



Dipartimento di SCIENZE POLITICHE *Cattedra* POPULATION, ENVIRONMENT AND SUSTAINABILITY

TITOLO

ENVIRONMENTAL PSYCHOLOGY: KILLING OURSELVES, CONSCIOUSLY.

RELATORE

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ANNO ACCADEMICO 2017 2018

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INTRODUCTION

In recent decades, the Earth's climate has strongly changed, distorting natural landscapes and endangering the existence of numerous plant, marine and animal species. The vast majority of scientists are now convinced that this climate situation is due to human activities, in particular to the huge emissions of greenhouse gases related to the production of energy from fossil sources, but also to industrialized agriculture and deforestation in the tropics¹.

The available data show that climate warming has already raised the Earth's temperature by about one degree (+0.8 ° C) in a century, causing dangerous effects such as the great decrease in the volume of Arctic ice, dropped by 40% in the last 35 years, and the consequent rise in sea levels. Moreover, the climate change that has been going on for some years is producing extreme weather events (heat waves, droughts, intense and localized rainfall, hurricanes and tornadoes, storms) that are increasingly frequent, causing destruction and death in various areas of the planet. All prediction systems put in place by climatologists indicate the need to intervene heavily on anthropogenic emissions of greenhouse gases to prevent these climate changes from continuing, bringing temperatures to dangerous levels for the survival of the human species at the end of the century².

The purpose of this Elaborate is to analyze the complex relationship between climate change and human activities. In the first chapter the topic of climate change will be addressed, as a global problem that is endangering the survival of the entire terrestrial ecosystem. Specifically, the impact that human activity has had on climate change and the consequences produced by industrial production on the environment will be addressed. In the second part of the Elaborate, the concept of Anthropocene will be analyzed, a term used by scientists to indicate a new geological era characterized by man's dominion over nature. In fact, if in the past the survival of humanity depended on environmental changes, today it is men with their actions that transform climate and nature, causing unpredictable and catastrophic consequences for the future.

Then we will analyze what are the psychological aspects that influence responsible environmental behaviors, through some of the main theories of environmental psychology. In the last part, the theme of the relationship between climate change and political power will be addressed. Specifically, the difficulties encountered by democratic governments in carrying out environmental protection measures will be analyzed. Finally, some examples of virtuous European cities that have adopted the principles of sustainability will be reported, proposing models of development focused on the enhancement of natural resources and respect for the environment.

¹ Morletto V., *Cambiamenti climatici, il futuro e il presente*, Ecoscienze, 1, 2017.

² Ibid.

CHAPTER ONE

EFFECTS OF CLIMATE CHANGE

1.1. Climate Change: Global problem

Climate change is a worldwide problem that is putting the survival of the Earth at risk. The human impact on the environment has produced many negative effects on animal and plant species that are in danger of extinction. According to the United Nation World Population Prospects Revision, the world population has reached 6.8 billion over the last decade³. Scientists believe that in 2050 the world's population will grow to 9 billion⁴. Human activity often changes or destroys the habitats that plants and animals need to survive. Because human populations are growing so fast animals and plants are disappearing very quickly.

Scientists estimate that in the 21st century 100 species will become extinct every day⁵. Over the last decades, the human industrial activity has released vast quantities of greenhouse gases, about 900 billion tonnes of carbon dioxide that are introduced into Earth's atmosphere. About 80% of carbon dioxide emission is caused by industrialization⁶. The impact of industrialization on the environment has led large negative outcomes. The rapid growth of industries are leaving negative effects on the human life, by polluting water and air. Global warming and greenhouse effects are the result of the industrialization impact on the environment.

The discovery of the phenomenon of global warming dates back to the end of the 19th century when Svante Arrhenius, Swedish chemist and physicist who received the Nobel Prize for Chemistry in 1903, illustrated for the first time the theory that carbon dioxide would have an impact on the climate, causing climate change⁷. From then on, the awareness that mankind has an influence on the climate and causes anthropogenic effects (climate change) has grown considerably. In the first half of the twentieth century, many scientists believed that the oceans would be able to maintain a constant level of CO₂ in the

³ United Nation World Population Prospects Revision, *World Population Prospects: The 2017 Revision*, DESA, 2017.

