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Public Transport in the Gulf Region: Is the Development of a BRT System a Viable Option for Doha?

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Abstract

Motorisation is increasing globally, especially in major cities of Asia and the Gulf region. To illustrate, over the last decades, Doha, the capital city of Qatar, has experienced a fast urban growth along with a wide increase in the need for new transportation options. Recently, the Qatari Government has planned to improve Doha's transport system, by developing projects that include a new metro and light rail scheme. On the other hand, Bus Rapid Transit (BRT)'s track record provides a compelling case for more cities to consider it as a transit priority. Within this context, this article critically examines three relevant factors (implementation time, cost effectiveness, and performance) for the successful dissemination of BRTs in relation to the city of Doha. The article argues that the implementation of a BRT scheme is a beneficial and effective alternative to the metro scheme that is under construction in the city.

Keywords: Gulf region, Doha, BRT systems, transport policy, sustainable mobility

1. Introduction

A rapid and massive urbanization process in emerging countries is driving an unprecedented level of private motorization. However, there is a general recognition that investing in mass transit systems can contribute to mitigating the negative impacts of car usage and reducing pollution and congestion (UN Agency for Human Settlements, 2012). Among the emerging countries, the state of Qatar, and its capital Doha, is the nation with the highest level of CO2 emissions per capita (The World Bank, 2015). The main reason for this is car usage, as the country does not have any form of public transportation, and mobility is based on private vehicles (GFN, 2013). The Qatari Government approved in 2007 a major mass transport development, the 'Doha Metro System', to meet the rapid growing transport needs of its capital city. The development is planned to be delivered in time for the 2022 FIFA World Cup (Qatar Rail, 2017). However, the accelerated expansion of Bus Rapid Transit (BRT) in South America and Asia demonstrates that BRT is a viable option to rail-based schemes. Many examples of BRT systems, from TransMilenio in Bogotá to Guangzhou in China, show that BRT can offer many benefits such as high reliability and high performance. Additionally, it is a cost-effective transport mode, with more flexibility in implementation than other mass transport systems (Wright, 2003; Fjellstrom, 2010; Hidalgo and Carrigan, 2010; Wright, 2010).

With this preamble, the article intends to analyse the main strengths of BRT systems in relation to Doha, the capital city of Qatar. The essay critically debates the current effort of Doha's government to introduce a new metro system, arguing that other alternatives, as BRT, are more beneficial and effective to the city and its residents. The analysis is based on three main arguments: implementation time, cost effectiveness, and performance (speed and capacity). These issues are discussed with reference to major successful examples of BRT schemes. Conclusions show that the implementation of a BRT system is an effective alternative to the metro scheme that is under construction. With a lack in the literature on mass transportation systems in the Gulf Region, findings can be applied by extension to the major Gulf cities, as they share many similarities in their urban form and transport development.

2. BRT Systems: A Viable Option for Doha?

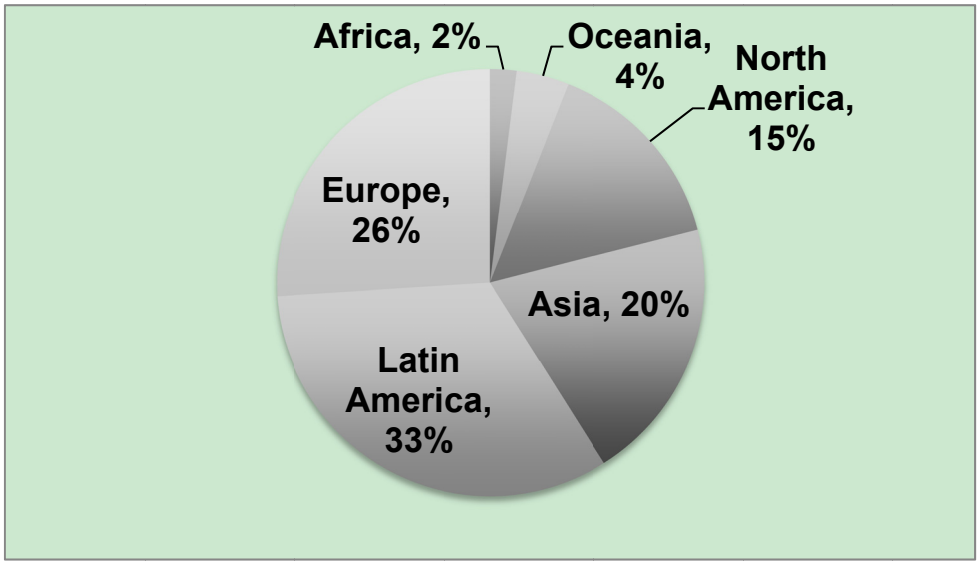
BRT is a bus-based mass transport system. It is a relatively new mode of transportation characterised by specialised design and infrastructure to improve the transit quality and reduce the major causes of delay in

