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### Challenges of Climate Change to Urbanization in Vietnam

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#### Abstract

Climate change is a global problem, affecting social life, especially in big cities, where there are high population density, many tall buildings and few trees. Climate change is a particular concern for fast-growing cities in Asia, where large populations, rapid urbanization, widespread poverty and social inequality, high levels of exposure to extreme weather events.

Vietnam is one of the countries heavily affected by climate change, especially for the process of urbanization. Although

urbanization is taking place strongly in Vietnam, contributing to accelerating growth, shifting economic structure and labor structure, changing the distribution of population and labor. But this process also faces many challenges due to climate change. Therefore, the article focuses on the challenges of climate change with urbanization in Vietnam, thereby proposing some solutions to adapt to climate change in the coming time.

**Keywords:** Climate Change, Urbanization, Challenges

#### 1. Introduction

Vietnam is a developing country with a fairly rapid urbanization rate. Urbanization leads to changes in natural land use patterns, removal of trees, construction of roads and high-rise buildings.

The urbanization process in Vietnam is also heavily affected by global climate change. According to forecasts, climate change will make storms in Vietnam more frequent and more intense, higher temperatures, and more severe weather conditions.

Besides, the impact of climate change on the urbanization process in Vietnam such as: affecting the production, daily life and health of people, the phenomena of climate change destroying the urban technical infrastructure works, affecting the living environment of organisms in the urban ecosystem. Rising sea levels cause floods to occur more frequently in urban areas. In addition, global warming causes prolonged droughts and clean water scarcity to occur not only in urban areas.

Therefore, considering the urbanization process needs to be analyzed in conjunction with the impacts of climate change.

#### 2. Theoretical Basis

##### 2.1 Overview of Climate Change

According to the United Nations Framework Convention on Climate Change (UNFCCC) 1992 <sup>[4]</sup>, climate change is caused directly or indirectly by human activities (industrial production, deforestation, the use of water resources as well as other harmful gases, etc., which change the composition of the global atmosphere and are caused by natural variations in climate (including changes in solar activity, Earth's orbit, the movement of continents, etc.).

This change in combination with natural fluctuations of nature leads to changes in climate over time. In a word, climate change is the change of the climate system from biosphere, atmosphere, hydrosphere to lithosphere in the present and in the future.

##### 2.2 Overview of the Urbanization Process in Vietnam

Urbanization is understood as the process of urban expansion, calculated by the percentage of urban area or population to the total area or population of an area or region. Besides, urbanization is also calculated according to the increase rate of the above two factors over time.

- Urban is calculated by the ratio of increase in area to total area of an area called urbanization rate
- Urbanization is calculated as the percentage of population over the total population of an area called the level of urbanization.

The process of urbanization manifests itself through the following criteria:

- The urban population is increasing day by day and the physical space is expanding with new architectural forms.

- The number of people concentrated in urban areas is increasing day by day.
- The main activities are non-agricultural activities.
- Urban lifestyle increasingly affects surrounding areas.

Vietnam currently has 870 cities of all kinds, the urbanization rate is about 40.5% (an increase of nearly 10% compared to 2010). Population density living in urban areas is many times higher than the national average, especially in big cities, such as Hanoi and Ho Chi Minh City. The process of urbanization is taking place rapidly, creating many challenges to meet practical requirements as well as ensure the quality and living environment.

### 3. Research Methods

The article uses qualitative research methods including two basic methods: data collection, synthesis and analysis and evaluation. Based on the synthesis of data related to the urbanization process and climate change, the article analyzes the main contents to highlight the impacts of climate change on the urbanization process in Vietnam today, thereby proposing some solutions to limit the risks of climate change in the urbanization process in Vietnam in the coming time.

## 4. Situation of Climate Change on Urbanization in Vietnam

### 4.1 The Challenge of Climate Change with Urbanization

Vietnam is in the top 10 countries suffering from natural disasters and climate change in the world. Climate change is one of the biggest challenges facing our country and has a direct impact on the urbanization process, which is manifested mainly through the increase in average annual temperature and sea level rise.

