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How Climate Change Affects Vietnam and Methods to Prevent Climate Change

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***Abstract*—** *Climate change is a challenge for all countries in the world and Vietnam is one of them. Vietnam has a long coastline and it is for this reason that it has become one of the countries most affected by climate change. Previously, climate change occurred in a long time due to the impact of nature. However, in recent years, climate change has become more and more complex under the influence of humans. Climate change has been adversely affecting life, economy, politics, culture and society, so the study and application of solutions to protect the environment and prevent climate change is a very important. The proposed solutions have partly solved the problem of climate change and environmental pollution but this is a global problem, so it is necessary to join hands of all humanity to solve this problem. The education of climate change in Vietnam needs to be taken seriously from kindergartens and primary schools in order to protect the environment of the country and the world in order to solve this problem. the most effective.*

***Keywords*—** *Climate change, Vietnam, impact, energy, industrial processes, agriculture, forestry and land use conversion, waste.*

I. INTRODUCTION

Globally, Vietnam is the sixth ranked country heavily affected by climate change. Each year, more and more unpredictable and unpredictable weather events cause very high mortality rates and damage to infrastructure, such as schools and health centers, and the impact Bad for livelihoods of disadvantaged groups in urban and rural areas. Children are especially affected by these natural disasters. Access to food, clean water, education and health care is at stake and pressure on the community - due to loss of income and assets - which increases children's exposure to violence, exploitation peeling and abuse. Women also tend to be affected significantly, increasing negative impacts on children, because they will be less provided with adequate nutrition or care. In fact, in Vietnam, climate change has been causing a lot of changes such as the annual average temperature increased by 0.5 ° C within 70 years; the number of cold air spells decreased significantly within 2 decades; storm patterns change and storms with high intensity appear more or more, sea level rises by about 20 cm within 50 years ...[1].

According to the Climate Risk Index published by the Germanwatch organization (Germany) in 2019, in the past 20 years since 1998, Vietnam is one of the 10 countries most seriously affected by climate change. 20 years because of storms, floods and landslides. In particular, the Mekong Delta is one of the three deltas in the world most vulnerable to sea level rise, besides the Nile Delta (Egypt) and the Ganges Delta (Bangladesh). The impact of climate change on Vietnam is very serious, which is an existent threat to the goals of poverty reduction, the Millennium Development Goals and the sustainable development. According to the Intergovernmental Panel on Climate Change, when sea level rises by 1m, approximately 5.3% of the natural area, 10.8% of the population, 10.2% of GDP, 10.9% of urban areas, 7.2% of agricultural area and 28.9% of low land will be affected [2].

Climate change in Vietnam also poses a serious threat to food security and agricultural development: Sea level rise increases the area of saline intrusion, loss of agricultural land, increased coastal erosion, affecting transport infrastructure, urban areas, residential areas, socio-economic development, life ...; The increase in temperature affects natural ecosystems, plant and animal structure, increasing food security risks. Increasing temperature, high humidity also makes bacteria species thrive, affecting human health, the quality of construction, maintenance costs ...; Increasing the extremity of the weather, making natural disasters more dangerous: Drought, lack of water in more places. Desertification land expands, even desertification. The risk of returning home is sooner than expected. Floods are also heavier ...[3]. Under the impact of climate change, only in the last 10 years, Vietnam has suffered natural disasters such as storms, floods, landslides, floods, droughts, saline intrusion ... have caused significant damage, killing and missing more than 9,500 people, property damage is estimated at 1.5% of GDP per year [4]. The weather in Vietnam in recent years has been increasingly abnormal. Droughts, floods, landslides, storms and storms have complicated changes, seriously affecting the economy heavily dependent on our country's agricultural production. In particular, Vietnam is considered as one of the countries most seriously affected by climate change (CC) due to its long coastline. If the sea level rises by 1 meter, 40% of the Mekong Delta area, 10% of the Red River Delta area will be flooded, directly affecting 20-30 million people.

II. CAUSES OF CLIMATE CHANGE IN VIETNAM

The causes of climate change are two causes: natural and human. In which human causes are mainly accounted for 90%. The key to natural processes is the fluctuation of the intensity of solar radiation hitting the earth and the amount of volcanic dust that concentrates more solar radiation into the air. Both of these factors affect the total amount of solar radiation absorbed by the climate system. However, human activities are also important factors that cause climate change due to the elimination of many greenhouse gases leading to the greenhouse effect, especially CO2 [5].

