

# Environmental Pollution in Vietnamese Urban

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**Abstract**— *In urban areas, where population is concentrated, socio-economic development (socio-economic) activities take place strongly. Along with the socio-economic development, urban areas of our country have changed markedly in terms of quantity, scale and quality of urban centers. Especially, 2 big cities are Hanoi and TP. Ho Chi Minh City has a very fast pace of development and dominates the country's urban development. The rapid urbanization process has led to many consequences, in which the quality of urban environment is greatly affected, and there are some pressing environmental problems that are mainly caused by urban infrastructure. The city has not kept pace with urbanization. Over the years, with the efforts of local authorities, the environmental quality in some urban areas has improved markedly. The implementation of projects and programs for treatment of urban domestic wastewater, dredging, clearing and renovating the landscape of inner rivers and lakes has contributed to significantly improving the quality of the water environment in some urban areas and big market. As for the air environment, some black spots on urban air pollution have also been removed. However, overall assessment, besides urban areas with relatively good environmental quality, urban areas that have improved environmental quality, there are still many urban areas, especially especially large cities, concentrated in delta areas, where strong socio-economic development activities and environmental pollution are still emerging issues, continuing to pose significant challenges to environmental management work.*

**Keywords**— *Transport, pollution, urban environment.*

## I. INTRODUCTION

Most of the major cities of our country are facing increasing air pollution, mainly focusing on dust pollution. Pollution levels vary from city to city, depending on the size of the city, the population density, especially the traffic density and the speed of construction. Pollution level is most evident in 2 cities, especially Hanoi and Ho Chi Minh City. Ho Chi Minh City, followed by first-class cities. The remaining groups of cities have lower levels of pollution. Dust pollution in urban areas is also mainly concentrated in the intersections, roads, where there is large traffic volume or industrial activities. In the recent period, the urban air environment was also affected by the activities of renovating and constructing new national highways, the system of inner and urban roads, the construction of new types of zones. Urban activities ... have released a large amount of dust into the environment, causing pollution in many surrounding areas. In urban areas and inner cities, such as Hanoi and Ho Chi Minh City. In Ho Chi Minh City, the number of days of the year with PM10 and PM2.5 dust concentrations exceeding the permissible limit of QCVN 05: 2013 / BTNMT accounts for more than 20% of the total number of days in a year. For the northern metropolitan areas, the number of days with high dust concentration is usually concentrated in the winter months. In particular, fine dust composition (PM2,5) accounts for a relatively high proportion.

According to the research, these dust particles are usually acidic, persist in the atmosphere, spread far and deep into the lungs, causing bad effects on human health. In recent years, the number of private vehicles has increased rapidly, making air pollution in urban areas across the country increasingly serious. Transport activities are currently considered as a major and worrying source of pollution to the air environment in our country, especially in urban areas and densely populated areas where activities pine flourish[1]. For years, scientists at Yale University's environmental research centers and Columbia University in the US have been conducting environmental performance index (EPI) research in 132 countries, The results show that Vietnam is ranked 79th in this list. On the basis of the world standard of air quality index (AQI), if the air cleanliness is from 150 to 200 points, it will be considered polluted, from 201-300[2]. Considered to be extremely urgent, seriously affecting the health of people. Meanwhile, in Vietnam, the two most polluted areas are Hanoi and Ho Chi Minh City, the AIQ of the day is at 122-178. As for the peak hours, when traffic jams or congestion occur, the AIQ index in large urban areas must reach over 200. This shows that Vietnam is standing at the pollution threshold. serious gas, causing immeasurable dangers to people's health. According to the EPI survey, Vietnam is among the 10 countries with the lowest air quality index (ranked 123) and is expected to fall to 125th position in the near future[3]. This is an alarming information to the air environment in our country today.