⁴ Ibid.

⁵ United Nations Environment Programme, *UNEP 2008 Annual Report*, UNON, 2008.

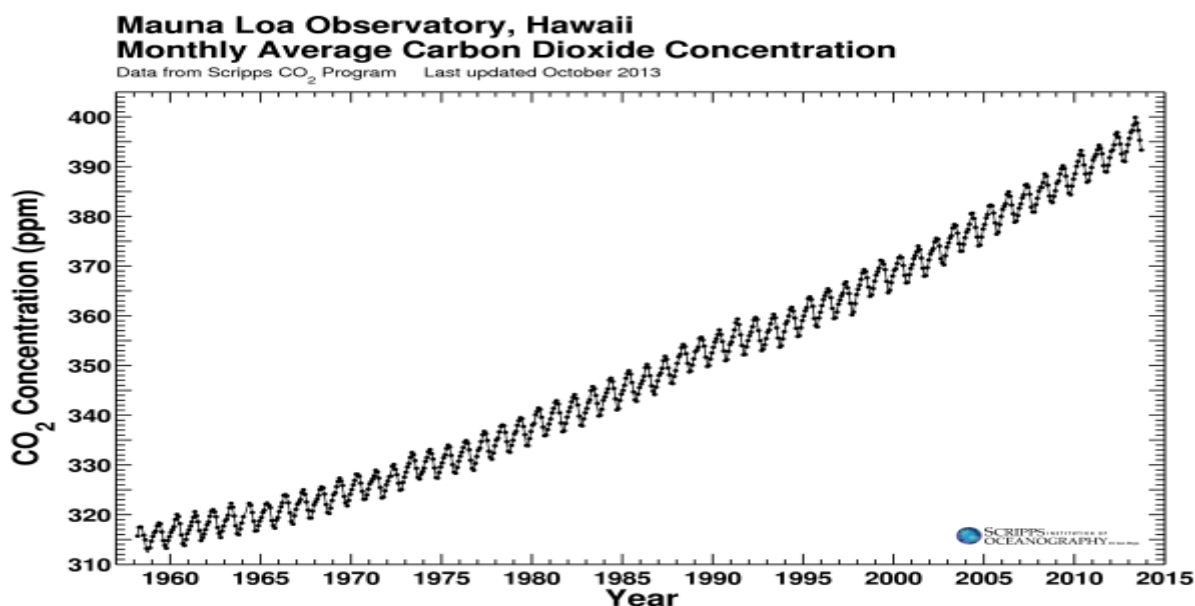
⁶ Ibid.

⁷ Bard E., *Greenhouse effect and ice ages: historical perspective*, Elsevier, 2004.

atmosphere, absorbing most of the anthropogenic emissions⁸. In 1957, however, this assumption was questioned by the study of scientists Roger Revelle and Hans Suess who showed that the oceans, while absorbing excess CO₂, do so at a much slower rate than previously expected and that over the years there could be an increase in average global temperature⁹.

This research was confirmed during the Sixties and Seventies of the twentieth century when several chemists began to make accurate measurements of greenhouse gases from the observatory on the summit of the Hawaiian volcano Mauna Loa, leading them to affirm that the concentration of carbon dioxide in the atmosphere was gradually increasing. In particular, Charles David Keeling of the Scripps institution of oceanography in San Diego, California, has produced the diagram called the "Keeling curve"¹⁰ that tracks month after month, year after year, the concentration of carbon dioxide in the atmosphere¹¹.

Graphic One



Thanks to these new data, scientists discovered that it is not only carbon dioxide (CO₂, also known as carbon dioxide) that causes global warming, but also a group of gases such as methane (CH₄), nitrous oxide (N₂O), ozone (O₃) and water vapour (H₂O). All these elements are responsible for the so-called "greenhouse effect". Also the chemically derived gases such as chlorofluorocarbons damage the atmosphere and the environment. For this reason, the emission of these gases was regulated by the 1987 Montreal Protocol as it was responsible for the depletion of the ozone layer¹².