*Firstly*, climate change causes an increase in average annual temperature affecting urban development, industrial zones, housing and people's lives. The degree of impact of climate change depends on each region, each locality and each location according to the geographical distribution. Detail:

According to statistics of the Ministry of Natural Resources and Environment, the average temperature in our country has increased by about 0.4°C in the last 20 years compared to the period 1981-1990<sup>[3]</sup>. According to research by the World Meteorological Organization (WMO)<sup>[6]</sup>, the summer temperature in Hanoi in the future with the impact of climate change will become even more severe. Specifically, under the average emission scenario, the temperature of Hanoi summer in 2100 could be equivalent to the current average maximum temperature in the Indian city of New Delhi, i.e., about 40.5°C. Under the high emission scenario, the temperature increase could reach 41°C, equivalent to the current average temperature in the Pakistani city of Faisalabad, which is considered one of the world's fire pans.

*Second*, climate change causes the earth to warm up, causing sea levels to rise, causing serious impacts on coastal cities.

Vietnam is considered as one of the countries heavily affected by climate change due to its long coastline. Most of Vietnam's urban areas are located in climate change vulnerable areas. In addition to big cities such as Hanoi, Ho Chi Minh City, Da Nang, Hai Phong, Can Tho. The coastal urban system and the Mekong Delta region have 138 urban areas at high risk of flooding. There are 24 urban centers in 15 provinces at risk of severe to very severe flooding. Climate change causes heavy rain, flash floods and landslides, affecting the development of urban systems in

the Mountains and Central Highlands with 143 cities at risk of being affected, of which 17 are likely to be affected. Great influence<sup>[3]</sup>.

The World Bank's research report on the impacts of climate change and sea level rise on Vietnam's coastal cities has forecast that sea level could rise by 30 cm by 2050 under the scenario. The most extreme version. Also under this scenario, about 4.5 million people in coastal provinces could be severely affected by floods<sup>[7]</sup>.

In addition, sea level rise causes coastal erosion, inundation in coastal areas, degradation of wetlands, saltwater intrusion, killing of freshwater plants and animals. In areas where climate change increases the intensity of rainfall, rainwater will increase soil erosion, flooding, landslides, and may affect the structure and function of water bodies, causing pollution. Water contamination. All these phenomena affect living species and biological resources, making many ecosystems degraded, making it difficult for economic and social development, especially in poor countries where most people's lives are still heavily dependent on nature.

Climate change and sea level rise could push 1.2 million Vietnamese people into poverty and cause damage to road infrastructure up to \$55 billion. It is forecasted that by 2050, if sea level rises from 18 ÷ 38 cm, the loss could be up to 2% of GDP; By 2100, if the sea level rises by 100 cm, 6.3% of the land area of our country will be flooded.

*Third*, climate change causes extreme weather events that affect many aspects of life in urban areas.

Vietnam ranks 7th among the most disaster-prone countries in the world, vulnerable to droughts, storms and floods. These natural disasters have claimed the lives of 13,000 people and caused property damage worth \$6.4 billion or 1.5% of GDP over the past two decades<sup>[5]</sup>.

In recent years, climate change in our country has been recorded with adverse trends, extreme climate events occur with stronger intensity and higher frequency. Coastal areas are mainly affected by storms, mountainous areas are affected by flash floods, cyclones, landslides, midlands and plains are mainly affected by floods, cyclones and hail.

The maximum daily rainfall increased in most climates, heavy rain, record rain caused flooding, flash floods, landslides with increasing damage. Unusual climate phenomena occurred in many regions, causing a prolonged drought in 2015-2016 in the provinces of the Mekong River Delta and the Central Highlands; landslides, tube floods, flash floods on a large scale with great devastation in Yen Bai in 2017, Thanh Hoa 2018, 2019; storm Damrey in 2017 made landfall in Khanh Hoa province and surrounding areas; The heavy rain caused landslides and historic floods in the Central region in 2020, causing a lot of damage to people and property of the people, especially affecting the poor and disadvantaged groups in society. In the period 1995-2017, damage caused by natural disasters in Vietnam was about 14 trillion VND/year (2010 price) with an increasing rate of 12.7%/year. 2017 was the year with many record-breaking storms (16 storms, 4 tropical depressions), 386 dead and missing, the highest total damage was 38.7 trillion dong<sup>[5]</sup>.