A. Cause by natural

The change in the intensity of the Sun's light causes a change in the energy that falls on the ground to change the

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temperature of the earth's surface. Specifically, since the Sun's creation, nearly 4.5 billion years ago, the sun's intensity has increased by more than 30%. As such, it can be seen that such a long period of time, the change in the intensity of sunlight is not significant to climate change [6].

When a volcano erupts, it releases into the atmosphere an extremely large amount of sulfur dioxide (SO2), water vapor, dust and ash into the atmosphere. Large amounts of gas and ash can affect the climate for many years. Small particles called aerosols are erupted by volcanoes, which reflect the solar radiation (energy) back into space, thus reducing the temperature of the earth's surface layer [7].

The oceans are a major component of the climate system. Ocean currents travel a great deal of heat throughout the planet. Changes in ocean circulation can affect the climate through the movement of CO2 into the atmosphere. Change the Earth's orbit - The Earth orbits the Sun with an orbit. The reel has an angle of 23,5 °. Changing the tilt of the earth's orbit may lead to small changes. Extremely small rates of change can take billions of years, so it can be said that there is no major impact on climate change [8].

B. Cause by human

Humans use a lot of fossil energy. This leaves the atmosphere daily to suffer a lot of emissions of fossil energy. These gases are the direct causes of the greenhouse effects that lead to global warming. To assess the role of greenhouse gases in necessary climate change, we need to consider the following four characteristics: Concentration changes, Radiation absorption properties, Time of existence, Impacts with other greenhouse gases [9].

These studies show that the relationship between the increase in the surface temperature of the earth and the increase in concentration of some species of greenhouse gases in the atmosphere such as CO2, CH4. The atmosphere currently has about 750 billion tons of carbon, the ocean contains 50 times more carbon, the Earth's biosphere is about 3 times more and the continent is about 5 times more than in the atmosphere. Before the pre-industrial period (1750), the atmospheric CO2 content, which was very stable at about 280ppm (parts per million), increased by about 370 ppm in 2000. In Vietnam, industry has not developed so greenhouse gas emissions are mainly in agriculture - forestry and energy use.

III. Impacts of Climate Change

Global climate change occurs due to the impact of greenhouse gases through human activities, leading to global warming and many other consequences. According to the IPCC report, the earth's temperature has risen an average of 0.60oC over the past century and is expected to increase by 1.4 to 6.4oC by 2010, precipitation increases unevenly, and many areas with excessive rainfall but many other regions became drier. According to the latest calculations, the sea level may rise from 0.7 to 1.4 m in the next 100 years. El-Nino phenomenon works stronger both in intensity and frequency. The area of the Northern Hemisphere has decreased by about 10-15% since the 1950s, and may not be as much as 2030. Arctic ice and high mountain peaks will also significantly melt in the coming decades.

Ecosystems on Earth together with all species are a source of economic, environmental and cultural values of humankind. Climate change will shift climatic regions. Species will have to adapt to new climatic conditions. First of all, due to global warming, the thermal boundaries of the continental and freshwater ecosystems will shift towards the poles, while also moving higher, so that tropical plants and animals can growing in higher macroscopy or higher mountain and plateau regions than before. In contrast, cold-loving species have shrunk, or had to migrate elsewhere Some species are more adaptive to climate change while others are not able to adapt and will gradually degrade. Climate change will make the climate more severe causing droughts, floods, and forest fires ... will put the species at risk of falling even more. According to the World Bank's assessment of important natural habitats in Vietnam based on scenarios of sea level rise, every 1 meter of sea level rise can affect 27% of natural habitats, of which 33 % in protected areas, 23% of areas with key biodiversity. These potential impacts are increasing from 1/4 to 1/3 of all key natural habitat areas in Vietnam. These areas are largely protected areas and currently proposed conservation areas of Vietnam, often focusing on islands and coastal areas. It is clear that Vietnam's biodiversity is facing a crisis when sea levels rise. In addition to the aforementioned negative impacts, climate change - rising sea levels will engulf and destroy tourism infrastructure and resources, thereby reducing the number of visitors and directly affecting the livelihoods of millions. people, most of whom are poor.