The greenhouse effect, however, is a natural phenomenon that can be described as the ability of the atmosphere surrounding our planet to absorb and retain within a certain level of equilibrium the humidity

⁸ Ibid.

⁹ Ibid.

¹⁰ Graphic One, Scripps institution of oceanography, California 2013.

¹¹ Ibid.

¹² Ibid.

and heat of the sun's rays. The presence of these gases is therefore essential to enable life on Earth. Without greenhouse gases, the average temperature would be around -18 degrees Celsius, while the greenhouse effect means that the average global temperature is around 14-15 degrees¹³.

The problem of global warming has as its object an increase in the average temperature on Earth due to an excessive concentration of CO₂ and other gases present in the atmosphere due to emissions no longer only of natural origin, but also anthropogenic. The main contributors to a global increase in carbon dioxide are fossil fuels that are burned without limits by man to produce Energy used to meet the consumption of electricity and heating and for the transport sector. The increase in methane and nitrous oxide is mainly due to the agricultural sector¹⁴. Deforestation also contributes to the increase of carbon dioxide in the atmosphere: forests, especially tropical forests, are real wells that absorb and retain CO₂, so their destruction, in addition to preventing the regular absorption, releases additional carbon dioxide into the air before "naturally stored". Since the early 1990s, deforestation has contributed to an increase in CO₂ of around 15-25%¹⁵.

The concentration of CO₂ in the atmosphere has gone from 280 parts per million, recorded before the industrial revolution, to 400 ppm in 2017. The record so far is 410 ppm set in 2017¹⁶. A record result of a level of CO₂ emissions into the atmosphere of 41 billion tons, a year. Even if the concentration of all greenhouse gases were to be maintained at year 2000 levels, a further increase of about 0.1 degrees per decade would be unavoidable given the slow absorption response of the oceans. Thus, by 2050 the concentration of CO₂ in the atmosphere would have reached levels twice as high as pre-industrial levels, around 550 ppm¹⁷.

According to the information collected by the World Meteorological Organization, the temperature of the Earth has risen by 0.74 °C (degrees Celsius) over the last hundred years¹⁸. Globally, the rate of warming averaged over the last 50 years is twice that of the last 100 years¹⁹. Since record keeping began in 1895, the hottest year on record worldwide was 2016, according to NOAA and NASA data²⁰. That year Earth's surface temperature was 1.78 degrees F (0.99 degrees C) warmer than the average across the entire 20th century²¹. Before 2016, 2015 was the warmest year on record, according to NASA²². According to the Intergovernmental Panel on Climate Change, the warming effect can be attributed to human activities and the industrial revolution²³.

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Ibid.

¹⁶ World Meteorological Organization, *Global Climate Report*, WMO Pub., 2018.

¹⁷ Bard E., *Greenhouse effect and ice ages: historical perspective*, Elsevier, 2004.

¹⁸ World Meteorological Organization, *Global Climate Report*, WMO Pub., 2018.

¹⁹ Ibid.

²⁰ NASA, *Weather, global warming and climate change report*, Callery, 2018.

²¹ Ibid.

²² Ibid.

²³ Intergovernmental Panel on Climate Change, *A guide to facts and fiction about climate change*, The Royal Society, 2007.

The rise in temperatures has had many consequences, including: ice is melting worldwide, especially at the Earth's poles. This applies to mountain glaciers, ice caps covering western Antarctica and Greenland, and the Arctic Ocean. Many species have been impacted by rising temperatures²⁴. Researcher Nill Fraser has monitored the decline in Antarctica of Adelia's penguins, whose population has fallen from 32,000 reproductive pairs 30 years ago to 11,000 today. Over the last century, sea levels have risen faster²⁵. Some species of butterflies, foxes and alpine plants have moved further north or to higher, colder areas. Rain and snow increased on average worldwide. Alaskan beetle picea scolitides are in the midst of an expansion caused by 20 years of hot summers with the result that they have already chewed 4 million acres of picea²⁶.