In addition, natural disasters and extreme climate events such as heavy rains, floods, storms, heat waves, etc. destroy structures, negatively impacting the lifespan of urban infrastructure systems. Therefore, these impacts will threaten long-term development activities and development

investment in areas exposed to risks related to climate change (low-lying areas, coastal areas, riverbanks subject to landslides). Miss...).

*Fourth*, climate change directly or indirectly affects many industries and fields in urban areas. These influences have been evident in recent years.

Among the top 10 most disaster-prone countries in the world, Vietnam's economic sectors are concentrated in coastal cities and towns where directly affected by natural disasters. Natural disasters cause great damage to key economic sectors and public services. Each year, approximately US\$852 million (0.5% of Vietnam's GDP) and 316,000 jobs in the agriculture, aquaculture, tourism and industrial sectors are at risk from direct flooding. Go out. Coastal tourism relies heavily on beaches and primary ecosystems, but an estimated 42% of coastal hotels are located near eroding beaches<sup>[5]</sup>.

Sea-level rise and drought can also exacerbate saltwater intrusion, affecting freshwater supplies for domestic use and industries, agriculture and aquaculture, and increasing adaptation costs. High due to investment in pumps and other equipment to maintain appropriate water and salinity levels in ponds and lakes or in low-lying areas.

For industry, the effects of climate change will affect the processing industry, especially the processing of agricultural products. In the case of increased temperature, energy consumption will increase, leading to many other activities such as increasing the capacity of power plants, increasing the use of cooling equipment, affecting national energy security. Studies under the sea level rise scenario show that, if the sea level rises 1m, most of the coastal industrial zones will be flooded, the lowest level is over 10% of the area, the highest level is about 67% of the area, directly affecting 20-30 million people<sup>[5]</sup>.

In addition, the consequences of climate change will also affect production, supply, transportation and exchange of goods as well as the development potential and investment opportunities of a particular region or city.

The impact of climate change on Vietnam is very serious, an existential threat to the goals of poverty reduction, the Millennium Development Goals and sustainable development.

*Fifth*, climate change affects water resources in urban areas. Climate change will alter the water cycle affecting the quality and availability of water, as well as access to water. Changes in precipitation and surface runoff will decrease water availability in one area but increase in another, impacting water supply. The demand for water will change as a result of heat and drought, especially the demand for irrigation, industry and daily life will increase.

## 4.2 Cause of Challenges

### 4.2.1 Objective Reasons

The objective causes of climate change include: (i) The circulation within the atmospheric system; (ii) Variation of ocean currents; (iii) Natural variations from the change of the earth's orbit, the change in the position and size of the continents, the activity of the sun.

### 4.2.2 Subjective Reasons

The subjective causes of climate change are mainly due to human activities, in which urban areas concentrate the most activities.

Subjective causes include human impacts including:

*Firstly*, excessive use of natural resources such as land and water in the process of urbanization.

The process of urbanization in our country has been unbalanced between the natural environment and the artificial environment; between economic regions and residential areas. The growth model of urban areas is not diversified, there is a risk of falling into an unsustainable growth model; dependent on the exploitation of resources; reserve capacity and long-term vision are limited; The situation of using land resources is not efficient, the technical infrastructure system has not met the needs, the transport connection between urban areas is still weak, which increases costs, and environmental pollution is common. In big cities; Investment in urgent issues of technical infrastructure has not been fully and synchronously solved by priority cities, leading to long-term consequences.

In fact, most urban areas in Vietnam were formed very early, then the development planning expanded, leading to a lack of synchronization, reducing the ability to cope with climate change, the area of Trees, lakes, and water sources are severely lacking. Currently, urban areas have very few trees, living space is limited, and lakes are gradually being leveled to get land to build houses, especially in big cities like Hanoi and Ho Chi Minh City.

The area of green trees is shrinking and the regulation lake is being leveled for construction land, which affects the air quality, the temperature increases, the amount of water in the rainy season is high, there is no reserve lake, causing flooding in the area. Urban areas.

*Second*, the increase in carbon dioxide emissions and greenhouse gases from human activities.

Human-generated carbon dioxide emissions are largely from the burning of fossil fuels such as coal, oil, and natural gas. These greenhouse gases strongly affect the Earth's temperature, without their presence, the average surface temperature of the Earth today would be about 33° C colder than it is today (59 °F)<sup>[6]</sup>.