bus-based schemes. It usually runs in segregated bus lanes and it has priority at intersections to allow a reduction of travel times. It is considered a cost-effective mass transport system, with high transportation and boarding capacity. Another advantage of BRT is the relatively short planning and construction process that can be less than two years (Wright and Fjellstrom, 2005). The first BRT system was implemented in 1974, in the city of Curitiba, Brazil, but it was the great success of TransMilenio in Bogotá in 2000 that opened the way to the implementation of many other BRT systems worldwide. Nowadays, around 205 cities have developed a Bus Rapid Transit or a bus priority scheme, with a total daily capacity of about 31.5 million passengers (Global BRT Data, 2017). More than 50% of cities with BRT systems are in emerging countries, and Asia and South America together account for almost 90% of world ridership (Figure 1), becoming the world leaders in the implementation of BRT schemes (Hidalgo and Graftieaux, 2008). There is an increasing demand for these new bus systems worldwide, as many cities are more interested in sustainable, but also affordable, mass transportation solutions. Indeed, BRT can offer high performance (in terms of comfort, capacity, and reliability), cost effectiveness, and rapid implementation time.

Doha, the capital city of Qatar, has been recently ranked at the bottom of the Sustainable Cities Index, where it is classified 41th out of 51 cities analysed (ARCADIS, 2015). Doha is also one of the cities with the world's highest ecological footprint (Global Footprint Network, 2013). The main reason for it is the high usage of private vehicles, as no public transportation exists in the city. In addition to high CO2 emissions, Doha has to face other relevant issues related to transportation: constant congestion, translated in a high amount of time spent by its inhabitants queuing in cars, and an extremely high accident rate (for statistics data: MDPS, 2014). To address these issues, in 2007 the Qatari government promoted a massive public transport development, the 'Doha Metro System' (Figure 2).

Originally planned to bid for the 2016 Olympics, the metro scheme is intended to be partially operational for the 2022 FIFA World Cup, which will be staged in Doha and its surroundings (Khaled and Hany, 2014). Consisting of four lines (Table 1), the metro will be underground in the city centre while it will be elevated or at ground level at the periphery. The overall network is estimated to cost $36 billion (QIA, 2015), and it will be implemented in two different phases. Phase 1, totalling $8.4 billion of the budget, is supposed to become operational by the end of 2020, two years ahead of the 2022 World Cup. Phase 2 will be completed by 2026, with an overall length of about 200 km and 85 stations (Qatar Rail, 2010; OBG, 2016). However, constant delays and changes in the scheme are seriously postponing the end of the works (Reuters, 2014).