If warming continues, further effects may occur later in the century: sea levels are expected to rise between 18 and 59 centimetres within the next hundred years, and a further 10 to 20 centimetres may be added to these centimetres, resulting from the continuous melting of the poles. There is a good chance that hurricanes and other storms will become more violent. Species that depend on each other may no longer be in sync²⁷. For example, plants may blossom before pollinating insects become active. Floods and droughts will become more common. The level of rainfall in Ethiopia, where drought is already widespread, could fall by 10% over the next 50 years.

There will be less fresh water available. According to the researchers, if the ice hood of Quelccaya in Peru continues to melt at its current speed, it will disappear in 2100, leaving thousands of people dependent on it for drinking water and electricity, without one of the two sources.²⁸ Some diseases will spread, such as malaria which is transmitted by mosquitoes. The ecosystem will change, some species will move further north or become stronger; others will be unable to move and may become extinct. Martyn Obbard, wildlife biologist, has found that, starting from the mid-eighties, the polar bears, which have less ice to live in and less fish to eat, are considerably slimmed down²⁹. Ian Stirling, a polar bear biologist, has found a similar situation in Hudson Bay. He fears that, if sea ice disappears, polar bears will also disappear³⁰.

In recent years there has been a growing interest for the climate change thematic at global level. The governments of the world and the scientific communities have begun to act important negotiation processes. The most significant agreement in this area is the Kyoto Protocol which was concluded on 11 December 1997. It consists in a series of international actions to reduce the impact of human activities on the environment, especially in terms of emissions. The European Union has also taken action in this sense, with

²⁴ National Geographic, *Effects of Global Warming*, GEDI, 2010.

²⁵ Ibid.

²⁶ Ibid.

²⁷ Ibid.

²⁸ Ibid.

²⁹ Ibid.

³⁰ Ibid.

the adoption of a Climate-Energy Package that includes measures aiming at the reduction of emissions and the development of production and consumption emissions of renewable energy sources³¹.

1.2. The human impact of climate change

Climate change is produced by changes in the composition of the Earth's atmosphere. This is a very worrying phenomenon, which has attracted the attention of many scientific and political bodies worldwide, but which is still being underestimated by individuals. This phenomenon, in fact, if in part it is attributed to the natural variation of the climate, depends above all on the activities of man, who still underestimates this change; the excessive emission of greenhouse gases in the atmosphere and the unbridled exploitation of the Earth's natural resources are the main cause of the state of disorder and strong change in which the planet finds itself. The consequences of climate change include global warming, followed by rapid melting of ice, acidification of the oceans and rising sea levels. This has led to changes in the seasons, the increasing likelihood of extreme events occurring and the increase in temperatures, phenomena which are more widely perceived by man, precisely because they directly influence his economic activity³².

The United Nations Convention on Climate Change (UNFCCC) defines climate change as: "*a climate change that is directly or indirectly attributable to human activity and that alters the composition of the Earth's atmosphere to a greater extent than its natural variability in comparable periods of time*"³³. The UNFCCC also argues that the adverse effects of climate change are causing irreversible damage to the ecosystem, the socio-economic system and animal and human welfare. Another definition was given by The International Panel on Climate Change (IPCC) that defined climate change as: "*a statistically significant change in the average state of the climate or in its variability, persistent over an extended period, caused both by its natural variability and by human activity*"³⁴.

The two definitions show how climate change is attributable to two main factors: the behaviour of the climate system is influenced and suffers the effects of human activities on the planet and it is also due to its natural variability. The IPCC, in analysing the phenomenon of Climate Change, attributes above all to man the responsibility of the climate changes in progress; human activities are responsible for the emission of greenhouse gases into the atmosphere, with consequent energy imbalances of the climate system. According to the NIPCC, we cannot attribute to man the sole and main responsibility for climate change, for the following organism climate change is essentially a natural and cyclical phenomenon. According to this

³¹ Stocker T. et al., *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, 2013.

