A Few Solutions for Improving the Water Quality of Polluted Rivers and Canals in Vietnam: A Case of Ho Chi Minh City

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Abstract: Ho Chi Minh City is continuously developing strongly in terms of economy and society, and people's problems are gradually being actively overcome and improved. However, a problem that is causing many shortcomings in recent times is the water pollution in the city area. While the direction to resolve has not been clearly outlined, this situation is causing difficulties for daily activities of residents. Most canals are in the city. Ho Chi Minh City is facing serious pollution. The people here can easily see a black water flowing along the city's vast boulevards, this image that has existed for many years. This paper addresses a number of possible solutions and by using interview and survey methods, the results of the paper shows that the environment of a big city like Ho Chi Minh city needs strengthening more drastic solutions.

1 INTRODUCTION

Currently in the city there are more than 17,000 shabby houses due to the construction of semi-temporary houses located on and along the canals' corridors, encroaching on the flow. This is part of the reason for the increase in domestic waste in the flow (Babut et al., 2019). In fact, the canals along the residential areas, the level of pollution are alarmingly high with a series of wastes, mainly domestic waste. These canals is polluted like this because part of people's awareness is not good, everyone poured garbage into the canal, no wonder it is not polluted.

Contrary to the current socio-economic development, environmental problems in Ho Chi Minh City are going down seriously. Because it is one of the major cities in Vietnam, HCMC has a dense population and many industrial parks. Wastewater from residential areas and industrial wastewater is the main cause of water pollution.

2 THE RESEARCH CONTENT

2.1 The Alarming Pollution Situation of Rivers in Ho Chi Minh City

Although Ho Chi Minh City has implemented many solutions to reduce water pollution in the Saigon River basin over the years, up to now, the pollution is still in excess of the permitted level, affecting public health (Figure 1).

Figure 1: The status of river pollution in Ho Chi Minh city.

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According to the monitoring results of the General Department of Environment, under the Ministry of Natural Resources and Environment (Natural Resources and Environment), the water quality of the Saigon River observed in the first five phases of 2020 has a clear change from upstream to downstream. 24% of the water quality index (WQI) value reaches the level of use for domestic water supply but requires appropriate treatment measures. Notably, 1.3% of the value is at heavily polluted water level, which requires future treatment measures (Danh & Hoi, 2019)..

The evolution of surface water quality in the Saigon River from 2016 to 2020 shows that the organic pollution (COD and BOD5) content does not increase much, but the BOD5 / COD ratio tends to increase at most of the monitoring points, proving that the control of domestic wastewater is not good. This is consistent with the new statistic that 21.6% of domestic wastewater is collected and treated (Thi Van Ha et al, 2008).

Over the past time, although Ho Chi Minh City has made efforts to implement many measures to protect the environment, there are still many pressing problems, seriously affecting the quality of water resources in the Saigon River basin. Saigon River flows through the territory of a number of localities in the southern key economic region, where many production establishments and industrial parks are concentrated. Because the population of Ho Chi Minh City is concentrated, the amount of domestic wastewater is very large but has not been thoroughly treated, causing water pollution in the city (Le Vo, 2007).

2.2 A Number of Activities Aimed at Overcoming River Pollution

In order to limit the environmental pollution impact on the Saigon River, Ho Chi Minh City has conducted inspection and violation handling activities. Up to now, all 37 establishments causing serious pollution in the city have completed the treatment of pollution completely or have been relocated or shut down (reaching 100%), of which 21 establishments have stopped operating Export, relocation and 16 facilities have completed the treatment of pollution (Thi Van Ha et al, 2008). The city has studied the WQI water quality zoning and assessed the use of water resources of rivers, canals and ditches in the area. The city has also deployed statistics on pollution sources from industrial wastewater in the city to assess and preliminarily determine the level of pollution caused by wastewater from industrial production activities on the river city (Le Vo, 2007). Dong Nai river system (including the Saigon river basin). The city has also investigated and counted the points of direct discharge to canals and channels in the basin of the Saigon - Dong Nai river; calculating the pollutant load of the wastes discharged into canals and channels in the Saigon - Dong Nai river basin; GIS mapping for management and monitoring of discharge points directly to canals and ditches in Saigon - Dong Nai river basin.

