Solutions for environmental improvement: a case of dong Thanh landfill area in hoc mon district, Ho Chi Minh city

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Abstract. Hoc Mon District is one of the five suburban districts of Ho Chi Minh City with rapid urbanization rate every year. Many large projects and projects have been built, leading to a large number of people concentrating on living and working in the area. This puts the Hoc Mon district at risk of environmental pollution, which directly affects people's health as well as the district's socio-economic development. Therefore, in order to reduce environmental pollution, we need many feasible solutions. Poor sanitation is the cause of serious health consequences for people. This paper identifies human perceptions about the impact of the environment, especially the pollution of landfills on health, and once there are concrete improvements in waste management, life would be much better. The article analyses some of the causes and finds suitable solutions to improve the environment. The results show that the people's awareness and timely support from the government play a very important role. Local governments need to have more specific policies and regulations to develop society in a sustainable way. Proposals have been studied for planning the development of eco-urban areas on the disposal sites themselves. We need to further expand the scope of urban development planning research to the vicinity of landfills, turning these places into clean land areas in order to develop modern urban areas in the future.

Keywords: Hygiene, environment, awareness, health, landfill.

1. Introduction

The problem of environmental sanitation is getting more and more serious not only for the city, but also for the whole rural area, the sanitation becomes increasingly difficult for some people who are living in the countryside, it's an increasingly serious problem in such a clean environment. The process of industrialization and modernization of agriculture and rural areas together with the land consolidation and exchange policy helps people to have jobs in the place where they live, and at the same time helps the rural economy grow stronger from the models themselves. But besides the advantages of such development, the rural areas in general and the rural areas in the peri-urban areas, in particular, are facing serious environmental pollution [1]. The drainage and wastewater treatment systems are not properly planned, people lack knowledge in waste treatment and are not conscious of keeping environmental sanitation should indiscriminately discharge waste into drains, ponds and lakes, leading to a situation where the ditches, which are very green, are now dark with all kinds of wastes and smell of strong stench. This is the cause of reduced resistance to livestock, high incidence of disease for livestock and poultry and seriously affects the health of farmers [2].

Landfills have a lot of impact on the environment, there are quite a few environmental benefits beyond the economy if the amount of waste decreases. When the volume of domestic waste that must be buried is limited, the volume of leachate will decrease. As a result, the negative impacts on the environment will also be significantly gone down such as reducing risks in the process of leachate treatment, reducing pollution of underground water, surface water, etc. If the landfills are limited, this will improve the greenhouse effect due to landfill gas since the gases causing the greenhouse [1]. The reduction in landfill of compostable waste leads to a reduction in the amount of air that affects the ozone layer. Utilizing recyclable solid waste helps conserve natural resources. Instead of exploiting resources to use, we can use these recycled products [3]. Thanks to that, we can both conserve resources and avoid the pollution brought about by mineral exploitation.
2. Methodology
The study was conducted in December 2020 to assess the current state of sanitation conditions in several areas of the Hoc Mon district. With the support of about 30 respondents in the form of direct interviews about the pollution situation as well as the improvements in life after the landfill has been turned into a garden and a green patch. Researching through data collection methods, analysing and synthesizing data. The paper focuses on analysing the current state of water use affecting the sanitation conditions, the current situation of waste collection, transportation and treatment and the impacts on domestic water.

3. Results and discussion
3.1. The pollution of Dong Thanh landfill
The level of smell awareness at the landfill is assessed to be heavy, lasting about 12 hours/day, in addition to the wide influence. Recently released garbage water has a very high concentration of pollution, pollution of odours within 5,000 m.

The Dong Thanh landfill site before 2002 was managed and operated by the Ho Chi Minh City Waste Treatment Company. At that time, all city waste was disposed of in a natural landfill, with no bottom lining and waterproofing. By the end of 2002, the People's Committee of Ho Chi Minh City decided to close the Dong Thanh landfill due to environmental pollution. In early 2003, the People's Committee of Ho Chi Minh City assigned Dong Thanh waste treatment site (an area of 40.4 hectares) to Ho Chi Minh City Urban Environment Co., Ltd. to manage and implement solutions to fix the environmental pollution for Dong Thanh landfill until now (Figure 1).

Currently, wastewater from garbage is transferred to wastewater treatment systems to limit environmental pollution [3]. All leachate is collected and put into the treatment system in accordance with the environmental standards issued by the Ministry of Natural Resources and Environment before being discharged into the environment (the process of collection, treatment and discharge; State management agencies are all closely inspected and supervised). In addition, the company also sprayed bio-products to treat odours arising from the landfill, covered with soil to create green patches for the entire landfill [1].

In fact, Dong Thanh landfill has been developed and turned into an ecological garden, a hi-tech agricultural park such as building an apricot garden, orchid garden, ornamental garden, fruit trees and green carpet in the construction area. In 2015, the company also built a hi-tech agricultural productive
garden to grow melons according to Israel's planting technology [4]. Up to now, the entire landfill has been turned into an ecological garden, no longer spreading the smell like before.