Cities



Ridership

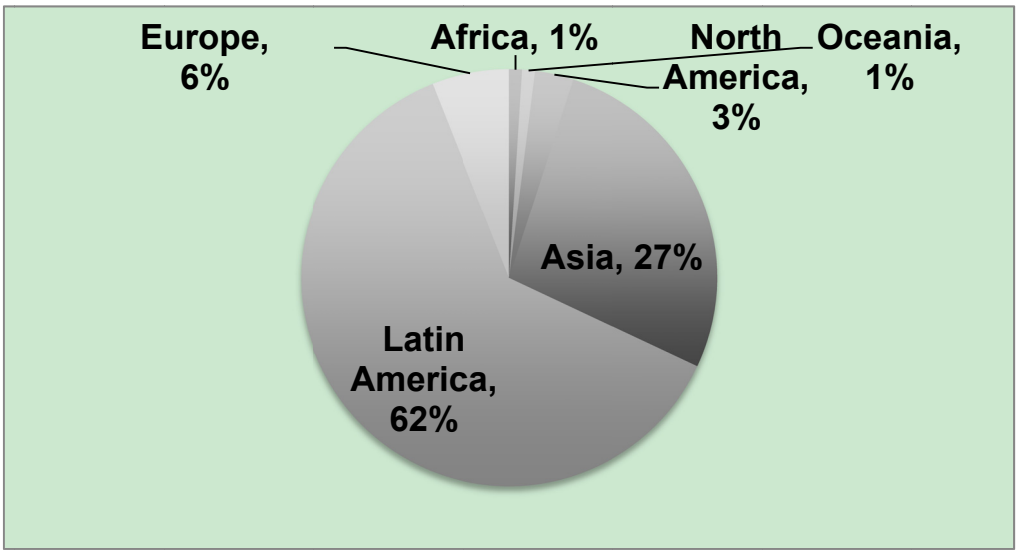


Figure 1. The distribution of BRT systems worldwide (2013). Data source: BRTdata.org (2017)

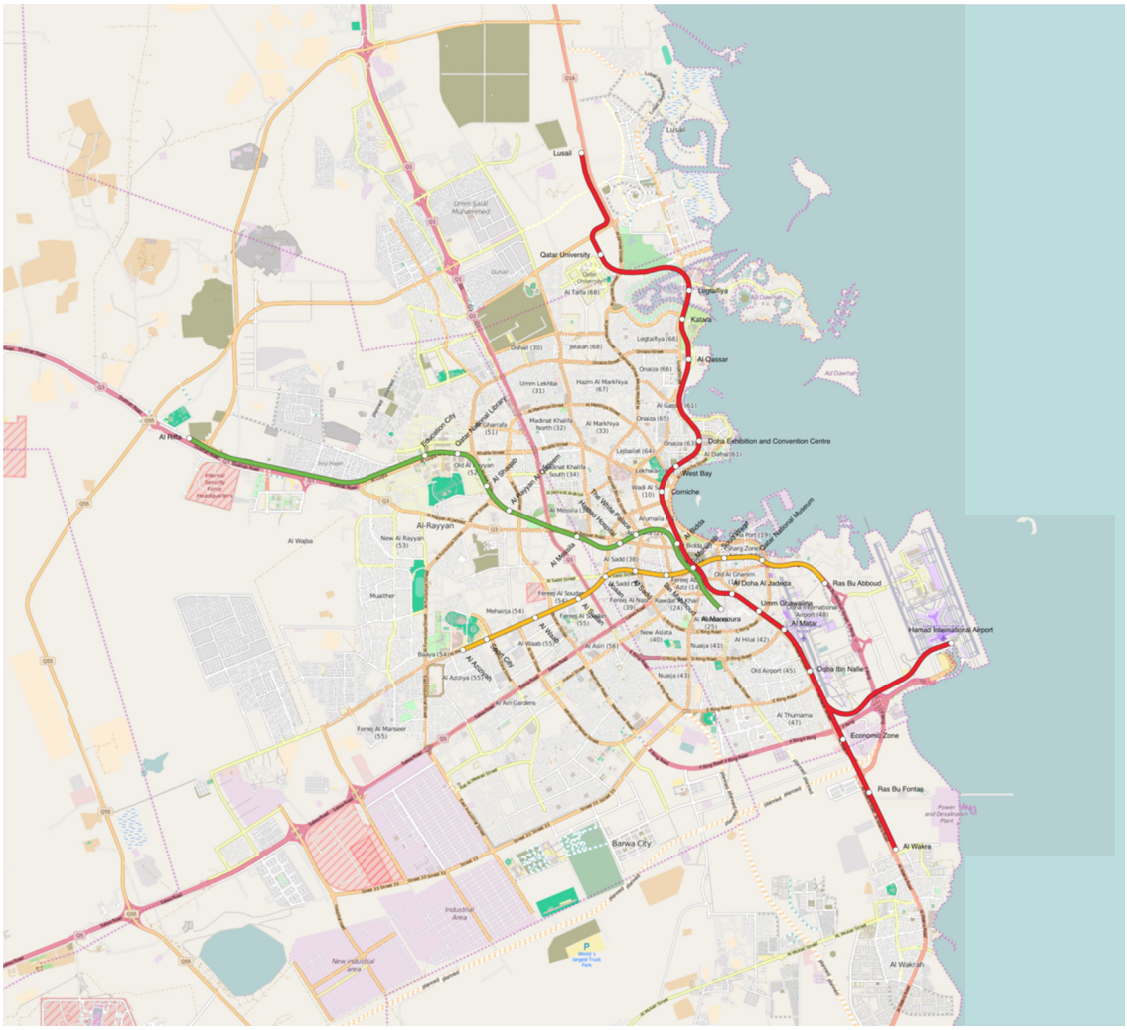


Figure 2. Doha Metro System, stage 1 (2020)

Source: Background map from Openstreetmap – Data from L9A8M under CC-BY-4.0.

