ISSN: 2278-4632
Vol-10 Issue-12 No.03 December 2020

Traffic Congestion and Environmental Impact in Vietnam: Public Transportation SystemDevelopment - Experience from Bus Operations

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Abstract

Rapid urbanization has led to a boom in travel demand. With high population density and urban structure, big cities in Vietnam, especially Hanoi and Ho Chi Minh City, are facing major challenges in urban transport such as traffic jams, accidents, environmental pollution, etc. One of the important factors that can help to solve these problems is to attract people to travel by public transport, firstly by bus and then moving forwards to fast-paced public transport such as a Bus Rapid Transit, Metro. Through analyzing the surveys about bus systems in Hanoi, this study presents some assessments and suggestions, contributing to the development of the public transport system in Hanoi.

Keywords: Bus system; Public transport; Hanoi buses; Transport engineering; Environmental pollution

Introduction

A developed city is one with a system of public transportation that develops sustainably and conveniently. It can be said that the public transportation system is one of the measures to evaluate the advancement of an urban. Major cities in the world, especially the capital cities of countries, always focus on developing and improving the quality of public transportation system. Hanoi city also follow this direction. Hanoi is the capital, administrative, cultural and economic center of Vietnam. After its expansion of administrative boundary in 2008, Hanoi became the largest city in Vietnam (3,358.9 km^2) by total area and with population ranking the second largest city in Vietnam (7,742,200 in 2017 just after Ho Chi Minh City). On average, Hanoi increases by about 200,000 people, equivalent to the population of one district, of which about 120,000 childrens are born. Along with migration issues, the sex ratio at birth is complex, aging population are pressures for infrastructure and general development of Hanoi. This expansion caused Hanoi to face a number of problems, namely urbanization disorder, population explosion, traffic congestion, environmental pollution caused by the traffic, etc.

Literature Review

The impact of traffic on theenvironment

In Vietnam, environmental pollution in large urban areas is becoming a pressing problem. For years, scientists at Yale University's environmental research centers and Columbia University in the United States have conducted an Environmental Performance Index (EPI) study on the world [1-3]. The results show that Vietnam is among the countries with the lowest air quality index and is expecting to fall to lower, details is: EPI score is 38.17 (rank 136/178) in 2014, 58.5 (rank 131/178) in 2016, 46.96 (rank 132/180) in 2018. This is an alarming news with the air environment in Vietnam nowadays.

The problem of air pollution caused by urban transport in Vietnam comes from many different causes. The first is the influence of urbanization associated with industrialization. The urbanization process will promote economic and social development but on the one hand, consequently the urban population will increase. At present, the urban population in our country is increasing rapidly and there are no signs of restraint. In 2002, the new urban population will account for 25% of the national population and 35.7% by 2015. This has led to an increase in the number of motorized vehicles in urban areas. According

ISSN: 2278-4632
Vol-10 Issue-12 No.03 December 2020

to the Traffic Police Department, there is 50,682,934 vehicles (2,932,080 cars, 47,760,854 motorcycles, motorcycles) in 2015. In which, thetotal number of motorized vehicles under management in Hanoi is 5,591,729 vehicles (546,057 cars, 5,045,672 motorcycles and mopeds),in Ho Chi Minh City were 7,420,395 vehicles (556,688 cars, 6,863,707 motorcycles and mopeds). The quality of the vehicles is also a very worthy issue. Most old cars and motorcycles are in circulation without emission control. Meanwhile, many people in the traffic in Vietnam have no habit of maintenance vehicles periodically as recommended by the manufacturer. The vehicles after a period of using the gasoline system will be exposed, gasoline is at risk of fire. Engines that do not run out of gasoline will also produce benzene in the exhaust [4]. Especially, many old and worn-out vehicles remain in traffic, not only threatening the safety of road users but also seriously affecting the air quality of the urban, threatening to the health and life of the people. Exhaust emissions, dust, pollutants are increasing every year with the growth in the number of road transport vehicles [4]. Details, the concentration of dust in the air in cities such as Hanoi, Ho Chi Minh City, Hai Phong, DaNang at traffic junctions 3 to 5 times higher than permitted standards; daily average concentration of CO and NO_2 in some large intersectionshas exceeded the permissible standards from 1.2 to 1.5 times. Hanoi now has more than 7 million people, accompanied by the same number of personal vehicles. It is expected that the number of private vehicles willincrease in future. By 2020, the number of cars will increase to 843,000 units, motorcycles 6.1 million units; In 2025, cars will be 1.45 million units and motorcycles will be 7 million units. In 2030, cars will be 2 million units and motorcycles will be 7.5 million units [5,6]. According to a report by Hanoi's Department of Environmental Protection, 70% of the air pollution in Hanoi is caused by traffic. Some areas with high concentration of dust pollution are concentrated in Ha Dong, Hoang Mai, Cau Giay, Tu Liem districts. According to the calculations in two major cities, Hanoi and Ho Chi Minh City showed that motorcycles