³² FitzRoy F., Papyrakis E., *An Introduction to Climate Change Economics and Policy*, Earthscan, London, 2010.

³³ Ibid.

³⁴ Ibid.

vision the latter is therefore following its natural course, it is changing in a predictable and not unexpected way³⁵.

Between the two interpretations, the first one, which is also the most widespread, gathers the general consensus of the most important international institutions and research bodies. As well as being scientifically proven, taking this view provides an incentive to act and think actively and responsibly towards the environment. Going back to the IPCC definition, it is useful to highlight how, in addition to human activities, the transformations taking place in the world (high population growth, emerging countries with an acceleration of their economic development, increased energy consumption) are also threatening the planet, causing a slow depletion of all natural resources and causing damage that is then difficult to remedy in the short term³⁶.

The Earth's climate system collects energy from solar radiation, about half of the energy supplied by the sun is visible in the electromagnetic spectrum. The Earth's temperature has remained constant for many centuries, thanks to the energy balance between incoming solar energy and outgoing radiation³⁷. Of the total solar radiation SWR (solar shortwave radiation) about half is absorbed by the Earth's surface; the fraction of SWR that is dispersed and reflected in space due to greenhouse gases, aerosols, clouds and albedo from the Earth's surface is approximately 30% and about 20% is absorbed into the atmosphere. Long-wave radiation (LWR) from the earth's surface is absorbed by certain atmospheric components such as water vapour, carbon monoxide (CO₂), methane (CH₄), nitrous oxide (N₂O), other greenhouse gases and clouds. The downward reflected component of these LWR waves adds heat to the lower layers of the atmosphere and the Earth's surface, creating the so-called "greenhouse effect"³⁸.

The sun provides more energy to the Earth mainly in the Tropics and Sub Tropics regions; this energy is then partially redistributed in the middle and high latitudes by atmospheric and ocean transport processes. The different climatic regimes of the planet depend on the annual balance of solar and terrestrial radiation and on the elements that influence it. In the Tropics the amount of radiation emitted by the sun is greater than that emitted by the Earth, while from the Tropics to the Poles is not present this situation of surplus, but deficit because the solar radiation is less, this phenomenon involves shifts of huge amounts of energy thanks to atmospheric and marine currents from the tropical belt to that of temperate and polar regions³⁹. Changes in the global energy budget result both from changes in the amount of incoming solar radiation and from changes in outgoing long-wave radiation. The changes of the first ones, derive from changes of the energy that comes out from the sun or from the terrestrial albedo. Changes in LWR emission

³⁵ Ibid.

³⁶ Ibid.

³⁷ Stocker T. et al., *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, 2013.

³⁸ Ibid.

³⁹ Ibid.

depend on changes in the temperature of the Earth's surface or atmosphere or changes in the leakage (efficient emission measurement) of LWR from both (atmosphere or earth's surface)⁴⁰.

As far as the atmosphere is concerned, these emission variations mainly depend on changes in cloud cover and its properties, the presence of greenhouse gases and the concentration of aerosols in the atmosphere. The increase of so-called greenhouse gases in the atmosphere favours the increase of energy available on the planet's surface; by altering the mechanisms that regulate the circulation of energy in the atmosphere, these gases act as a barrier, like the glass of a greenhouse, do not allow solar energy to escape into space, causing changes in the Earth's radioactive balance. In addition, due to the emission of chlorofluorocarbons into the atmosphere, a slow and gradual reduction of the ozone layer is taking place⁴¹. The alteration of the energy balance of the climate system is therefore mainly attributable to the variation and increase of greenhouse gases and aerosols in the atmosphere, mainly causing global warming⁴².

The emission of these greenhouse gases into the atmosphere is mainly linked to anthropogenic activities. The main greenhouse gases responsible for global warming, by absorption of terrestrial infrared radiation are: carbon dioxide, one of the main greenhouse gases, produced by fossil fuels used in transport, heating, air conditioning and industry. The increase of the latter in the atmosphere is also indirectly attributable to phenomena and actions of deforestation and reduction of the green resources of our planet; methane, which is more responsible for its emissions are agricultural and zootechnical activities, also derives from the decomposition of organic waste and combustion of biomass; nitrous oxide, released during fossil combustion and through the use of synthetic fertilizers and fluorinated gases, resulting mainly from activities industrial, refrigeration, air conditioning⁴³.