In the coming time, the city will continue to build local environmental technical regulations, evaluate, classify and build a national database on waste sources. The city has increased the dissemination of the WQI index on the 48-board traffic electronic system; continue to maintain the web-based system that includes all general information and data of each monitoring location; Integrate into the environmental monitoring portal and mobile application that can access, access and monitor environmental monitoring data via smart phones (Hoi, 2020).

Along with that, the city continues to review and propose a list of facilities causing environmental pollution, serious environmental pollution, and production facilities that are not in line with the urban construction planning. At the same time, the city urged facilities to complete remediation measures, or relocate on time. The city also continues to update data on environmental database management software, complete the environmental database (Le Vo, 2009).

3 METHODOLOGY AND RESULTS

This paper is made and completed based on the analysis of historical and current data on environmental pollution in Ho Chi Minh City and gives some suitable recommendations.

A small survey with the participation of 20 people living near canals in Ho Chi Minh City also showed that the results were not very satisfactory. Most of them expressed dissatisfaction with the terrible smell of the canals. During low tide, the smell from these canals affects their life quite significantly (90%). Most of the people (100%) think that they cannot use water wells for domestic purposes because the pollution is very serious. The smell of the water is also very bad and the color of the water is problematic. In addition, some people are less conscious since they throw rubbish indiscriminately; they even throw animal carcasses down the canals.

Some people also use canals as toilets, this has a big impact on residents' daily lives.

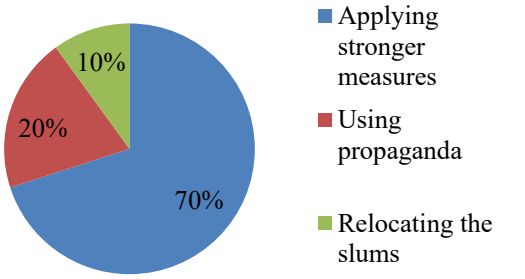

Figure 2: Respondents 'ideas about improving environment

When asked about the solutions, the majority (70%) said that the government needs stronger measures. Others (20%) said that propaganda plays a rather important role. The remainder believe that the slums need to be relocated soon to improve the environment (Figure 2).

Currently, about 20% of the people do not have access to clean water, 17.2 million people still use water that does not meet the clean water standards of the Ministry of Health of Vietnam. The total amount of water being exploited and used annually is 80.6 billion m3 / 830 billion m3 (10% of the total water volume of the country. Of which more than 80% (about 65 billion m3 / year) is used for agriculture. ; The demand for water for people living and industry will reach about 130-150 billion m3 / year, accounting for nearly 50% of the water produced in the territory, nearly 90% of the water in the dry season (about 170 billion m3).

The risk of dehydration is obvious and severe. Degradation, depletion of surface water, groundwater, water shortage, water scarcity become more common.

Statistics from the Ministry of Natural Resources and Environment, the Ministry of Health, currently each year, about 9,000 people die from poor water and sanitation, nearly 250,000 people are hospitalized because of diarrhea due to polluted domestic water. About 200,000 people get cancer each year, one of the main causes is water pollution. According to a WHO study on malnutrition in Vietnamese children, it has issued a warning that about 44% of children are infected with worms and 27% of children under 5 are malnourished, the main cause. This is due to lack of clean water and poor sanitation. Besides, about 21% of the population is using arsenic contaminated water. It is very worrying that, in fact, there is still a segment of the population despite these red alarm numbers. According to a recent report by the Ministry of Natural Resources and Environment, up to 30% of the population is not aware of the importance of using safe water.

4 DISCUSSION

4.1 Causes of Water Pollution

The reason is indicated by the hot growth in population, rapid urbanization and industrialization in recent years, which has put pressure on the water environment in river basins (Babut et al., 2019). The level of pollution of water sources in canals, rivers and lakes in big cities and concentrated population areas is very serious (Figure 3).

Figure 3: The slums in Ho Chi Minh city.

