Creating a Green, Clean and Worth Living City in the Digital Period

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Abstract. The world's urban population is constantly growing and this growth will put enormous pressure on infrastructure, especially water and waste. In order to reduce infrastructure pressure, reduce CO₂ emissions, greenhouse effect and to improve the quality of life of people, creating a green city is an essential solution that is being cared for by many countries. Vietnamese people are not new to green spaces, that is, villages in this Vietnam not only contain the philosophy of living in harmony with nature, but also the most concentrated expression of the style of organizing living space. In a digital age, Green City or Smart City is an indispensable trend of the urban development process that humanity is thinking about. This paper focuses on analyzing outstanding issues in Ho Chi Minh City and at the same time, it also offers some solutions to a green, clean and worth-living city here.

Keywords: green city; polluted; population increase; solution technology.

1. Introduction
Ho Chi Minh City is the largest city and an important economic, political and educational centre of Vietnam. With a population density of 4,363 people / km², Ho Chi Minh City is facing many environmental challenges. Building a green city model is preeminent, especially in the context that climate change has a strong impact on the earth and the Industrial Revolution 4.0 is changing the world day by day. Ho Chi Minh City must always be the leading and economical hub, a large and modern centre of economy, trade finance, dynamic and creative science and technology of the whole country; drivers of regional economic development. This place is also striving to become a green city with a good quality of life so that all people can benefit fairly from the development achievements. Therefore, the city needs to implement urban planning well to expand development space. This city must be the leading locality in implementing the 4.0 revolution, speeding up the implementation of the construction project in order to become a smart city where there is e-government, effective administrative reforms to improve competitiveness compared to other cities in the region.

It can be said that Saigon - Ho Chi Minh City is a river city, including Saigon, Dong Nai and Nha Be Rivers with gentle canals with 11 canals radiating into the city and Can Gio Mangrove Forest etc. The two rivers are Dong Nai River and Saigon River has a total length of 80km. These rivers are flowing into the city, in which there are 11 canals with total length up to 700km. The city's water system and canals occupy a special place, which is also a factor that has driven the morphological development of the city. What one can do from the beginning as well as later development is based on a predetermined
form. In other words, the system of rivers and canals is a natural element that functions to create landscapes - human ecology and define the planning idea of old Saigon.

2. Research content

2.1. Definition of a green city.

In the 1960s, the movement of “returning to nature” became popular in many Western countries. But it was not until 20 years later that German scholars first came up with the idea of eco-cities and in 1987, the phrase eco-city - a green city appeared in a book published by Environmentalist Richard Register in California [1].

Green cities are developed from three concepts including ecology, sustainability and intelligence. First of all, a green city is an eco-city, where a significant proportion of trees contribute to ecological balance in a residential area. Next, the city must show sustainable development factors with complete infrastructure, rational exploitation of resources and effective response to climate change. And finally, it reaches the level of a smart city from integrating information technology into management, administration, and servicing the needs of residents.

![Figure 1. Sweden's Capital City, Stockholm](image)

In recent years, a series of ecological urban models have been formed in many countries in the spirit of natural respect such as Curitiba (Brazil), Qingdao, Beihai (China), Freiburg (Germany), Alexandria, Virginia (USA), etc.; this has been creating a new trend in the process of urban development of mankind. Among them, Stockholm (Sweden) is known as a role model in the story dealing with environmental issues and energy security. This is also considered as a “phenomenon has happened in most of Asian countries” [2].

In the city which is dubbed as the "Green Capital of Europe", every residential area has green spaces to provide clean air and 83% of the energy used for heating is clean energy. In addition, they also have "respectable" figures such as 50% of the buses running in the city use renewable energy or public transport facilities are using eco electricity.

It can be seen that the owners of a smart city must be intelligent people who can reconcile different creative ideas; can solve a series of difficult problems such as urban quality, competitiveness and constantly mobilize and innovate to create unique identity for the city. Green city - Smart city or a Satellite town in India is both the goal and the driving force of Ho Chi Minh City in the technological age under the strong impact of the “Industrial Revolution 4.0” [3].