Ho Chi Minh City Department of Transport has just reported to Ho Chi Minh City management about the environmental pollution caused by transportation activities is at an alarming level. Currently, the city has more than 8 million vehicles (of which more than 7 million motorbikes) are operating every day emitting a tremendous amount of emissions into the environment, increasing air pollution and the cause of disease risks for people in the area and people in traffic[4]. More specifically, there are many old and outdated vehicles that still exist and are naturally involved in traffic, which not only threatens the safety of life for road users but also affects the traffic safety. seriously affecting the air quality of urban centers and people's health[5]. According to the Institute of Transport Strategy and Development (Ministry of Transport), in the period of 2011-2016, transportation activities in our country consume a large amount of energy, accounting for 30% of the total national energy demand, 60 % of total fuel consumption[6] and increase 10% per year[7]. In particular, road transport consumes the largest energy, accounting for about 68% of the total fuel of the industry[8]; 90% of transportation fuel is gasoline and diesel (only 0.3% is clean fuel)[9]. With the consumption of large amounts of fuel,

transportation activities have emitted a large amount of GHG[10], increasing climate change[11]. Currently, on average transport each year emit about 30 million tons of CO<sub>2</sub>[12]. In particular, road traffic emissions accounted for 86%, railways, waterways and air traffic accounted for 14%[13]. In recent years, with the trend of innovation and integration, Vietnam has created new impetus for the development process, overcome the impact of the global

recession and maintained the annual economic growth rate with the average of 5.7% / year. However, our country is still facing many challenges, including air pollution. Air pollution is not only a hot issue concentrated in developed urban areas, industrial zones, clusters ... but has become a concern of the whole society. Air pollution is considered as one of the leading factors with a serious risk to public health.