Agriculture is subject to the direct impact of the climate, the most important of which is solar radiation. Through photosynthesis, the yield of a plant is a function that is homogenous to solar radiation. Global warming is leading to changes in crop structure such as shortening the cold season, prolonging or shortening the rainy season. All these factors will affect seasonality, pests, productivity - output. In general, agriculture is the industry most affected by climate change. Increased temperatures can lead to: Some crops, especially subtropical plants, are likely to disappear, crop and crop structure, livestock in some areas may be changed, decreased grain production in the tropics and subtropics, especially crops or sea level rise, increases saline intrusion affecting crop yields. Climate change with increasing temperature, changes in rainfall will affect forest vegetation in many different directions. High temperatures combined with abundant light will promote photosynthesis leading to enhanced assimilation of greenery. In particular, the increase in CO2 content will contribute to the development of forest ecosystems, but due to increased evaporation, the soil moisture content will decrease, resulting in a decrease in the vitality growth index of forest trees... The danger of genocide of animals and plants increases, some important plants such as Frankincense, Eucalyptus, Redwood, Flower Slices, Mahogany, etc. will probably be depleted. In addition, increased temperatures and drought levels will increase the risk of wildfires, pests and diseases, and diseases that destroy crops.

The salt water intrusion deep into the continent, causing loss of appropriate habitat of some freshwater aquatic species. This narrows the area of mangroves affecting the ecosystems of some brackish and saltwater aquatic species. The ability of

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the seaweed ecosystem to synthesize organic matter decreases leading to a decrease in the supply of photosynthesis products and nutrients for benthic organisms. As a result, the habitat quality of many aquatic species deteriorates. Increased water temperature causes a pronounced thermal stratification in standing water bodies, affecting biological behavior of the organism. Due to rising temperatures, some species move elsewhere or deeper. In addition, the intensity of heavy rainfall, salt concentration decreases by 10 to 20% over a long period of time, causing brackish and coastal water creatures, especially the 2-piece shell crustal mass to die due to unbearable with varying salt concentrations. Sea level rise makes the physical, chemical and aquatic regimes worse. As a result, the existing biomes have changed their structure and composition, the additional reserves have been seriously reduced.

Sea level rise also affects directly to clean water and environmental sanitation. Due to long-term inundation, fertilizers, pesticides, latrines from toilets, animal sheds, and other wastes ... were washed away, into ponds, lakes and rivers floating everywhere, disease outbreaks are difficult to control and people's health will be seriously threatened. Concentrated clean water supply works have been damaged or due to polluted water sources, causing difficulties for water treatment and supplying clean water to people.

Industries, especially coastal industrial zones, will be severely affected by climate change. First of all, sea level rise of about 1m by the end of the 21st century will cause most of the industrial parks to be submerged, the lowest is over 10% of the area, the highest is about 67% of the area. Sources of raw materials for industry, especially for foodstuff, textile and garment processing industries, will be significantly reduced because they are not supplied from raw material areas in the Me Kong delta was the most heavily flooded in Vietnam. This further pressures the restructuring of industries in terms of industry type, percentage of processing industry and high technology. In 24 coastal provinces and cities, there are 266 big and small seaports; is the country with many potential oil and gas in the region. Rising sea levels along with heavy rain and storms will threaten to destroy important infrastructures, flood the coastal railways, airports, destroy bridges and pipelines and many other works connect other transport infrastructure.

Next, rising temperatures increase energy consumption in industries: increasing ventilation costs, cooling mining pits and reducing the efficiency and output of power plants. Increasing electricity consumption for domestic use and cooling costs in commercial industries also increase significantly as temperatures tend to increase.

Finally, erratic rainstorms and rising sea levels will negatively impact the operation, exploitation of power transmission and distribution systems, drilling platforms, oil and gas pipelines to the mainland, and oil supply to ships. carrying oil; increase the cost of maintenance and repair of energy works; affecting the supply and consumption of energy, national energy security.

IV. THE GOVERNMENT OF VIET NAM'S CLIMATE CHANGE ADAPTATION MEASURES

The Government of Vietnam is deeply concerned about climate and sea level rise, so it signed the United Nations Framework Convention on Climate Change and became a party to the Convention since 2005. It is not a The country must comply with the roadmap to reduce greenhouse gas emissions, but Vietnam is still proactively developing appropriate action plans to avoid possible negative impacts to ensure the sustainable development of the country. . Combating climate change in Vietnam is integrated into the Law on Environmental Protection, and other programs such as Agenda 21, National Strategy for Coastal and Marine Environmental Management, Action Plan National Biodiversity and Climate Change, National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020.

Climate change is considered to be both a short-term and a long-term problem, complicated and related to all industries, on a regional and global scale. Therefore, the development of national programs and their implementation should be studied at all levels: regions, sectors and in all sectors, most importantly energy, delivery. pine, industry, agriculture, forestry, fishery, tourism, natural resources and environment; in all relevant localities, especially the coastal plains. Integrated coastal management is considered an appropriate adaptation solution to cope with climate change and rising sea levels. [23].