ISSN: 2278-4632
Vol-10 Issue-12 No.03 December 2020

accounted for 95% of the number of vehicles involved in traffic [7], consuming only 56% of gasoline but emitting 94% of hidrocacbon (HC), 87% carbon monoxide (CO), 57% Nitrogen oxide (NOx) in total emissions of motor vehicles and motorcycles are used in traffic as the main source of most pollutants.

To reduce air pollution, Hanoi is implementing some measures such as actively promoting the planting of 1 million trees from now to 2020 [8]. Along with that, the Hanoi People's Council has also through the scheme of management of means of transport, development of public transport [5,6]. Accordingly, by 2030, the entire inner city will ban motorcycles. To carry out this task, the Hanoi Police recently conducted a survey of households in 30 districts with more than 15,000 questionnaires showing that 90.35% of people supported to restrain private vehicles and itinerary for stopping motorcycles [7]. However, the Hanoi people are required to improve the capacity of the public transport to meet the demand for transportation. According to the People's Committee of Hanoi, the city now has more than 5.2 million motorcycles [7], nearly 486 thousand cars, that is not including 1.2 million transport means from other provinces participating in traffic locality. If 60% of the total number of motorized vehicles is active simultaneously with the speed of 20 km/hr, the area occupied the road has exceeded 1.34 times the capacity of the urban road system. Consequently, the risk of congestion is very serious, especially during peak hours and holidays.

Solutions to solve the problem of environmental pollution and traffic jams now, Hanoi advocates simultaneously with the itinerary of limiting motorcycles will promote the development of public transport in both quality and quantity [8]. According to the master plan of Hanoi till 2030, with vision till 2050, Hanoi will have 8 metropolis railway (Figure 1) and 8 rapid bus routes (BRT) as following: (1) Kim Ma - Le Van Luong - Yen Nghia Bus Station with length of 14.3 km; (2) Le Trong Tan - Ha Dong axis - Xuan Mai with length of 17 km; (3) Ngoc Hoi - Phu Xuyen, 27.1 km in length; (4) Lien Ha – Son Tay (west axis of Thang Long) with 27 km in length; (5) Phu Dong - Kieu Ki with 15.7 km in length; (6) Gia Lam - Me Linh (Ring road No. 3), 29.8 km in length; (7) Me Linh - Me So (Ring Road 4), 53.2 km in length; (8) My Duc - Phu Xuyen (Do Xa - Quan Son), 28.5 km in length [6].

However, with current narrow traffic environment and space of many areas in Hanoi, conventional bus might probably be more appropriate [9]. This research will analyze the performance, achievements and difficulties of the bus system in Hanoi to propose certain suggestions to improve and develop the bus system in Hanoi (Figure 2).

The development of buses in Hanoi

Public passenger transport in Hanoi has a history of over 115 years.

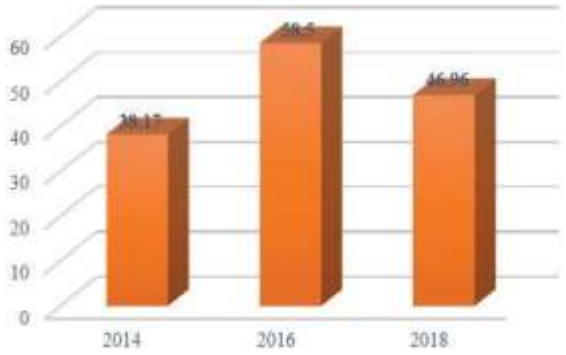

Figure 1: The Vietnam's Environmental Performance Index (EPI) score.