*Third*, there is a lack of synchronous planning in urban development to respond to climate change.

The process of urban planning and construction in Vietnam currently has limitations on the integration of climate change adaptation, lack of assessment and analysis of the impacts of climate change. In addition, there are still plans to expand urban construction into areas at risk of natural disasters, with many potential risks while infrastructure has not met the needs of urban development. The urban construction general planning project mainly focuses on technical and spatial organization, not focusing on environmental protection and urban economic efficiency in order to support solutions to respond to climate change. Queen.

In addition, many localities have not assessed the selection of construction land, land use planning, proposed urban models, urban spatial structure, technical infrastructure to cope with climate change. Do not pay attention to sustainable development and environmental protection.

## 5. Solutions to Limit Risks of Climate Change in the Process of Urbanization in Vietnam

*Firstly*, develop green infrastructure systems in urban areas, including:

(i) In order to quickly reduce greenhouse gas emissions, including carbon dioxide (CO<sub>2</sub>), tree planting is considered

an urgent solution, suitable for population growth and construction density. Especially, for coastal urban areas, it is necessary to take measures to plant trees against wind and storms, to plant mangroves to prevent coastal erosion and flooding due to high tides.

(ii) Retain or enhance the design of regulating lakes and open spaces, connecting green spaces with the urban park system in the neighboring subdivisions into a system.

(iii) Encourage the use of environmentally friendly construction materials, reduce the greenhouse effect, promote buildings that are able to respond well to the impact of climate change, such as buildings green, green building.

*Secondly*, eco-cities and green cities should be developed, where there is a balance between economic development and the natural environment, the least raw material consumption, the most recycling and reuse of waste. Encourage the use of renewable energy, "green" means of transport, "green" industrial production. It is not recommended to develop current large cities into megacities because with high construction density, urban areas are difficult to adapt to climate change and natural disasters.

Besides, it is necessary to forecast and warn early, increase investment, upgrade and modernize the climate change monitoring network; carry out an inventory of greenhouse gases; promote the implementation of clean energy development, economical use of energy.

*Third*, there should be synchronous planning to prevent climate change. Detail:

(i) Urban development should not be done on the coast or riverbank where there is erosion or frequent flooding; restrict urban development in low-lying sea areas or where flood is likely to occur. To adapt to climate change, it is necessary to strengthen the development of sea dykes, develop buffer zones to protect coastal cities with mangrove forests, green strips.

(ii) Localities need to plan and manage urban foundation construction and urban surface water drainage; working with donors to speed up the completion of steps to implement the project of investment in the urban flood control and prevention canal system.

(iii) Control planning and construction to limit the impact of natural disasters and increase disaster risk. Determining drainage standards for flood prevention and control in line with the impacts of climate change, proactively zoning drainage, focusing on saving space for flood drainage, arranging regulating reservoirs to temporarily store water to prevent flooding. Flooding during heavy rain and improving the capacity of the drainage system.

(iv) Prevent and treat works, houses, dump waste encroaching on drainage and water storage space, strengthen dredging of drainage and drainage systems. Focus on building water drainage and waste treatment systems, increasing water drainage capacity in urban areas, especially big cities like Hanoi and Ho Chi Minh City.

(v) Strengthening international cooperation in urban planning to respond to climate change in order to create more financial strength, science and sustainability in urban planning and construction.

(vi) A full and scientific assessment of the impact of climate change on urban planning. Making plans to prevent and avoid climate change; prevent and avoid the risks of natural disasters that may occur, especially in big cities, coastal urban areas, and mountainous areas often suffer greater

impacts; build reasonable urban works, best respond to the impact of climate change.

(vii) Develop sustainable cities, adapt to climate change, strengthen linkages and support between cities in the regional and national urban network.

## 6. Conclusion

At present, cities in Vietnam are facing more and more serious challenges from the dangers of natural disasters and climate change, which appear more and more often and irregularly. In that context, it becomes more urgent to strengthen resilience to recovery and adaptation to climate change in line with the urbanization process in Vietnam.

By analyzing the challenges of climate change to the process of urbanization and the causes of those challenges, the author has recommended a number of solutions to help Vietnamese cities reduce the impact of climate change. climate change in the near future.

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