The Qatari Government did not consider any other alternative to a rail-based scheme, but is a metro system the only choice to promote sustainable mass transit in Doha? Could an efficient BRT be a more beneficial, or a complementary option? The analysis that follows is based on three main arguments: implementation time, cost issues, and performance (speed and capacity).

With regard to implementation time, literature shows that planning and building a BRT system is often relatively fast. Indeed, schemes like Transmilenio in Bogotá demonstrate that BRT can reach light-rail or metro capacity and performance, but in a much shorter time frame (Fjellstrom, 2010). Wright and Fjellstrom (2005) stated that the planning process can take about one year and costs approximately between US$ 400,000 and US$ 2 million. In addition, because of the relatively low cost, funding a BRT project is faster and more accessible than metro schemes. The simpler physical infrastructure of a Bus Rapid Transit suggests that such projects can be planned and completed in less than 18 months (Deng and Nelson, 2010). On the contrary, implementing a rail-based transit often takes a considerably longer period, usually at least three years (Wright and Fjellstrom, 2005), but often more. The increasing pollution, congestion, and high accident rate in Doha are making it necessary for a rapid shift towards more sustainable mass transit options. Additionally, the deadline of the 2022 World Cup makes this transition more urgent. While a BRT can be easily designed and implemented within a two-year timeframe, Doha metro network is taking more than ten years to be realised. The scheme was planned in 2007, when the city bid for the 2016 Olympics, but was launched in 2010, after being awarded the 2022 World Cup. Phase 1 should be operational in 2019; however, because of chronic delays in the construction and frequent changes in the scheme, there are increasing concerns that the final deadline of 2022 will not be met (Doha News, 2013).

Table 1. Doha Metro System

Line	Length	Stations	Termini
Green Line	65.3 km	31	Education City Al Ryyan North Umm Salal Stadium Industrial Area South
Blue Line	17.5 km	4	West Bay Central Airport City North
Gold Line	30.6 km	20	Al Ryyan South Industrial Area North Airport City North
Red Line	98.5 km	30	Al Khor North Hamad International Airport Messaied
Total	211.9 km	85	

Data source: Qatar Rail (2017)

A second argument to consider is cost issues. The total investment and operating costs for bus rapid transit are much less than the equivalent for metro schemes. Indeed, the cost-effectiveness advantage has allowed BRT to be accessible to budget-constrained governments, which otherwise could not sustain a metro-based system (Deng and Nelson, 2010). To illustrate, the city of Jakarta decided to implement a BRT system in 2001, and the local municipality could support its implementation simply by allocating funds from the routine city development budget (Wright and Fjellstrom, 2005). Menckhoff (2005) stated that the investment cost for BRT is usually less than one-tenth per km than other rail-based systems, while Wright and Hook (2007) suggested that developing BRT on average costs between four and twenty times less than a light rail system, or between ten and a hundred times less than a metro scheme. In other words, with an equivalent investment, a BRT system can deliver wider network coverage than any rail-based infrastructure. Doha Metro System is estimated to cost $36 billion (QIA, 2015). However, because of chronic delays and continuous changes, this budget will probably be

revised and increased (IMF, 2014). Qatar is a wealth country with the highest GDP per capita worldwide (The World Bank, 2016). However, Qatar is spending billions of dollars on transportation, infrastructure, and stadiums projects in preparation for the international football tournament, and, after years of surplus, the country has experienced a deficit since 2015 amid low oil prices and rising capital spending (QNB, 2015). Moreover, the relatively small population of its capital city, a little more than 2,000,000, does not justify such an investment. A well-planned BRT could benefit the city as much as a metro system, and for a fraction of the cost (Table 2). Additionally, the funds saved for building a BRT instead of a rail-based system would allow the government to finance other developments, as the rapidly growing population needs infrastructure such as hospitals, nurseries, schools, and affordable housing (Rizzo, 2014).

