



Overview of the Activities of Industrial Parks and Impacts on Surface Water Quality in Ho Chi Minh City, Vietnam

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Abstract

Ho Chi Minh City is an economic, commercial, financial and service center of Vietnam, concentrating many industrial and export processing zones with large scale and high growth rate. After nearly 30 years of construction and development (1991-2019), industrial parks and export processing zones have been formed, diversified and actively contributed to the socio-economic and industrial development. However, along with it, the level of environmental pollution caused by IPs and EPZs is increasing, becoming a threat to sustainable economic growth. This article provides an overview of the current status of operations as well as impacts on surface water from the operation of some industrial parks (IPs), export processing zones (EPZs) in Ho Chi Minh City, Vietnam.

Keywords: pollutions, industrial parks, surface water, Sai Gon river

1. Overview of industrial parks in Ho Chi Minh City

1.1. Overview of Ho Chi Minh City

Ho Chi Minh City (HCMC) is located in the transition zone between the Southeast and the Southwest, at geographical coordinates about 10°10' – 10°38' North latitude and 106°22' – 106°54' East longitude. The province is bordered on the north by Binh Duong province, the northwest by Tay Ninh province, the east and northeast by Dong Nai province, and the southeast by Ba Ria-Vung Tau province, the west and southwest by the provinces of Long An and Tien Giang. The total area of more than 2,095 km², the city is divided into 24 districts with 322 wards, communes and towns [12]. Thanks to favorable natural conditions, Ho Chi Minh City has become an important transport route of Vietnam and Southeast Asia, including roads, railways, waterways and airways. In the process of development and integration of Vietnam, Ho Chi Minh City plays an important role, being the economic, commercial, financial and service center of the country. Through statistics on Vietnam's gross domestic product and total revenue, it shows that Ho Chi Minh City accounts for 21.3% of the total product (GDP) and 29.38% of the total budget revenue of the country [4], [5].

In recent years, the city's economy has always maintained a high growth rate. Before the renovation period, in 10 years (1976–1985), the city's gross domestic product (GDP) only increased by an average of 2.7%/year, then in the period of 1991–2010, the economic growth rate average economic increase of more than 5%/year. From 2011 to 2016, the economic growth rate is approximately 10%/year, 1.6 times higher than the national average. GDP per capita continuously increased rapidly, from about 700 USD in 1995–1996, to the 1997–2016 period, the average GDP per capita reached 5,131 USD and the data in 2017 reached nearly 6,000 USD.

In 30 years of implementing industrialization and modernization and developing urban areas, the role of Ho Chi Minh City has been increasingly affirmed and enhanced throughout the country. In 1991, Ho Chi Minh City contributed about 15% of the country's GDP, accounting for 6.4% of the population and 5.3% of workers but by 2013 the figures were 20.8%, 8.8% and 7.7% respectively. Over time, the scale of economy, potential and contribution of Ho Chi Minh City to the whole country is growing. As of the end of 2017, the city has contributed about 1/3 of industrial production value, 1/5 of export turnover and 1/5 of Vietnam's economic scale; contributing 30% of the total national budget revenue. The economic structure has shifted positively, towards industrialization and modernization: the proportion of services has accounted for 59.6% of GDP, industry and construction accounts for about 39.4%, the agricultural sector is only 1% and growing towards forming an ecological urban agriculture. Compared to 1991, the population size of the City has increased almost 2 times but thanks to the rapid economic growth, the total domestic product per capita has increased nearly 8 times.

Currently, the economic sectors in Ho Chi Minh City have shifted positively: increasing the proportion of products and services with high value-added tax, high science and technology; Besides, reducing labor-intensive professions, causing environmental pollution, gradually forming high-quality services towards building a city into a commercial, service and industrial center with high technology of the whole country. The contribution structure of economic sectors in GDP has also shifted significantly in the direction of strong development and increasing contribution of non-state and economic sectors with foreign investment. In addition to contributing to promoting the potential and capital resources of the people, promoting socialization of investment, increasing attraction

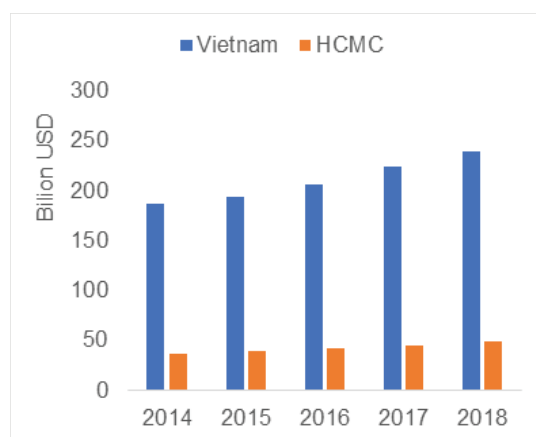


Fig. 1. The correlation between the total value of gross domestic product between HCMC and Vietnam over the years

Rys. 1. Korelacja między całkowitą wartością produktu krajowego brutto między HCMC (Ho Chi Minh City) a Wietnamem na przestrzeni lat

of foreign investment capital. This is a favorable economic structure for fast and sustainable development of the city economy in the coming years.