The effect of human activities on the climate system goes beyond its natural course. The majority of greenhouse gases are emitted into the atmosphere as a result of human activities related to energy supply, industrial activities and some of the responsibility also lies with the transport sector; the leakage of these gases alters the balance between propagation from the sun and infrared radiation from the Earth, altering their thermal regulation. While some gases are highly absorbent and cause SWR changes, aerosols indirectly increase atmospheric reflexivity, influencing the albedo of clouds, since they act as their condensation cores. Therefore, changes in their distribution and consistency can cause small but important changes in the cloudiness of the atmosphere. Clouds play a critical role in the climate, not only do they increase albedo and affect the cooling of the planet, they also cause global warming through the transfer of infrared radiation. Whether the net radioactive effect of a cloud is cooling or heating depends on its physical properties, as well as on the nature of its condensing cores.

Humans directly increase the greenhouse effect by emitting GHGs such as CO₂, CH₄, N₂O and chlorofluorocarbons. They also produce pollutants such as carbon monoxide, volatile organic compounds,

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² Ibid.

⁴³ Ibid.

nitrogen oxides and sulphur dioxide, which individually are negligible greenhouse gases, but combined have an indirect effect by altering, through an atmospheric chemical reaction, the presence of gases important for LWR output such as methane and ozone (O₃) and/or by acting as secondary aerosol precursors. Thus, anthropogenic emissions as a whole emit some climate-altering chemicals, others that cause air pollution, or both.⁴⁴

Man is also threatening the planet's energy and water reserves, for example by changing how the land is used; more and more forests are being converted into cultivated land; and the characteristics of vegetation, including its colour, seasonal growth and carbon content, are changing. For example, removing or burning a forest to replace it with agricultural land, reduces carbon deposition in vegetation, increases carbon dioxide in the atmosphere, changes the reflectivity of the earth (the area of albedo), the rate of evapotranspiration and the emission of long waves. The change that involves the atmosphere, the earth, the ocean, the biosphere and the cryosphere as a result of human action, but also of a natural nature, upsets the radioactive balance of the earth, causing a radioactive forcing (RF- radiative forcing) that damages the climate. RF is the measurement of the energy balance change network in response to external disturbances⁴⁵.

Radiant forcing quantifies the change in energy flows, following the intervention of the factors mentioned so far. Positive radioactive forcing leads to a warming of the earth's surface, negative radioactive forcing leads to a cooling of the earth's surface. RF is estimated on the basis of remote observations, carried out on site, based on the properties of greenhouse gases and aerosols. There are several response mechanisms in the climate system that can both amplify (positive feedback) and decrease (negative feedback) the forcing effects of climate change. An example of positive feedback is water vapour, if the surface temperature rises, the same applies to the total amount of water vapour present in the atmosphere⁴⁶. The latter is a powerful GHG; when its atmospheric concentration increases, the greenhouse effect increases, thus causing a further warming of the surface. Another example is the situation of the highly reflective ice albedo; its melting due to climate change reduces albedo and when snow surfaces melt, they expose the darker and more absorbent surfaces below. The negative results are increased energy emissions via LWR and an increase in surface temperature. Some consequences are immediate (in hours), while others develop and last for decades or centuries⁴⁷.

Climate change on the planet and its global consequences testify to the influence of human activities on the planet's climate. Rising temperatures, changing rainfall patterns, rising sea levels, ecosystem imbalances and increasing intensity of extreme events are now threatening settlements and agricultural crops and endangering the habitat of millions of people. According to the IPCC Report 2007, the direct impacts of climate change are identifiable as greenhouse gas emissions from anthropogenic activities that will continue

⁴⁴ Ibid.

⁴⁵ Ibid.

⁴⁶ Ibid.