Of the total amount of wastewater generated in river basins, domestic and industrial wastewater still accounts for the largest proportion (Hoi, 2020). According to the latest national environmental status report (2018), the rate of domestic wastewater collected in urban areas of grade 4 and above is only about 12.5%, with 45 factories, Wastewater treatment stations, concentrated in 29 provinces and cities (in Hanoi alone, 20.62% of domestic wastewater is treated, while in HCMC about 13%). Out of 251 industrial zones in operation, there are 221 industrial zones with complete centralized wastewater treatment system and in operation, accounting for 88%. However, out of 689 industrial clusters in operation, only 109 industrial clusters with wastewater treatment facilities were in operation, accounting for only 15.8%. The rate of daily-life solid waste collected and treated is about 86% in urban areas, about 40% -55% in rural areas; a very large portion is discharged into the water supply (Le Vo, 2009).

In addition, the amount of fertilizers, pesticides, and chemicals used in agricultural cultivation that flow back into the water source is also considered "seriously polluting". Notably, measurement and monitoring data at border locations also recorded polluted water sources that have been flowing into our territory.

Besides, the current provisions of law on licensing wastewater discharge are not appropriate. Cooperation in water sharing as well as cross-border pollution control continues to be a challenging issue, requiring smart political-diplomatic policies.

Statistics of the Department of Natural Resources and Environment of Ho Chi Minh City show that the city currently has about 3,300 sources of waste from production, trade and service establishments. In which, only 35% of production, service and trade establishments have environmental treatment systems meeting environmental standards (Danh & Hoi, 2019).

Water quality monitoring results have just been announced by the Department of Natural Resources and Environment, showing that the water source in the canal system in Ho Chi Minh City is in a state of heavy pollution. Components such as BOD5 (biological oxygen demand), COD (chemical oxygen demand), microbiological criteria (coliform), suspended matter content (SS), heavy metals, etc. all exceed the magnetic standard tens to thousands of times allowed. Pollution becomes more serious at low tide (Hoi, 2020).

This situation reduces the quality of water resources in the inner city canals and river water sources, seriously affecting the water supply for daily life of the city people city (Le Vo, 2007). Only the wastewater from the export processing zones and industrial zones in the city has shown an alarming level of pollution (Gia, 2021). In Ho Chi Minh City, 15 export processing zones and industrial zones have put into operation the centralized wastewater treatment system, but still more than 700 other sources of waste that have not been fully controlled are still being discharged into the environment. That is not to mention the small-dispersed industrial establishments located in the residential areas also regularly discharge untreated wastewater into canals (Duc & Truong, 2003).

Meanwhile, a scientific study of the Project to control scattered waste sources along the Saigon River funded by the Government of Spain in Ho Chi Minh City also showed that the domestic wastewater of the city people also is one of the main causes of such serious pollution.

The research results of this project show that the water quality of the Saigon River is degraded by many sources of waste such as urban runoff, wastewater from residential areas, oil leakage from water traffic activities, landfill, mining and industrial and agricultural production. In which, the most worrying thing is wastewater in residential areas, especially domestic wastewater contaminated with feces and urban runoff (Gia, 2021). Due to the growing concrete area of the city, rainwater cannot penetrate the ground, but overflows carry all the waste on the ground down to the canals leading to the river. And the waste from the septic tanks that are not working effectively or not go through the septic tanks is discharged into the river, making the river water polluted quite seriously (Thi Van Ha et al, 2008).

4.2 The Effects of Water Pollution on People's Life

Vietnam has a dense river and a large number of rivers and streams concentrated in big cities like Ha Noi and Ho Chi Minh city (Figure 4).

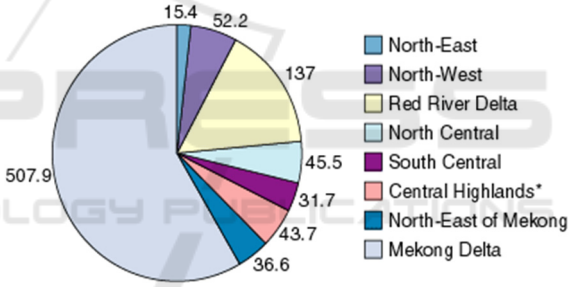

Figure 4. River flow per area (bill m³ / year)

According to the statistics of the Ministry of Health, the Ministry of Natural Resources and Environment, an average of 9,000 people die each year from polluted water, over 200,000 cases of cancer are found, one of the causes is due to using polluted water. When water is contaminated with microorganisms, toxic chemicals, etc. can adversely affect the health of users (Bolay et al., 1997).