Through statistics in 2018, the city's economy still maintained a relatively stable growth although the economy of the country faced many fluctuations and difficulties. With GDP growth of 7.9%, of which services increased by 9.1%, industry by 6.2% and agriculture by 7% over the same period last year.

1.2. Overview of activities of industrial parks and export processing zones in Ho Chi Minh City

Industrial park is an area defined geographical boundaries, specializing in producing industrial goods and perform services for the manufacturing industry, was established under the conditions, order and procedures prescribed. Export processing zones are special industrial zones only for the production and processing of products for export to foreign countries or for enterprises operating in the service sector related to import-export activities. In that area with preferential import-export tariffs or rental price incentives [1]. Ho Chi Minh City is the local pioneers of the country Vietnam in the construction and development of IPs/EPZs of the country, the development of IPs/EPZ is the base clearly reflects on the process of industrialization modernization of the city over the years. IPs/EPZs are considered as key areas to attract investment, contributing positively to the socio-economic development of the city.

Starting from the first construction project of Tan Thuan EPZ (Figure 3) in 1991, followed by Linh Trung EPZ, then in turn formed IPs/EPZs in districts and suburbs. Up to now, Ho Chi Minh City has 3 export processing zones, 16 industrial parks, 22 production clusters established and operating with a total area of more than 6,112 ha. The IPs/EPZs in the city are formed to realize the 5 economic goals set by the Government on the following tasks: (1) Attract domestic and foreign investment capital; (2) Job creation; (3) Importing advanced technology and management experience; (4) Increase export capacity, create foreign currency revenue; (5) Contributing to the city's socio-economic development following the trend of industrialization, modernization and urbanization of suburban areas [4].

According to the list of established IPs/EPZs and industrial clusters (ICs) as shown in Table 1, HCMC has a number

of large-scale IPs/EPZs such as Hiep Phuoc (908.4 ha) and Tan Phu Trung (542.64 ha), Tan Tao (380.15 ha), Tan Thuan (300 ha), Dong Nam (286.76 ha), Tay Bac Cu Chi (208 ha), Vinh Loc (203 ha). These IPs/EPZs focus on a variety of production areas such as mechanical engineering, construction materials, tanning, rubber, electronics, textile and dyeing, agro-chemicals, food, pharmaceuticals, cosmetics [6]. The scale of IPs/EPZs is presented in Figure 4.

Established since 1991, over 28 years of construction and development, the system of IZs/EPZs has increasingly promoted the leading role in the city's economy in particular and the country in general. In addition to improving the export value and competitiveness of the economy, contributing to expanding economic relations between localities throughout the country, between Vietnam and the territory.

As of December 31, 2017, there were 1,495 investment projects in EPZs and IPs with a total registered capital of 9.936 billion USD. In which: Foreign invested projects are 564 projects, registered investment capital is 5.675 billion USD; Domestic investment projects are 931 projects, registered investment capital is 63,909 billion VND (equivalent to 4.26 billion USD). The total annual export turnover reaches over 6 billion USD with the major markets of Europe, the US, Japan, South Korea and Taiwan; Total import turnover reached 4.95 billion USD. The total number of employees working in EPZs and IPs is about 291,712 people, of which 2,546 are foreign workers [4].

The strong development and great contributions of IPs/EPZs are undeniable. However, the process of developing industrial parks in Ho Chi Minh City as well as in Vietnam in the past time still exists with many challenges and shortcomings including the problem of environmental pollution despite many remedial measures, but still going on complicated developments, more and more tend to increase the level of pollution. Out of 42 industrial parks and export processing zones established, put into operation, only 27 industrial parks and export processing zones have built wastewater treatment systems (64.2%). According to Ho Chi Minh City Export Processing and Industrial Zones Authority (HEPZA), the remaining IPs/EPZs do not have a wastewater treatment system or are in the process of construction. It is worth mentioning that even the IZs/EPZs have built a waste treatment system, the operational efficiency is not high, especially for industrial



Fig. 2. Map of the location of IPs/EPZs in HCMC
Rys. 2. Mapa lokalizacji IP/EPZ w HCMC



Fig. 3. The Tan Thuan Export Processing Zone – the first EPZ of Ho Chi Minh City, is also the first export processing zone of Vietnam to be established in 1991
Rys. 3. Strefa przetwórstwa eksportowego Tan Thuan – pierwsza EPZ miasta Ho Chi Minh, jest także pierwszą strefą przetwórstwa eksportowego Wietnamu, która została utworzona w 1991 r.