2.2. Outstanding issues in Ho Chi Minh City

2.2.1. Overpopulated population
At the year of 2019, Ho Chi Minh City, which has the population of 8,993,082 people, became the most populous city in the country. It has an increase of 1.8 million people compared to 2009. The average population growth rate in 2009-2019 is 2.28% per year. The population density is 4,363 people / km² (an increase of nearly 26% compared to 2009) and is also the city with the highest population density in the country (Hanoi's population density is 2,398 people / km²). It can be affirmed that the cause of the floods, traffic jams, and environmental pollution of Ho Chi Minh City stems from the uncontrolled urbanization process [4].

2.2.2. Rare green areas
In the General Construction Plan till 2025, the area of greenery for the existing inner city area shall be 2.4 m² / person, the newly developed inner area will be 7.1 m² / person, suburban area is 12 m² / person; but currently, it only reaches 0.5 m² / person. The total area of trees is only 8% compared to the requirements. Similarly, the new urban areas have to reserve part of the green area corresponding to 7m² / person. In fact, the green area is only 0.5 m² / person in the new urban areas. That is the information given at the workshop on planning and development of greenery and lighting parks in inner-city districts in the period of 2019-2025 organized by the Ho Chi Minh City People's Committee on August 14, 2019.

The city does not currently have a specific green tree development plan, all are spontaneous and fragmented. According to the Ho Chi Minh City Department of Construction, the number of parks in the city is both small and unevenly distributed. For example, there are 4 parks in the central area (district 1). Meanwhile, other big districts have no park although they possess large areas.

Next, businesses are aware of the importance of green development but for profit, when building businesses, they do not care about green development. Difficulties in investing in parks and green trees are quite large. The budget is increasingly limited, more urgent investment projects such as roads, flood control works, schools, hospitals are prioritizes, and so many park building projects have been planned but have to be waited. This is the reason why the city spent thousands of hectares of land to build Safari Park (Cu Chi district) but this project has been suspended for 20 years.

The population growth rate of the city is fast while the area of green trees has increased slowly, making the city increasingly stifling. The rate of urbanization too fast in the previous period in areas without urban planning has formed spontaneous residential areas with dense residential density but lack of green space and public spaces. This leads to polluted living environment, causing many consequences for socio-economic development, affecting people's lives, health and spirit. Meanwhile, in new residential projects, in the past, investors often focused on building technical infrastructure systems but did not pay much attention to building green parks according to planning. The project is less attractive to people and has difficulty in developing, forming a residential area with good quality of life. On the other hand, some parks are being occupied to organize fairs and exhibitions, making the people's living space narrowed. After each exhibition, fair, the park's green carpet is trampled causing beauty and, even some parks are occupied by parking lots and cafes [5].

2.2.3. Environmental pollution
Contrary to the current socio-economic development, the environmental problem in Ho Chi Minh City is going down dramatically. As one of the major urban areas in Vietnam, Ho Chi Minh City is densely populated and has many industrial zones. Waste water from residential areas and industrial wastewater are the main causes of groundwater pollution. Environmental pollution is known to be very diverse, but it is worth noting that water and air pollution are the most serious.

Ho Chi Minh City with more than 2,000 canals in the city has become an obsession for the people, because the water in these canals is seriously polluted with solid waste and sewage and this influences a lot on the lives of people along the canals. The sources of waste water from residential areas, waste
water from processing facilities and industrial parks flow directly into the river, lake and canals, causing the water here to change colour, smell and seriously pollute.

Regarding air pollution, emissions from 10 million motorbikes, cars and 1,000 large factories, dust from continuous construction activities make the air of Ho Chi Minh City more polluted. Statistics in Ho Chi Minh City in 2016-2017 showed that up to 27% of the time of day, the AQI index exceeded the 100. AQI is the US air pollution standard, set by the US Environmental Protection Agency (EPA), according to which, if at 51-100, the air is considered as acceptable, but it is dangerous with some people, especially sensitive groups. If AQI index is above 100, air is severe [6].

2.2.4. Slums
According to the 2015 statistics of the Department of Construction of Ho Chi Minh City, there are more than 17,000 slum dwellings located on and along the corridor of canals in the city.