When the water environment is contaminated with bacteria, viruses, parasites or when the water becomes the medium for vectors of disease such as: gastrointestinal disease (diarrhea, cholera, dysentery, typhoid, Hepatitis A, etc.); helminthiasis (roundworm, whipworm, hookworm, liver fluke, pulmonary fluke, schistosomiasis, etc.); Using dirty water in personal hygiene can lead to skin diseases; eye diseases (red eye pain, trachoma, conjunctivitis, conjunctivitis); gynecological diseases such as bacterial vaginosis, etc.

Scientific studies also show that, when using arsenic-contaminated water for drinking, people can get cancer, most commonly skin cancer. In addition, arsenic also poisoning the circulatory system when drinking water with arsenic content of 0.1mg / l. Therefore, it is necessary to treat arsenic contaminated water before using it for daily life and eating (Duc & Truong, 2003).

People with long-term lead infection can suffer from kidney, nerve, ammonium, nitrate, nitrite infection that can cause blue skin disease, anemia, can cause cancer. Methyl tert-butyl ether (MTBE), a common additive in oil extraction, has a very high potential to cause cancer. Sodium (Na) infection causes high blood pressure, cardiovascular disease, sulfur causes gastrointestinal disease, Potassium, Cadmium cause degenerative spinal disease, back pain. Organic compounds, pesticides, insecticides, herbicides, growth stimulants, food preservatives, phosphorus, etc. cause poisoning, hepatitis, vomiting city (Le Vo, 2007).

Long-term exposure will cause serious cancer of internal organs. Bacteria and parasites of all kinds are the causes of gastrointestinal diseases, worms and helminth infections. Heavy metals of all kinds: titanium, iron, lead, cadmium, arsenic, mercury, zinc cause nerve pain, kidney, excretory system, osteomyelitis, anemia.

5 SOME SUGGESTIONS

For a long time, the city has not synchronously implemented measures to protect the water environment; funding for monitoring and checking the discharge of enterprises, production establishments, etc. is insufficient. The monitoring force is limited, so a number of businesses have discharged wastewater directly into the river system, causing water pollution. The city should have propaganda policies to let people in the city in particular, as well as people from other places come to do business and live in the city, see their responsibility in protecting the environment, and see the city as of their own, associated with their own survival. At the same time, the city should strengthen sanctions, severely punish violations of environmental laws.

We need long-term and short-term solutions to help improve canal pollution. Specifically, the reduction of water pollution in canals should be community based. At the same time, we need to add the function of environmental self-management to the neighborhoods, promote their role in propaganda to raise people's awareness, especially households living along canals without littering and wastewater into the river (Thi Van Ha et al, 2008).

Another solution is to survey, mobilize and encourage households to build water storage tank to avoid environmental pollution and not go directly to the natural environment. This approach allows a 60% reduction in pollutant concentrations for BOD5 and 40% for COD. We also need to strengthen propaganda, advocacy, punishment education, enforcement of law enforcement, encourage investment establishments and well implement construction regulations city (Le Vo, 2007). In addition, the management agency should strengthen measures to manage, supervise and inspect wastewater treatment facilities to reduce the risk of water quality pollution (Thuong et al., 2007).

In the long term, it is necessary to increase the capacity of state management on the protection of surface water environment; building a network of domestic wastewater collection, connecting to the city's general collection and treatment system as planned; improve the garbage collection network. It is necessary to prioritize investment in the urgent treatment of water pollution and degradation in canals and rivers such as standard wastewater treatment systems, drainage and domestic wastewater treatment systems; strengthening the dredging of polluted canals, embankment construction.

6 CONCLUSION

The speed of industrialization and urbanization is quite fast and the population growth has put increasing pressure on water resources in the territory. The water environment in many cities, industrial parks and craft villages is increasingly polluted by wastewater, emissions and solid waste. In big cities, the high density of domestic waste is also an important cause of water pollution. The communication campaign to raise awareness, the community consciously protects water resources, especially the need to apply stricter regulations on pollution control, forcing all businesses to Enterprises - from small to large scale - must meet the minimum standards of wastewater in production and business, and avoid environmental pollution. After all, clean water and fresh air are essential to a healthy life.

CONFLICT OF INTEREST

There is no conflict of interestin the paper.

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