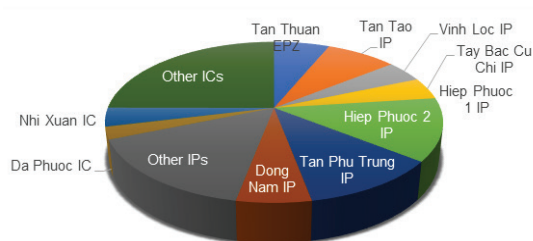


Fig. 4. Scale of IPs/EPZs in the general overview of Ho Chi Minh City
Rys. 4. Skala IP/EPZ w ogólnym przeglądzie miasta Ho Chi Minh

parks with long time of operation located next to Saigon river basins, Dong Nai, because the wastewater treatment system of these areas has deteriorated. In addition, many other IPs/EPZs have built a centralized wastewater treatment system, but in fact they do not operate or operate only in response to the inspection [4].

2. Current status and impacts on surface water in some IPs/EPZs in HCMC

Currently, water quality in river basins in Vietnam in general and HCMC in particular are seriously polluted or tend to increase pollution levels in many places, especially in river sections which flows through urban and industrial areas [2].

In Ho Chi Minh City, water pollution due to waste water from IPs/EPZs in recent years is very large and increases very fast compared to waste from other activities. According to the general assessment of the PC49 Environmental Crime Prevention Police Department, around 62% of industrial parks nationwide have built centralized wastewater treatment systems but these works are inefficient, leading to The situation of 75% of industrial wastewater discharged to industrial parks still contains high levels of pollutants, exceeding permitted standards. This data is quite similar to the data on the status of HCMC (64.2% of IPs/EPZs built wastewater treatment systems).

Because of the above reason, the situation of violating environmental regulations often occurs in the IPs/EPZs, leading

Tab. 1. Number and area of IPs and EPZs in HCMC. Source: Ho Chi Minh City export processing and industrial parks authority (Hepza)
 Tab. 1. Liczba i obszar IP i EPZ w HCMC. Źródło: Urząd ds. Przetwórstwa eksportowego i parków przemysłowych Ho Chi Minh City (Hepza)

No.	IPs/EPZs	Area (ha)
1	Hiep Phuoc IP (phase 1)	311,4
2	Hiep Phuoc IP (phase 2)	597
3	Tan Phu Trung IP	542,64
4	Tan Tao IP	380,15
5	Tan Thuan EPZ	300
6	Dong Nam IP	286,76
7	Tay Bac Cu Chi IP	208
8	Vinh Loc IP	203
9	Le Minh Xuan III IP	155,75
10	Tan Binh IP	128,7
11	Cat Lai II IP	124
12	An Ha IP	123,51
13	Le Minh Xuan IP	100
14	Co khi Oto IP	99
15	Linh Trung 1 EPZ	62
16	Linh Trung 2 EPZ	61,7
17	Tan Thoi Hiep IP	28
18	Binh Chieu IP	27,34
19	Da Phuoc IC	116,8
20	Pham Van Coi IC	75
21	Tan Quy A IC	65
22	Tan Quy B IC	97
23	Long Son IC	25,37
24	Handicraft District 2 IC	18
25	Tan Thoi Nhi IC	87
26	Tan Hiep A IC	25
27	Tan Hiep B IC	40
28	Nhi Xuan IC	180
29	Dong Thanh IC	36
30	Duong Cong Khi IC	55
31	Bau Tran IC	95
32	SAGRI IC	89
33	Tran Dai Nghia IC	50
34	Quy Duc IC	70
35	Tan Tuc IC	40
36	Long Thoi IC	57
37	Binh Khanh IC	97
38	Hiep Thanh IC	50
39	Binh Dang IC	33
40	Phu My IC	80

to many channels in Ho Chi Minh City becoming dead canal with black color of water and bad smell. Illustrative images for polluted canals in Thu Duc District, HCMC are shown in Figure 5.