Coastal area development plans, relocation and resettlement plans must be carefully considered when dealing with sea level rise. In strategic sea dyke plans to cope with rising sea levels, aquaculture development plans need to develop adaptive models and mitigate climate change impacts depending on the region. Effectively manage water resources, regulate, share and balance water resources among basins, have an appropriate plan in managing the operation of upstream reservoirs to regulate the flow for the lower region. Save and limit saline intrusion. Develop and complete policies to support severely affected areas, especially for the poor. Establishing groups of experts, organizations, research institutes, universities and research centers concerned to carry out climate change research and projects; developing climate change scenarios in Vietnam; develop and evaluate options to reduce greenhouse gas emissions and propose measures to cope with climate change. Invest in research programs and assess the vulnerability of ecosystems in coastal areas; developing scenarios of sea level rise for Vietnam in the period of 2010-2020 connecting with international programs and receiving international assistance. Cooperation in technology transfer ... Exploiting and applying new technologies in fields related to climate change and sustainable development. Re-planning land, water resources, building infrastructure in sensitive and vulnerable areas. Research and find out agricultural varieties adapted to the environment. The purpose of the fund is to serve measures to clean the environment and respond to climate change. There is a mechanism to increase domestic financial resources and expand access to other financial sources, support the implementation of environmental protection activities such as the Green Credit Program by foreign banks. in Vietnam, the

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Vietnam Environment Protection Fund, the Green Credit Fund sponsored by the Swiss Government, the DANIDA Fund of the Danish Government, the Dutch Government, and the World Bank Global Environment Fund. In addition, there are international cooperation programs and projects mobilized from non-governmental and private sources. It is necessary to diversify forms of lending, capital support, loans with preferential interest rates, grants or repayment loans; mortgage assets to implement programs, projects, pilot projects, applied researches in the field of improving the efficiency of using natural resources, reducing poverty. This is considered an important solution to raise public awareness about climate change in Vietnam to adapt. Communication should be promoted so that people are aware that climate change is an existent issue and a direct threat to human health and life. Thereby, contributing to changing their behaviors with the environment such as saving and effectively using energy and water resources, protecting mangroves, planting and protecting coastal protection forests. In addition, a separate communication channel is also developed to provide the most comprehensive information on serious climate change issues. Strengthen cooperation with countries, international organizations in the field of climate change and clean development mechanism to reach cooperation agreements. Continue to promote financial and technological cooperation and capacity building in the post-Ky-post period, actively participate in international seminars, conferences and negotiations on issues related to variables. climate change. Thereby, it requires the developed countries to provide financial support and transfer new, environmentally friendly technologies to serve the goal of sustainable development and be ready to coordinate with developed countries in building and implementing Currently, CDM projects in Vietnam serve sustainable development and reduce greenhouse gas emissions. Develop project lists to call for funding and technology transfer from developed countries. International cooperation in training, capacity building through direct investment, advice and construction of early warning systems. Promote cooperation in developing an Action Program to adapt to climate change and sea level rise in Vietnam.

V. CONCLUSION

Climate change has really existed and greatly affected the lives of people and creatures in the world and Vietnam is one of the countries most affected by this incident. The impact of climate change is very broad and strong to all sectors and fields of social life. Therefore, adaptation and mitigation of climate change is a very necessary work and requires the cooperation of all people. Every small job like planting trees, saving electricity, limiting the use of disposable plastic and synthetic chemicals, etc. can help in combating climate change and protecting the environment. In addition, to ensure that these can be effectively implemented, the Government's introduction of reasonable laws and sanctions is also a measure to promote human awareness of this urgent issue. In addition, developing clean energies and finding new sources of fuel to replace fossil fuels is also an urgent task. As mentioned, the emissions of fossil fuels are huge, they are the main cause of the greenhouse effect and global warming. Finding clean and environmentally friendly fuel sources will help the environment reduce the amount of emissions it receives each year. In Vietnam, the development of E2 biofuel is a major development as it will reduce the consumption of all kinds made of crude oil and replace it with biofuel. Currently, this type of biofuel is very popular in Vietnam because it is cheaper than gasoline produced from crude oil and more environmentally friendly.

The fact that big cities like Hanoi and Ho Chi Minh City are changing their bus systems every day from DO diesel-powered vehicles to CNG-fueled cars will also help in protecting the environment. In addition, the skytrain systems are also in the process of finishing and are expected to be operational in 2020. This will contribute to reducing the number of private vehicles entering the city, helping to reduce congestion. traffic jam and rush hour. This will significantly reduce the impact of personal vehicle emissions on the air as well as having good effects on the economy as well as transportation.

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