The people here believe that their lives have been turned upside down. The first question: "What is your life like when the pollution has reached alarming levels?" has shown that most of them completely do not accept the stench from this landfill. Up to 100% of people think that the landfill should be relocated as soon as possible.

3.2. The impact on groundwater

However, the issue of water resources still does not make people feel secure. The reason is the factory for treating medical and hazardous industrial wastes at Dong Thanh construction site. This is an ODA project (Official development assistance project) between the Government of Vietnam and the Government of the Kingdom of Belgium for investment cooperation [5]. After the investment is complete, it is assigned to Ho Chi Minh City Urban Environment Company Limited to receive and operate to burn seven tons of garbage/day and handle unexpected cases. The project has a total capital of 95.2 billion Vietnamese dongs VND) with a capacity of 21 tons/day.

![Figure 2. The leachate from Dong Thanh landfill](image)

3.3. The impact on people's health

According to the Department of Health of Ho Chi Minh City, the results of performing health checks for 1,250 people in the area near the landfill of the Hoc Mon district showed that 10 common diseases in this examination are chronic non-communicable diseases [2]. Common in the elderly, such as arthritis, polyarthritis, hypertension, diabetes, fatty liver, etc. and is similar to the general disease pattern of the people who come for examination and treatment at the Hoc Mon District Hospital in recent years [6]. This landfill has affected the quality of life of people. In a family of 6, up to 5 people suffer from respiratory and cardiovascular diseases. This landfill is very inadequate because it is located next to the people's house, greatly affecting people's lives. Due to a large amount of waste, in the rainy season, the amount of wastewater flowing to the houses causes a very unpleasant odour. As for the second question: "Does pollution affect underground water (water well)?", Most respondents said that they are very afraid
to use groundwater from wells, well water is only used for washing but they are also concerned about skin and health effects.

3.4. Certain difficulties in waste disposal

Although many encouraging results have been achieved, but efforts to reduce environmental pollution are still limited, Ho Chi Minh City has not yet reached all the set targets. The control of environmental pollution has not been synchronized. Data on waste sources is inconsistent and there is a lack of software to update data directly from the locality [7]. With the system of industrial clusters, it is very difficult to call for investment in waste treatment infrastructure. As a result, enterprises in industrial clusters do not guarantee compliance with the Law on Environmental Protection.

3.5. Some missions carried out in order to become a city worth living

In the environmental pollution reduction program in the 2016-2020 period, the city sets a target to collect and treat up to environmental standards 100% of industrial wastewater and medical wastewater, and 90% of industrial emissions; 90% reduction in surface water pollution, 70% decrease in air pollution due to traffic activities compared to 2011; continues to inspect, supervise and maintain 100% of industrial parks, export processing zones, hi-tech parks, industrial clusters (with infrastructure investors) having centralized wastewater treatment systems [8]. An automatic wastewater monitoring system has data transmission lines to state management agencies in the field of environment for inspection and supervision, etc.

Some solutions given by the Department of Natural Resources and Environment of Ho Chi Minh City to achieve these goals are: Strengthening inspection and monitoring of waste sources; strictly handle violations; implementing a program to improve establishments causing environmental pollution and establishments that do not comply with the plan. Maintain wastewater quality monitoring stations in industrial zones [9]. For industrial clusters and businesses with waste sources with a flow of 1,000 m³ / day or more, they will have to install an automatic continuous wastewater monitoring system and transmit data directly to the Department of Natural Resources and Environment according to regulations to serve the supervision and timely handling of violations. Production, business and service establishments located outside the industrial zone with discharge scale below 1,000 m³ / day and potentially harmful to the environment will also be encouraged to install automatic monitoring equipment [5].

In addition, the city has also strengthened its calling for investment and rapid implementation of centralized urban wastewater collection and treatment works [3]. Effectively implement projects on renovating and dredging canals in combination with maintaining and promoting propaganda activities for people to raise awareness of environmental protection, not discharge waste into canals, etc.

In 2016, the city's urban embellishment and development program were also promoted with groups of solutions to relocate and reorganize the lives of people living along canals, building and replacing old apartments, building into new urban areas. In the immediate future, the city will build four projects to relocate 1,832 houses along the canals and canals with a total estimated investment of 3,749 billion VND, of which budget capital is 2,449 billion VND. These projects include the rehabilitation of a polluted canal in the city.

Reducing environmental pollution and embellishing urban development is a big, complex and difficult program. For successful implementation, the city needs to build a mechanism to attract investment resources [10]. To implement the mode of socializing investment in urban embellishment and development projects in order to mobilize all resources and all economic sectors to participate. Implement plans to expand land acquisition, adjust planning in the direction of increasing architectural planning targets to increase land use value to call for investment in projects of embellishment and urban development. Review existing land fund, housing resources, redundant land from the program of the relocation of polluting production facilities, restructuring businesses, handling inefficient land and housing assets, and land plots are handled, recovered due to violations of regulations on land management and use, etc. for auction, creating capital for the implementation of the program, or the investor may swap out the land fund directly managed by the State [6].
3.6. The status of the landfill today
Hoc Mon district has a large garden planted with many fruit trees, vegetables, tubers, fruits, etc. bringing relaxation for people coming here. A special thing, nearly 20 years ago, right in this green garden was Dong Thanh landfill, where people used to reflect every day because of the strong stench (Figure 3).