The company was founded in 1899 by the French-based Tonkin Territory, to build and operate the Tramway lines in the city. Tramway network of Hanoi has developed to 5 routes with the total length of 32 km and the tramway axis has become the axis of urban development of Hanoi. In 1988, the Tramway lines were dismantled, and replaced by the trial operation of Trolleybus on two lines: Sword Lake side - Ha Dong; Sword Lake side-Mo market, which stopped runny by the end of 1993. The development of buses in Hanoi can be divided into 5 stages as following:

- **Hanoi buses before the renovation (before 1986):** Bus routes of Hanoi were formed in the 1960s, reaching its zenith of development in 1980 with 28 lines downtown, 10 full service bus lines with 500 buses which had carried 50 million passengers, satisfying 20% of the travel needs of people in that period. This was the stage when bus operaration was under subsidy mechanism.
- **The crisis of Hanoi buses (from 1986 to 1992):** The country removed subsidized regime, bus businesses had to self - financed so they shifted from public bus transport to inter-provincial transport and service business. The lowest point of bus development was in 1992 when the number of bus routes reduced to 13 and capacity of transportation was less than 3 million passengers. This was also the start of booming period for motorbikes in Hanoi.
- **Bus rebound (from 1993 to 2001):** Since 1993, the city began to re-subsidize, but bus ridership grew very slowly (from 4.8 million passengers in 1993 to 15.2 million in 2001). Under the circumstance, in June 2001, the city decided to establish Hanoi public transportation and service company (now Hanoi transport Corporation) for comprehensive renovation and rapid development of public buses in Hanoi.

Figure 2: Metropolis railway network of Hanoi in the overall planning till 2030, vision till 2050.

ISSN: 2278-4632
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- **Comprehensive renewal period (from 2002 to 2010):** With the attention of the city to make an initial change, Hanoi Transport Corporation (Transerco) focused on comprehensive renovation of bus operation according to "leading supply" principle: Streamlining the flow of routes and networking; issuing interconnected monthly tickets; renovating means of transport; appling centralized management and improving service quality with a criterion: "Travelling by bus is faster than by bicycle, cheaper than by motorbike". With the advent of both the political system and the support of the people, Hanoi succeeded and the bus development model of Hanoi was replicated in many cities across the country (Figure 3).
- **Period of saturation and tendency of decreasing (from 2011 upto now):** During this period, the number of routes and means has also been increasing but the amount of transport has almost been saturated. Particularly, in 2014, 2015 and the first 6 months of 2016, the number of bus users was on a downward trend (only attaining 90 to 92 percent of the number of users on main routes and conventional routes comparing to the same period of previous years). By the end of 2015, Hanoi had 72 subsidized buses (1.1 times higher), with 1,208 vehicles (rose by 1.15 times). However, the number of 2015 decreased comparing to that of 2014, and comparing to that of 2010 it increased only by 1.02 times; In the first 6 months of 2016, the number of passengers only reached 90% over the same period of the previous year (Table 1).

Figure 3: Hanoi bus map.

The main causes of above conditions:

- **Unstable bus infrastructure:** The construction of key projects, bus stops, waiting houses has continuously been adjusted, encroached. Private vehicles has increased too fast compared to the development of transport infrastructure, affecting the speed of bus operating along the mixed lanes.
- **Service quality:** It does not seem to be compartible with the requirements of passengers which are increasingly higher and more diversified. Buses are not as convenient as personal means in terms of travel for short and medium distances.
- **Ticket price:** This is no longer an attractive factor for short and medium trips (as it is being competed by private means, type of taxis like Uber, etc.
- **Decrease possibility of access:** Because urban space planning is not compartible with public passenger transport planning, new urban areas lack land areas and access to public transportation.

The success of Hanoi buses

The bus area was expanded and initially attracted passengers: After 16 years (2001-2016), Hanoi bus has "bought the habit" of the people. The number of routes has increased 2.4 times, the quantity of buses has risen by 3.6 times, and over 28 times increase is witnessed in the quantity of bus ridership from 15 million passengers in 2001 to over 431 million in 2015. Currently, Ha Noi has 96 bus routes (75 of which are subsidized, 12 are non-subsidized and 9 are nearby bus routes). The route network covers all downtown districts and 26/40 town areas, townships and administrative centers of suburban districts.

Buses have made positive contributions to reducing congestion: The area of occupancy dynamically for a bus ridership is 1.5-2 square meters, while that for a person riding motorbikes is 8 – 12 m^2 and for car is 24 – 26 m^2. The survey results show that the rate of road occupancy for bus in certain main streets is below 10% but the bus can cover over 15% of travel demand such as in Cau Giay axis; Kim Ma; Nguyen Van Cu, etc.

High efficiency of exploitation: In 2001, the average of one bus was only 119 passengers per day, yet by 2010, this number rose by 1,152 passengers, reaching the maximum level. However, by 2015, an average bus could only carry 867 passengers per day.