Table 2. Doha Metro System compared to Jakarta BRT, Corridor 1

	Doha Metro Scheme - 4 lines	Jakarta BRT Corridor 1***
Estimated Cost	$36 billion*	
Total Length	211.9 km*	12.9 km
Estimated Cost $/Km	$170 million/km**	$1 million/km
Number of stations	85*	20
Average distance between stations	2.5 km**	0.645 km

*Data source: Qatar Rail (2017)

** Data estimated by the author

*** Data source: BRTdata.org (2017)

With regard to performance, bus services are normally perceived unreliable and polluting by their users, causing governments to evaluate carefully in investing in BRT systems. Another common critique of BRT is that they are slower and have less capacity in comparison to metro or LRT systems. However, the last generation of BRT showed an impressive improvement in passenger capacity and speed. For example, the BRT in Guangzhou, China, has a capacity of 27,000 passengers per hour per direction (pphpd) (Fjellstrom, 2010), while BRT systems in Colombia and Brazil are already carrying a number between 20,000 to 30,000 pphpd (Wright and Fjellstrom, 2005). In fact, contrary to traditional assumptions, the major elements that determine the capacity are not the means of transportation but rather the techniques utilised for boarding and disembarking (Wright, 2003). Doha is a relatively 'small' urban development of 2,000,000 inhabitants; the emulation of any of the successful examples of BRT systems already in place would be enough to meet its needs in term of capacity.

Due to its heavy traffic congestion, realising a BRT project with high vehicle speed would probably be the most important challenge to achieve in the city of Doha. However, the use of segregated bus way isolates BRT from traffic congestion, granting buses a higher speed. For example, thanks to segregated ways TransMilenio in Bogotá has raised its average speed from about 15 km/h to 26.7 km/h, with the result of a considerable travel time saving for users (Cain *et al.*, 2009). Hidalgo and Graftieaux (2008) analysed eleven different BRT schemes in Asia and South America, finding that the average speed of their systems increased between 14.5 and 26 km/h, based on the improvement of their bus way. BRT systems running on dedicated lanes can usually reach very fast travel speeds. However, a segregated bus way is also one of the main limitations of BRT, as dedicated lanes are 'intrusive' and require at least the double road space of a car (Wright, 2003). Nonetheless, due to its recent urban development based on the use of private vehicles, Doha has a well-developed road network with a highway system and expressways. All the major streets consist of three or four lanes per direction. The space required for a dedicated bus way is easily obtainable and the necessary infrastructure could be developed with minimal effort.

3. Conclusions

Increasingly worsening traffic congestion has prompted stakeholders worldwide to search for more sustainable mass transportation systems to address traffic-related issues. For decades, rail-based systems have been the main option adopted by decision-makers. However, in the last twenty years, many governments have developed ambitious BRT systems, because of their cost-effectiveness advantage and shorter implementation time (Flyvbjerg *et al.*, 2004).

To mitigate some of the worsening effects of its increasing motorization, and with the aim to equip the city with a state-of-the-art mass transport system for the upcoming 2022 World Cup, Doha is undertaking the implementation of a massive metro network (Azzali, 2015; Azzali 2016). Based on three main arguments, implementation time, cost issues, and performance, the article analysed the feasibility of a BRT scheme as an alternative to the 'Doha Metro System'. The analysis confirmed that a BRT system could be an effective and high-quality alternative to the rail-based scheme that is under-construction. Indeed, to reduce the increasing traffic congestion, pollution, and the high accident rate Doha urgently needs to shift toward a more sustainable transportation mode. Since development started in 2007 with a budget of $36 billion, the implementation of the 'Doha Metro System' has accumulated extra costs and severe delays. Drawing on experience from cities across Asia and Latin America, the development of a BRT system would offer a high-level performance in terms of speed and capacity, but at a fraction of the cost and time. Additionally, BRT would cover a wider urban area, because being a bus-based system it offers a more distributed service, with a higher number of stations along the corridors than a typical metro line (Wright, 2003). Finally, Qatar owns the third largest reserve of gas in the world. Liquefied gas could be used as eco-fuel for the buses, benefiting the environment at a low cost for the government.

Nonetheless, in spite of all these advantages, the Gulf Region, and Doha specifically, seem not to consider BRT as a viable option. With a general lack of literature on public transportation systems in the Gulf Region, but with an increasing interest by local governments in developing efficient mass transit modes, this research intends to be a first attempt at making decision-makers more aware of their choices. To conclude, BRT systems are flexible and can be adapted to different urban contexts, but more research needs to be carried out to understand the specific demand and needs of this geographical area.

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