![Figure 3. Fruit gardens being born from Dong Thanh landfill](image)

Speaking of the landfill, almost everyone is concerned about environmental pollution. However, at Dong Thanh landfill, after a decision to close in 2002, a company has made efforts to renovate, build and develop to turn this landfill into an ecological garden, a hi-tech agricultural park. This ecological garden has many types of trees such as apricot, fruit trees, green vegetables, etc. The renovation of this landfill into an ecological garden also makes the local people very excited. Many people said that they did not think this place would one day be renovated so greenly and clean (Figure 4).
Figure 4. A big flower garden being born from Dong Thanh landfill

Through years of renovation, people here no longer have to live in a polluted environment. The number of trees planted makes the environment greener and cleaner, and people are more excited. Up to this point, people hardly reflect on the environmental pollution situation [6].

3.7. Some great economic benefits

After years of closed landfills, the company has turned this landfill into an ecological garden and high-tech agricultural park. It is currently cultivating a variety of vegetables and fruit trees, contributing to increasing income for the workers operating at this site, while also bringing economic value to the company.

4. A few suggestions

The State should support businesses that intend to invest in waste power projects. In addition, the Government on the mechanism to support the development of power generation projects using solid wastes in Vietnam has regulations on electricity purchase prices. However, waste treatment projects must follow electricity planning, so many projects have difficulty due to waiting for the planning of the power sector.

In order to create favourable conditions for businesses, the Government should direct the review and amendment of legal documents, processes and procedures that still have problems between current regulations on construction investment management in the field of urban domestic waste management, and we need to have specific preferential policies for foreign investors. Only when administrative procedures are simple can we attract businesses to invest in solid waste treatment [7].

However, attracting investors in waste power projects is not easy and difficult to adapt to the reality in Vietnam because waste is not sorted from the source. When the projects have been completed, the economic efficiency is not high. Therefore, we also need to pay attention to the classification of garbage for the sake of sustainable development and economic goals.

Currently, the world is applying many measures and technologies to treat urban waste such as landfilling, incineration technology, biotechnology treatment, etc. Each method and technology has certain advantages and limitations [4]. Among the above methods, landfill technology is one of the traditional methods to perform, the process quickly with large volume in a day, and at the same time, the investment cost of the landfill system, the treatment technology is ensured safe, less expensive. One drawback, however, is that a sanitary landfill needs a large area, located far away from residential areas. This is one of the conditions that is not suitable for countries with little or no land to invest in this treatment technology.

In order to overcome the above shortcomings, countries around the world have applied the model of urban waste treatment and management with a closed and hygienic and safe landfill technology. This model has the advantages of low investment, operation and treatment costs, ensuring a level of safety for the environment [8]. At the same time, it increases the capacity of garbage storage and allows the extension of landfill operation time as well as the recovery of generated gas for electric energy generating or commercial purposes.

Korea is one of the leading countries in applying modern and closed landfill technology. The Sodokwon landfill in Korea implements a safe and hygienic domestic waste landfill, thanks to the application of modern technology and equipment, not only protecting the environment, but also bringing economic benefits through the recovery of CH4 gas for electricity generation. At the same time, the development project "turns" this landfill into the largest "Dream park" environmental theme park. This is a closed project of waste treatment, bringing economic benefits and creating a play space, eco-culture with a clean environment for the community [9].

It can be said that the domestic waste burial model that Korea is applying is very effective and environmentally safe. Not only helps to solve the problem of environmental pollution caused by waste, but also reduces the annual treatment costs of water pollution [11]. At the same time, bring economic benefits from the reuse of waste for electricity generation, reduces greenhouse gas emissions and
increase budget revenue from the sale of emission quotas due to the savings. Not only that, the Korean government also continues to build an environmental theme park on this landfill to efficiently use the vacant land by building an amusement, entertainment, and sports area, ecological zone, environmental activity area for community activities. This is one of the solutions to treat urban domestic waste that Vietnam needs to study and apply (investment in landfill technology is low-cost and suitable for Vietnam when there is still a lot of land in the suburbs).

5. Conclusion
With current conditions in Vietnam, it is essential to calculate and research and choose the most appropriate, effective and economical investment in urban waste treatment technology. Factors and conditions in Vietnam are to consider choosing models and technologies to treat urban waste by a safe and hygienic burial method. There is still a lot of land in rural areas and the spending. The low investment fee also helps to reduce the waste fee for the people due to the current conditions that the income level of Vietnamese people is too low to apply higher rates of collection and treatment of municipal waste as in developed countries. However, we can see a lot of efforts by Vietnam, a country that is always diligent in learning and always looking for solutions to protect the environment much cleaner and Dong Thanh landfill is a typical example. This Dong Thanh landfill has affected the quality of life of people and has been improved by the participation of the society as well as the people, this is an extremely wonderful thing that we need to ponder.

6. Limitation of the research
The article still has some limitations and hopes that it will be improved in the future.

7. Conflict of interest
There is no conflict of interest in the paper.

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