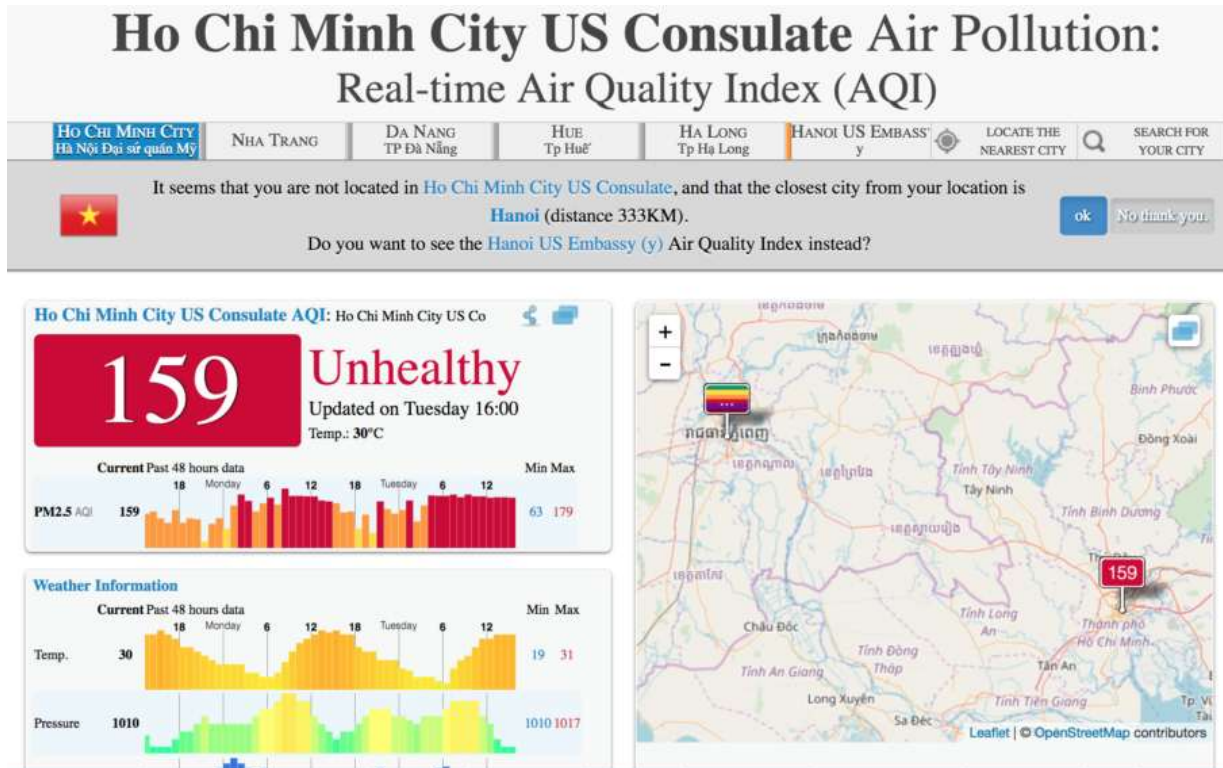


Fig. 1. Pollution in Ho Chi Minh City

The operation process of means of transport discharges large amounts of substances such as dust, CO, NO<sub>x</sub>, SO<sub>x</sub>, gasoline vapors, lead dust, benzene ... causing air pollution[14]. Specifically, the concentration of dust in the air (quarter 2/2016) in cities such as Hanoi, Ho Chi Minh City, Hai Phong, Da Nang ... at intersections is 3-5 times higher than the permitted standard; The average daily concentration of CO and NO<sub>2</sub> in some large intersections has exceeded the standard from 1.2 to 1.5 times[15]. The statistics also show that the emission of road motor vehicles depends heavily on the quality of vehicles. For cars and motorcycles over many years of use of low quality, low fuel efficiency, high concentrations of toxic substances, dust in exhaust gas ... are the causes of serious environmental pollution[16]. In particular, motorcycles are the main contributor of polluted gases, especially CO emissions. Trucks and passenger cars of all kinds emit a lot of NO<sub>2</sub>. In addition, the noise generated from traffic activities also plays a major role in causing environmental pollution[17]. According to the HCMC Environment Protection Sub-department, air pollution is mostly caused by suspended dust from transport activities. The average content per hour of suspended dust monitored in the

third quarter of 2016 in 20 spots in HCM City was between 87.70– 715.93 µg/m<sup>3</sup>, while 43.75 percent of monitored value could not meet the Vietnamese standard QCVN 05:2013/BTNMT (the concentration of suspended dust is 300 µg/m<sup>3</sup> per hour)[4]. The traffic jams in the city make the pollution even worse. The air pollution at Go Vap Roundabout, Nguyen Kiem, Xo Viet Nghe Tinh and Bach Dang streets is more serious because there are too many motorbikes, cars and buses which discharge emissions at the same time[18]. In districts 2, 9 and Thu Duc, the dust sometimes is so thick that it looks like fog. The same situation can be seen in Hanoi. Tay Son, Truong Chinh, Giai Phong and Nguyen Xien roads are dusty because of the heavy traffic there. The HCMC Transport Department has proposed to the HCMC People’s Committee to urge the Prime Minister to approve the MOT’s plan to control vehicles’ emission. Under the plan, MOT will draw up a roadmap for applying emission standards for motor vehicles with the capacity of 175 cm<sup>3</sup> and higher in 2018-2020 [19]. Climate and weather factors (including radiation regime, temperature, precipitation, etc.) have certain effects on the air environment. In Vietnam, the climate is clearly differentiated by region. The North has a

tropical monsoon climate, the South is tropical, while the highlands exhibit a temperate climate. Dry, hot climate, high heat radiation are factors that promote the dispersion of pollutants, and heavy rain can contribute to reducing air pollutants. In addition, greenery is also a factor to help reduce emissions in the atmosphere significantly. According to statistics in our country, although the total forest area has increased, reaching 40% forest cover, the forest quality continues to decline. For urban areas, the density of trees does not meet the standard of coverage. Specifically, in Hanoi capital and Ho Chi Minh City. In Ho Chi Minh City, this area has just reached  $<4\text{m}^2$  / person, lower than the requirement of the standard ( $10\text{-}15\text{ m}^2$  / person) and does not meet the role of green lung to minimize air pollution.

## II. SITUATION OF AIR POLLUTION

The urbanization process, together with unmanaged and well-controlled socio-economic development activities, negatively affects the quality of the air environment. In Vietnam, in the period of 2008 - 2013, the economic growth rate was recorded to decrease due to the impact of the financial crisis from the end of 2007-2010. However, the environmental pressure from industries is still not small. Current sources of emissions are increasing in both quantity and scale. The pressure on the air environment varies depending on the development characteristics of each region and the size of the nature of each source of waste. The rapid