The quality of bus services is basically consistent with the feature of passengers: According to the survey results, in the period from 2001 to 2010, cheap price of bus ticket was the major factor for attracting passengers; 26% of the respondents rated the service quality as good; 65% rated it as normal, 8% rated it as poor and 1% rated it as very poor. However, by 2016, the evaluation of bus service quality has changed due to the demand of passengers increasing and becoming more diversified.

Lessons learned from bus development activities in Hanoi

Firstly, the advent of both the political system and the determination of the City's leaders along with the selection of the development model, the appropriate steps were decisive factors in the success of the Hanoi bus in those years. City investment was just to make an initial push, then the step by step socialized but still played a leading role in the state economy.

Second, to develop public passenger transport, apart from investment in facilities, infrastructure, logistics facilities, as well as advanced system of management and administration equipment, the development of infrastructure for bus operation (such as priority lane,

ISSN: 2278-4632
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peculiar lane for bus, initial stop, final stop, transit position) should also be taken in to account.

Thirdly, people in big cities of Vietnam do not lack means of transportation. Therefore, comprehensive renovation and improvement of service quality according to "leading supply" principle are a decisive factor so as to limit their personal means of transportation and increase the use of public buses.

Fourthly, the city had a mechanism of policy to develop in accordance with each stage, policies on public transport infrastructure in general and buses in particular. Long-term subsidy policy was a factor that ensures the sustainable development of public bus.

Discussion

Opportunities and challenges for public transportation development in Hanoi in the future

Features of passengers and the requirement to improve service quality: From the results of the surveys in 2010 and 2016, the change in the features of passengers using buses is as following (Table 2):

- **Type of passengers:** In the 2001-2010 period, bus passengers were mainly students (65%) but upto now the type of passengers has become more diversified (with students making up of 37%, other group such as retired people, housewife accounting for 14%, employee 23%).
- **Passenger income:** In the 2001-2010 period, the majority of bus passengers had low income (less than 1 million accounting for 51%, from 1 to 2 million accounting for 32%) but upto now average income of passengers has been higher (from 2 to 4 million, accounting for 35%, 4 - 6 million accounting for 23%) and high-income people (over 10 million) has started to use the bus [10,11].
- **Purpose of the trip:** Using bus has been mainly for regular trips such as going to school and going to work.
- **Average travel distance of passengers:** In the 2001-2010 period, the distance of travelling was mainly 6 km in the downtown area of the city (which accounted for 78%) and 10 km in the suburban area. At present, travel distance of over 10 km makes up of 63% and less than 10 km travel distance only accounts for 23%.
- **Passengers requiring higher access:** In 2010, 40% of passengers accepted going further than 500m to the bus stop. However, upto now, 76% of passengers accept to walk to the destination and 58% accept to go to bus stop with distance of less than 500m.
- **Reasons for choosing bus:** In 2010, the rate of selecting bus because of low cost was 50%, followed by safety which made up of 20%. However, upto now, low cost only accounts for 18% of the reasons, passengers require higher about safety, security (30%) and quality of service. Cheap tickets are no longer the biggest advantage for for choosing buses as means of travel today.
- **Reasons for not using buses:** In the period before 2010, the reason for not travelling by bus was mainly due to long time of waiting (65%) but now there are many reasons of not choosing bus such as low quality of infrastructure, service, facilities, staff attitude, etc.
- **General assessment of service quality:** In the period before 2010, passengers assessed the quality of bus services to be relatively high (91% rated bus quality from average or above, but up to now this is only 65% and there are even 28% of the passengers evaluating the service as not satisfactory) (Table 3).

These changes are not only opportunities but also challenges for the development of public passenger transport generally and buses particularly in Hanoi in the coming period. Changes to passenger service quality.

The introduction of new public passenger transport modes in the coming time: Along with the development of public passenger transport buses, the city has been developing fast and mass modes of passenger transport. It is expected that by the end of 2016, the BRT route: Kim Ma - Yen Nghia has come into operation; By the end of 2018, the 2A railway Cat Linh – Ha Dong will be operated; and by 2020, the third railway line will be operated between Nhon and Hanoi Railway Station. When these modes go into operation, the bus will play the

S. No.	Target	Unit	2010	2011	2012	2013	2014	2015
1	Total number of routes	Route	80	82	86	89	91	91
2	Subsidized routes	Route	65	65	67	70	72	72
3	Number of subsidized buses	Bus	1,046	1,104	1,140	1,189	1,206	1,208
4	Total number of passenger carried by subsidized buses	Million passengers	421	440	453	458	463	431

Table 1: Bus development targets for the period of 2010-2015.