2.1. Surface water quality

Ho Chi Minh City is now facing a big problem of environmental pollution, especially water environment. The results of environmental quality monitoring periodically on rivers and canals in Ho Chi Minh City show that the Saigon river system is seriously polluted. Specific information is as follows:

- At water intake locations for water supply purposes, the content of ammonium, coliform and DO concentration are not up to the permitted standards. Indicators of ammonium, phosphate, salinity, COD, coliform, BOD and total grease tend to increase at the monitoring points compared to the same period last year [6].
- Indicators: TSS, DO, Coliform and E.coli hardly meet the standards for water supply purposes at monitoring locations. In which, TSS exceeded 2.35 – 4.35 times, Coliform exceeded 1.3 – 8.3 times, E.coli exceeded 2 – 700 times [3].

- The BOD and COD content at all measuring points in the river system exceed the limits of water quality standards according to Vietnam's Ministry of Natural Resources and Environment Standard, for water supply column A₂ of QCVN 08: 2015/MONRE [6], [7].

With the above results, it is shown that the quality of water resources in the Sai Gon river system has been deteriorating in quality, the level of pollution tends to increase due to the increasing reception of magnetic pollutants activities of IPs/EPZs, production facilities in the basin. In addition to the results of physicochemical analysis, biological water quality analysis was carried out, the results show that the quality of Saigon river water is recorded in areas far away from industrial zones and residential areas residence; fruits are much poorer at survey sites in the industrial and urban centers [9].

2.2. Causes of environmental pollution

With the current status of water quality as mentioned above, the main cause of pollution is due to industrial activities, derived from the direct discharge of waste into the environment. Although the concentration of production facilities in industrial zones facilitates waste management, but until



Fig. 5. Untreated wastewater discharged directly to Kenh Ba Bo, Thu Duc District, HCMC
 Rys. 5. Nieoczyszczone ścieki odprowadzane bezpośrednio do Kenh Ba Bo, dystrykt Thu Duc, HCMC

now, besides some industrial parks, complying with legal regulations on waste management, there are still many industrial parks have not completed the concentrated waste collection and treatment facilities [8]. Some industrial zones have built centralized wastewater treatment systems but almost do not operate because to reduce costs [10].

Currently, the environmental pollution control by policy tools and laws is not serious and effective. There are still many difficulties, obstacles and shortcomings in the activities of environmental impact assessment reports. Pollution control with technical tools is still ineffective due to outdated production technology and large waste generation [8].

3. Conclusion

With the aim of promoting industrial development and attracting foreign investment to develop in the direction of industrialization and modernization, since 1991, the Government of Vietnam has a policy of building and developing. IPs/EPZs. This development is the right policy of Vietnam,

the socio-economic efficiency brought about by IPs/EPZs has been clearly shown. However, in addition to the positive contributions, the industrial development process in general and the system of IPs/EPZs in particular in Ho Chi Minh City, Vietnam is creating many major environmental pollution challenges.

According to a World Bank study [11] "Risks due to water pollution are becoming more serious, causing impacts on human health as well as the economy and the environment, a major threat. and they can cause nearly 6% of GDP losses by 2035, if no changes are made".

Currently, surface water in Ho Chi Minh City is polluted by organic substances, nutrients, heavy metals, microorganisms and some other compounds. One of the causes of this pollution is the industrial production of industrial parks/EPZs. Therefore, in the coming time, it is necessary to have specific research investigations to assess the current situation accurately to provide solutions to control and prevent pollution in accordance with the current reality.

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Przegląd działalności parków przemysłowych i wpływ na jakość wód powierzchniowych w Ho Chi Minh City, Wietnam

Ho Chi Minh City jest ekonomicznym, handlowym, finansowym i usługowym centrum Wietnamu, skupiającym wiele stref przetwórstwa przemysłowego i eksportowego o dużej skali i wysokim tempie wzrostu. Po prawie 30 latach budowy i rozwoju (1991–2019), parki przemysłowe i strefy przetwórstwa eksportowego zostały utworzone, zróżnicowane i aktywnie przyczyniły się do rozwoju społeczno-gospodarczego i przemysłowego. Jednak wraz z nim wzrasta poziom zanieczyszczenia środowiska powodowanego przez IP i EPZ, stając się zagrożeniem dla zrównoważonego wzrostu gospodarczego. Artykuł zawiera przegląd obecnego stanu operacji, a także wpływu na wody powierzchniowe wynikające z funkcjonowania niektórych parków przemysłowych (IP), stref przetwórstwa eksportowego (EPZ) w Ho Chi Minh City w Wietnamie.

Słowa kluczowe: zanieczyszczenia, parki przemysłowe, wody powierzchniowe, rzeka Sai Gon