increase in the number of urban areas is accompanied by a rapid increase in the urban population (currently accounting for 32% of the total national population) while unmet infrastructure is the cause of the environmental problems in the country. urban centers of grades I and II. Construction, renovation and new construction of apartment buildings, urban areas, roads, bridges, house repairs, transportation of materials and construction wastes take place everywhere, spreading dust into the ambient gas. The problem of air pollution caused by urban transport activities in our country comes from many different causes. First of all, that is the effect of urbanization associated with the industrialization process. The process of urbanization on the one hand will promote economic, social development and accordingly the urban population will constantly increase. Currently, the urban population in our country is growing rapidly and there is no sign of being controlled. In 2002, the new urban population accounted for 25% of the national population, by 2012 the urban population reached 34% and in 2015 was 35.7%. That has led to an increasing number of motorized vehicles in urban areas. According to data from the Traffic Police Department, in 2015, there were 50,682,934 vehicles in the whole country (2,932,080 cars, 47,760,854 motorcycles and motorbikes)[4]. Only the total number of motor vehicles managed in Hanoi is 5,591,729 vehicles (546,057 cars, 5,045,672 motorcycles, motorbikes) in Ho Chi Minh City. there are 7,420,395 vehicles (556,688 cars, 6,863,707 motorcycles and mopeds).

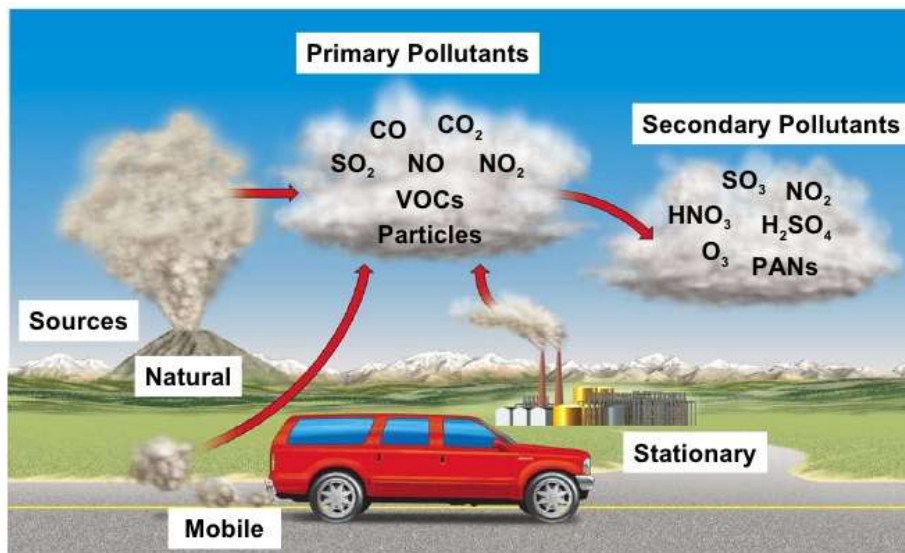


Fig. 2. Sources of air pollution

The quality of the transport is also a matter worth discussing. Most of the old cars and motorcycles in circulation do not have a control system for emissions. Meanwhile, many people in traffic in Vietnam still do not have the habit of periodic vehicle maintenance according to the manufacturer's recommendations. The vehicles after a while using the fuel injection system will be exposed, the risk of fire. Engines that do not run out of gasoline will also produce benzene in the exhaust. When the vehicle is regularly maintained, it will help the engine operate better, the fuel consumption is less so the

vehicle emissions to the environment are also less. On the other hand, it also helps to make the vehicle structure better and safer during circulation. Therefore, many individual vehicles do not strictly implement the periodic maintenance and maintenance regime, which causes an increase in emissions to the environment with increasing levels of toxicity. In particular, many old and rotten vehicles still use traffic, not only threatening the safety of life for road users but also seriously affecting the air quality of the roads, urban areas, threatening people's health and life[14]. The volume of