No.	Features of bus ridership	Survey in 2010	Survey in 2016
1	Area of serving passengers	Mainly focus on downtown area of Hanoi (78%)	Cover almost suburban districts of Hanoi
2	Passenger using bus	Mostly highschool or college/ university students (65%), business sector (15%)	Diversified type of passengers, namely highschool, college/ university students (37%); retired people, housewife (14%); worker (11%); office worker (12%)
3	Income of passenger	The majority were low-income people (51% of the passengers having income of less than 1 million VND; 32% get income ranging from 1 to 2 million VND)	Average income of bus passengers was below 6 million VND, accounting for 81%; 35% of the passenger had income of 2 to 4 million VND, 23% have income of 4 to 6 million VND; high income people (over 10 million VND, accounting for 5% of the passenger rate) started to use buses.
4	Purpose of travelling by bus	The majority of passengers (60%) use bus for going to school or to work.	Going to school or to work accounted for quite a high rate of 52%.
5	Average distance that passengers travel	6km for downtown travelling; 10km on for suburban travelling	Mainly selected buses with distance trip of over 10km (63%); 27% of the passenger selected bus for distance less than 10km.

Table 2: Features of bus ridership.

ISSN: 2278-4632
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No.	Service quality	Survey in 2010	Survey in 2016
1	Assessment of the accessibility to bus	40% of the passengers have to walk farther than 500m to the bus stop	The distance for walking was mainly less than 500m (accounting for 58%); distance to the destination was less than 500m (accounting for 76%)
2	Reason for choosing to travel by bus	Low cost of ticket (50%); safety (20%)	Low cost of ticket (18%), safety, and security (30%); nowadays low cost of ticket is no longer the biggest advantage of travelling by bus.
3	Reason for dislike using bus	65% due to long time of waiting (65%); 16% on account of bad quality of service and 10% because of long distance to walk	Long time of waiting for bus accounted for 12%; inappropriate route accounted for 11%; 11% due to long time of the trip and 10% due to long distance to walk
4	Quality of service on the bus	Average and good assessment accounted for 91%	65% assessed as acceptable; 28% were not satisfactory
5	Overall assessment of service quality	Relatively appropriate for passengers	Not satisfied when the income and type of passengers were variable with higher demand for a better quality

Table 3: Passenger requirements of bus service quality.

role of connecting, gathering and releasing passengers to ensure the best quality of passenger service. The task required is to have a state management agency on public passenger transport, modern electronic ticket system, transit system [12], conveniently connective terminals, etc.

Urbanization and development of urban space in Hanoi according to approved planning: Before merging period (before 2008), Hanoi's urban space was mainly concentrated in the downtown area of Hanoi, thus public passenger transportation system only developed in the original downtown districts. Following the mergence, in Ha Noi there was the rapid development of satellite urban areas (Xuan Mai, Son Tay, Hoa Lac, Phu Xuyen, Dong Anh, Soc Son) following "multi-center direction"; therefore, inter-regional public transport and regional connection will play an important role in the next phase. This was the opportunity for the bus to expand the service area, meeting the need of people in the suburbs, connecting the satellite towns with the center of Hanoi.

The shortcomings need to be overcome in order for the Hanoi bus to develop sustainably and efficiently: About route network and bus infrastructure, According to interviews, 93% of passengers assessed the suitability of the routes as low and medium, and 59.6% of passengers use monthly tickets but do not transit, which shows the network of routes does not seem to meet the demand of passengers.

Infrastructure for buses is not only insufficient but also weak. In many areas it is difficult to get access to the bus. The development of standard infrastructure such as the terminal, transit point and dedicated lane encounters plenty of difficulties. In a total of 1,974 km bus lines there is only 1.3 km for dedicated road. In a total of 78 terminals, 55 are located on the curb, unstable and unplanned areas, which accounts for 70%; The entire bus network has only 5 transit points.

Road network is overload, personal vehicle increase, travel time gets lengthened, service quality is affected especially during rush hours. According to statistics of Hanoi Police, in the 2011-2015 period, motorbike growth rate was 7.66% per year; automobiles increased by 12.9% per year (in which cars increased by 16.15%). Currently, Hanoi has over 5 million motorbikes and nearly 550 thousand cars; over 1 million bicycles and electric bicycles, while the growth rate of the city's transport infrastructure is only 3.9% per year. Infrastructure limitation and the rapid growth of personal vehicles lead to the extention of bus travel time upto 40 percent comparing to that of 2015. On major corridor axes, buses frequently arrive from 10 to 15 minutes later than scheduled due to traffic jams.