![Figure 2. Slums in Ho Chi Minh City](image)

In addition, the Department of Construction also said that the number of slums may be higher than the figure of 17,000 units. Many of the canals, ditches, slums along the rivers and canals are heavily polluted by rubbish and wastewater, adversely affecting the social environment and development conditions of residents here. From there, residents here may face bad health, more bad vices, and long-term consequences for the whole community [7].

2.3. Some recommendations

2.3.1. Planning a rational green area
This is an important criterion for the city environment since the rate of greenery is low. This criterion also contributes to the model of green urban development. Actively proactively bringing the per capita greenery index of the whole city to about 7-10 m$^2$ to build a green, clean, beautiful city, which needs to be completed and expanded green infrastructure, including green space and open space, trees along streets, vegetation, green roofs, green house façades and water permeable pavement [8].

The green area of the inner city area and the open space consist mainly of park greenery combined with entertainment areas divided into 2 small areas. The first one is the old inner city area which can only be raised to 3m$^2$ / person. The second one is the old inner city area which needs to preserve green parks such as Zoo and Botanical Gardens and recreational parks. The green parks in the old inner city area will combine with the green wedges of newly built residential areas during urban embellishment, combined with continuous green strips along the banks of the canals.

However, if excluding the area of trees outside the inner city, the target of greenery in the inner city, even if it is newly increased, has not reached half. Therefore, there should be additional solutions such
as planting trees on the roof and on the façade. The planting of green trees on the roof is not too strange to other countries in the world and in the region but in Vietnam it is still a new concept and all is just the beginning, pioneering among them is Phu My Hung residential area is also just gardens, overhead parks.

The city needs to encourage rooftop gardens; the entire roof covered with trees will help the house against the summer heat. Combining greening for exterior façades, the green building façade will become a trendy, ecological and beautiful decoration that is not too expensive to support the green architecture trend in the city. In Singapore, in order to build a sustainable environment, the Singapore Department of Construction has launched a green building rating system suitable for tropical climates such as improving energy efficiency, water conservation, indoor environmental quality, reducing waste in the building. In 2009, the Government of Singapore made a commitment in which all new construction works of the state sector and major renovated works must achieve the highest green score; all new government land sales at strategic growth locations require green score standards as part of the condition to sell land.

2.3.2. Investing in public transport infrastructure, advocating the use of clean energy

Limiting personal vehicles causing dust such as motorbikes and cars is the key to limiting air pollution in the city. To do this, the city must be equipped with efficient public transport system. It is necessary to accelerate the completion of metro lines so that they can be put into operation on time. The Department of Transport also cooperates with consulting units, districts to conduct surveys, household interviews and is finalizing mid-term reports [8].

A number of solutions are designed for specific studies, such as setting up a project to collect motor vehicle traffic into the downtown area, with guaranteed fees to reduce the number of vehicles entering the central area. The city needs to prepare a plan to collect environmental pollution charges for road vehicles according to the emission level when circulating. It is also necessary to set up a transport service price bracket with progressive hourly and regional progression from the suburbs to the city centre. At the same time, the city needs to control the use of public vehicles as prescribed; resolutely handle and withdraw vehicles which are not in compliance with regulations; review regulations on restrictions and licensing of transport vehicles in the downtown area [9].

2.3.3. Garbage collection and waste water treatment

Garbage should be treated thoroughly, that is, more special attention needs to be paid to urbanization in areas where the population is soaring. The efficiency of using or reusing existing materials, on-site resources and material life cycle analysis can significantly contribute to not only the “green” aspects of a development but also saving on materials, energy and manpower costs during the construction process [10].

2.3.4. Building a smart city

To overcome the current environmental pollution, promoting the application of science and technology is really an urgent requirement. We need to promote and apply technology in building information data on natural resources and environment, then it will be easy to access, exploit and use effectively this resource and this will be the foundation for creating environment development for socio-economic development of the city [11].

3. Conclusion

With the right strategic system, combined with the drastic implementation, Ho Chi Minh City would become a green, clean and worth living city in the future. To accomplish this goal, it is not only the determination of the government, but the cooperation and assistance of the whole community. A city worth living must be built from its people with a sense of responsibility, a sense of community and a willingness to share. Many cities in the world have successfully implemented this, which is a big challenge but it is a vital choice for the sustainable development of the city.
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