vehicles participating in traffic increases rapidly in the condition that infrastructure has not been improved much, the policy of moving hospitals, schools, large administrative agencies, bus stations ... out of the city. well done. The construction and new construction of traffic works have both prolonged and occupied a large surface of the road, the organization of traffic has encountered many difficulties, which greatly affected the traffic safety situation, landscape and urban environment causing serious cancer conditions. Although in 2015, Hanoi and Ho Chi Minh City did not have for more than 30 minutes, traffic congestion still occurred due to high traffic density, especially at rush hour. . On the other hand, when heavy rains occur, flooding on some roads will obstruct traffic. When traffic congestion occurs, the level of pollution of gasoline vapors can increase 4-5 times compared to normal. Pollution of CO and gasoline vapors (HC) often occurs at large intersections. Therefore, transportation emissions are becoming a major source of pollution to the urban air environment, especially in large cities like Hanoi and Ho Chi Minh City. It can be affirmed that up to 70% of urban environmental pollution emissions originate from vehicles. In Vietnam, about 75% of cars run on gasoline, 25% of cars run on DO oil, 100% motorcycles run on gasoline. When vehicles use fuel to operate, the engine will emit a large amount of toxic gases that pollute the environment and directly affect the health of people in traffic and living along the road. traffic routes.

### III. SOLUTIONS

Air pollution is a complicated issue, involving many fields and activities of urban areas: construction, land use, transportation, daily-life activities, industry, energy. The control and minimization of urban air pollution must be based on a series of synchronous solutions [18]. *Firstly*, strictly implement the provisions of the Ministry of Transport's Circular No. 70/2015 / TT-BGTVT dated November 9, 2015 on inspection of technical safety and environmental protection of transport vehicles motorized road. For the traffic police force, it is necessary to strengthen the patrol and control of vehicles in and out of the city, especially for the case of drivers of vehicles that are out of date and will use the traffic procedures collecting vehicles in accordance with the Government's Decree No. 171/2013 / ND-CP. At the same time, the traffic police force should coordinate with the Traffic Inspectorate to strengthen inspection and handling of vehicles transporting construction materials in the city and have strict sanctions on vehicles violate. *Secondly*, public transport in the areas of large cities actually only meets 7-10% of the travel needs of the people. Therefore, it is necessary to focus on the development of bus systems, fast buses (BRT-Bus rapid transit), high-speed trains ... in order to target the proportion of public transport in the total transport volume for the region. The urban area must account for at least 25% in the coming time to contribute to restricting traffic accidents and reducing traffic accidents. The development of public transport and the restriction of private vehicles by road users must be considered as a core solution to minimize the emissions of vehicles into the environment. Currently, Hanoi and Ho Chi

Minh City are implementing urban railway project and BRT system. The goals of these projects are directed to the development of public transport. Therefore, it is necessary to monitor projects on schedule and meet environmental standards when put into operation. *Thirdly*, encourage the development of clean energy vehicles such as natural gas, liquefied gas, fuel alcohol, biodiesel and electricity. At the same time, the collection of environmental fees for means of transport should also be considered as a solution to raise people's awareness and responsibility to the environment today. *Fourthly*, traffic management needs to be compatible with the environment, there must be a comprehensive monitoring system to monitor traffic situations and environmental conditions existing in the areas of urban areas. Conduct periodic and regular cleaning of traffic environment by spraying water and sweeping roads especially in the dry season. Cars must be sprayed with water and washed before coming into the city and motorized vehicles must be washed when coming out of construction sites in urban centers. *Fifthly*, bus terminal areas are crowded with vehicles and passengers, so bus stations must sign a commitment to protect the environment and invest in an air filtration system. Building a system of waiting rooms and roofs to ensure the health of passengers. In addition, it is necessary to increase the area of greenery in wharves and yards to make the environment clean. In order to reduce the negative impact of transportation activities on the environment, the Ministry of Transport encourages the implementation of programs and projects on improving the efficient use of transport fuels. In particular, the project of eco-vehicle control management system (EMS) was implemented in Hanoi in 2017, with activities including: Improving vehicle control skills and control consciousness Eco media for taxi drivers. At the same time, an EMS vehicle control management system will be installed in taxis to accurately monitor, monitor and evaluate the feasibility and effectiveness of emissions reduction. According to the calculation results, in the case of 1,000 taxis participating in driving EMS, it will increase fuel efficiency by 10%, thereby reducing about 1,000 tons of CO<sub>2</sub> per year. In addition, the Ministry of Transport is also implementing a project to study the conversion of fuel use from diesel to natural compressed air (CNG) for road motor vehicles, firstly buses across the country. Currently, the project has been piloted in Ho Chi Minh City. Ho Chi Minh City, with 50 buses code 01 using CNG fuel, has a long operating route of nearly 9 km Ben Thanh - Cho Lon route. In general, the most worrying factor in Vietnamese cities is dust, especially fine dust. That fine dust is caused by vehicles. As for other pollution such as SO<sub>2</sub>, CO, NO<sub>x</sub> ... it is still approximately the permitted standard. But dust is 3-5 times higher than standard for poker.