Regarding the mechanism and policy: There is a lack of planning for development of a modern multi-modal public passenger transport system. There has been a resolution on priority for development of public passenger transport (Resolution 03), but has not been implemented due to the lack of specific guidelines for implementation

Solution for the development of public passenger transport in Vietnamese cities

The basic solution to clear up the problem of public passenger transport in the cities is to develop according to Transit Orriented Development (TOD) [12,13]:

- It is to consider urban transport as the subject of urban development planning and land use planning. Taking mass passenger transport as a backbone for urban development;
- Vehicle planning must be done prior to transport infrastructure planning;
- People should be encouraged to travel by public transport; possession and use of personal vehicles, especially cars, should be controlled properly.

To supplement the standards and regulations on the allocation of infrastructure for public passenger transport in investment projects on upgrading, renovating and building new urban centers. Road access to residential areas should be ensured to have at least 2 lanes standardized for automobiles (7.5 m or more). Residential areas of 5,000 people or more must reserve a land area of no less than 1,000 square meters. Accelerate the application of technology and modernize the network operating system, especially the bus ticket system.

Focus on speeding up the investment in mass rapid public transport routes such as BRT, Metro, etc ... because of the limitation of bus capacity. In order to promote the efficiency of mass passenger transport (BRT, Metro), the bus system should be a tool to create the integration and connection of the whole system, namely:

- **Traffic:** Create the connection among BRT, Metro and conventional bus routes and create multimodal transit points among BRT, Metro and conventional buses, taxis along with parking arrangement for personal transportation vehichle (cars, motorcycles, bicycles) of passengers.
- **Transportation:** There should be a logical link among BRT, Metro and conventional buses at transit points so passengers do not have to wait for so long during transit and an operating system that consistently monitors service quality (it is necessary to develop service quality standards for each mode of transportation and for the overall system).
- **Institution:** There should be a consistent management body and especially a common electronic ticketing system for joining BRT,

ISSN: 2278-4632
Vol-10 Issue-12 No.03 December 2020

Metro with conventional buses and other public transport services in the city. There should also be a mechanism to encourage people to use public passenger transport means; personal vehicle should be restricted, along with a long-term and stable subsidy policy for the development of public passenger transport.

Conclusion

Compared with mass transportation means such as subway, BRT, conventional buses are somewhat less transportable. However, with narrow traffic environment and space in many areas of Hanoi, buses are seemingly more suitable. Along with the implementation of measures to limit private vehicles, regulating traffic demand; building and promoting the development of public transport is also one of the basic solutions to reduce environmental pollution, air pollution due to traffic jams. In addition, some solutions are set up for specific research, such as the congestion charge, the system consists of tolls at access points around the central city which charge varying fees to incentivize public transport – or at least not car use – during peak hours; set up a scheme on collection of environmental pollution charges for various types of land-road traffic means according to the levels of waste gas on circulation; to rise parking charges per hour or per area from suburban areas to the center of the city to limit parking in inner city. At the same time, scrutinize, closely inspect, resolutely handle and recover used vehicles in contravention of regulations; Review regulations on restrictions and licensing of transport vehicles in inner city [9,13].

The Hanoi People's Committee has approved the project "Strengthening the management of land-road traffic means in order to reduce traffic congestion and environmental pollution in Hanoi during 2017-2020, vision till 2030". However, the current problem is the construction of overhead trains or subway is very expensive and complex. Moreover, not in every area nor any route can these types be built. BRT require very strict operating conditions such as private lane, priority signaling system, etc [9,13]. Meanwhile, conventional buses have the advantage of reaching the majority of residential areas, operating condition required is only on average level. On the other hand, for great modes of transportation, each trip can accommodate thousands, millions of visitors and transport them to the station or transit points. Conventional bus become the force to release quite a large number of passengers. Thus, whether there are addition of subway, BRT or any other means, conventional buses will still be the main public passenger transport force of Hanoi. In order to meet the forthcoming requirements, Hanoi's conventional bus is in need of a detailed, scientific planning; this should be accompanied by practical measures to improve service quality with the support of advanced technology to develop buses into smart, accessible and environmental friendly modes of transportation. This is the solution to create a new look for urban of Vietnam, the urban that worths living in with transport system properly planned and sustainably developed.

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