue from strengthening and operationalizing existent trade agreements with bordering countries including Brazil and Suriname.

Better and wider road network could also provoke greater population dispersion particularly in hinterland areas with low demographic density. However, such access to the hinterlands could render forested areas highly vulnerable to unregulated land-use practices including in the logging and mining industries, as have occurred in other Amazonian countries and have given rise to widespread deforestation.

Although congestion, increased CO2 emissions, road traffic fatalities and increased travel time are among the major social and environmental externalities of the rising private traffic fleet especially in the Capital City of Georgetown, it remains uncertain as to whether increasing the capacity of roads will be a solution. The absence of public transport and the presence of a rapidly growing and unregulated sector of private vehicles, which offer transport services, are indicative that TDM measures including vehicular restrictions and congestion pricing may be better options. In addition, infrastructural provisions and safety are necessary to increase other options such as walking and cycling especially around the Capital City of Georgetown. Greater decentralization of services across the country and making greater use of digital services could also reduce the need for residents outside Georgetown to travel to the Capital City in-order to gain access to basic services. In this context, Guyana may want to explore the Avoid-Shift-Improve approach for urban transport management at the national level. This could allow Guyana to eradicate or at least alleviate the social and environmental externalities associated with the transport sector, thereby strengthening the country's transition to a greener economy.

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