This method is true because gasoline has lead when mixed (biofuel) to increase the octane index. However, the current development is not much. And the engine (used) in Vietnam is still the type built for fossil fuels. If you change the carburetor, change the alpha ratio, you can use. However, there are currently no buyers so biofuel production suffers a loss. When used, the durability of the current engine is reduced. Therefore, it is necessary to change the engine accordingly. It

must be made from the root is planning residential areas to increase public transport area up. Need to change your mind, not a motorbike. One method that has long been used to keep the air fresh is to plant trees so that they absorb carbon dioxide and release oxygen for human to breathe. But while vehicles are increasing, the area of greenery is shrinking.

According to the Department of Transportation City. Ho Chi Minh City, the time of testing buses running on CNG shows that the engine runs smoothly, the harmful emissions are reduced by 53-63%, CO<sub>2</sub> causes the greenhouse effect by 20%, no dust and black smoke, the fuel is thoroughly burned, especially saving 30-40% of fuel. Expected, by the end of 2017, TP. Ho Chi Minh City will invest 800 buses using CNG. Planning to develop transport infrastructure system in the direction of reducing environmental pollution. Accordingly, it is necessary to plan the road network in key areas, especially large cities, to create favorable conditions for road users. At the same time, focusing on integrating GHG emission reduction into planning, plans, investment projects, transport development. In addition, it is necessary to develop mechanisms, policies and encourage the use of energy-efficient transport. Implementing vehicle emission control program. Strengthening the stations and patrol, control on the road to ensure the motorbike during use is always maintained, repaired and inspected on time for emission standards when participating in road traffic. Vehicles within the scope and subject to regulations but failing to carry out emissions inspection, without certificates will be handled for administrative violations. Application of intelligent transport technology, green transport technology to reduce GHG emissions in circulation and transport of goods. On the other hand, it is necessary to review and gradually eliminate ineffective, environmentally friendly technologies, facilities and equipment. Piloting and expanding the application of renewable energy, low energy-consuming technologies (solar batteries, LEDs ...) into lighting and traffic signals. Meanwhile, according to industry, construction is causing air pressure mainly because the construction companies have not implemented fully and strictly environmental protection measures at the construction site. Pressure from livelihood activities is concentrated in rural areas where raw materials for cooking and production still rely mainly on fossil fuels, firewood ... and uncontrolled wastes. The livestock industry with the scale and number of rapidly increasing (nearly 2,000 farms in the two years from 2011 - 2013) discharged about 75-85 million tons of waste, giving rise to emissions including CO<sub>2</sub> accounting for 9%, gas CH<sub>4</sub> accounts for 37%, NO<sub>x</sub> 65%, and some other gases such as H<sub>2</sub>S and NH<sub>3</sub>. The field of cultivation also causes environmental problems due to an increase in the amount of chemical fertilizers, pesticides and the amount of post-harvest waste (including straw, dried trees) that is uncontrolled. Activities of a number of handicraft villages, such as recycling villages, put significant pressure on the environment and are common in the Northern region, which accounts for 60% of the total number of trade villages in the country. Transport with the trend of increasing number of vehicles over the years is considered to be a significant contributor to the deterioration of air quality. In particular, the

CO, VOC, TSP are mainly emitted by motorcycles while for cars, the main sources of pollution include SO<sub>2</sub> and NO<sub>2</sub>.

#### IV. CONCLUSION

Based on the successes achieved from the previous period, the period of 2008 - 2013, the management of the air environment from all sectors and fields continued to be strengthened and obtained positive results. Some solutions have been implemented effectively such as continuing to improve the legal corridor and organizational structure on air environmental protection; air pollution control results from transportation activities; control sources of emissions from industrial production activities; promote the implementation of green solutions group; promote the monitoring programs of MTKK, enhance continuous automatic air monitoring. However, besides, there are still inadequacies in management that exist for many years but have not been completely solved.

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