⁴⁷ Ibid.

to change the climate until 2030⁴⁸. In particular, a further increase in temperature of 0.2 degrees per decade is expected. In addition, global warming is expected to range from 1.1 to 2.9 degrees (the lowest scenario) and from 2.4 to 6.4 degrees (the highest scenario)⁴⁹.

Researchers predict that rainfall will increase at high latitudes and decrease in most subtropical regions. The following developments are also expected: an increase in the number of nights and hot days, a reduction in the number of nights and cold days, more frequent periods of heat waves on most emerged lands, more intense rainfall and an increase in the proportion of such events in overall rainfall more intense tropical cyclones the routes for storms in mid-latitude areas will move north⁵⁰. Further consequences of climate change could be: water availability will change in many regions of the world and, in general, in regions and periods of high rainfall rainfall will increase, while in regions and periods that are already dry today rainfall will decrease further, arid areas will also increase; glaciers, snow surfaces and ice in the Arctic Sea will decrease further and the adaptive capacity of many animal and plant species will be more demanding; warming by 1-3 degrees will increase global agricultural yields on average, but if the increase is greater, they will decrease; rising sea levels will lead to increasing salinisation of groundwater and increase the risk of flooding in coastal areas used intensively and densely; will increase economic and social costs as well as the consequences in regions exposed to extremes.⁵¹

According to IPCC research, the sensitivity of the hydrological cycle to changes in temperature and precipitation will lead to significant changes in soil moisture, surface water flow, river and lake flows. This will expose ecosystems and human communities to substantial changes in water availability, water quality, flood risk and drought⁵². Research indicates that water stress may increase in many countries including Australia, North Africa, Southern Africa, Southern Europe, the Middle East and Latin America and decrease in Asia and Equatorial Africa. Climate change will also create significant imbalances in ecosystems over long periods of time, leading to a reduction in biodiversity. Changes in the distribution of animals and plants have already been observed and will continue in the years to come, with shifts of 400-600 kilometers northwards for an increase of only a few degrees centigrade⁵³. Where such movements are not possible, or are too slow in relation to climate change, climate change could irreversibly threaten or damage certain systems and species.

Significant changes are also expected in the oceans: in particular, reduction of frozen areas at the North Pole, modification of salinity and currents, reduction of fish stocks. Many coastal areas will also experience an increase in the invasion of marine waters, erosion and salinisation of groundwater. The risk is particularly high in tropical and subtropical areas. Finally, as far as human health is concerned, changing

⁴⁸ Intergovernmental Panel on Climate Change, *Fourth Assessment Report: Climate Change*, GEDI, 2007.

⁴⁹ Ibid.

⁵⁰ Ibid.

⁵¹ Ibid.

⁵² Ibid.

⁵³ Ibid.

climatic conditions could lead to increased deaths due to heat waves, increased frequency and intensity of extreme climatic events such as floods and cyclones and their consequences, an increased spread of diseases such as malaria⁵⁴.

The expected changes will vary significantly between different regions of the globe. The consequences for developing countries are particularly serious, as they are the most vulnerable, not least because of their low adaptive capacity. In the agricultural sector, for example, developing countries are likely to face increasing uncertainties about food availability and even an increase in the frequency and duration of famine. For industrialised countries, the most significant impacts will concern the intensity and frequency of extreme events, the hydrological cycle and availability of water, and health. The experience of some recent extreme events suggests that, for urban areas, adaptation processes could be costly and entail high social costs. For the whole of southern Europe, climate changes in the IPCC climate scenarios (year-round temperature increase, reduced summer rainfall, increased intensity and frequency of heavy rainfall) will lead to reduced water availability, increased flood risk, deterioration of soil quality, increased frequency of fires, increased erosion and loss of wetlands in coastal areas⁵⁵.

The expected impacts are particularly critical for Italy, which suffers from conditions of hydrogeological instability of the territory that compromise its capacity to regenerate its resources, as well as its ability to mitigate the effects of extreme climatic events. The most recent analyses of the meteorological series carried out by the CNR show that, already today, the trend of the main climatic parameters is as follows in line with the global trend predicted by the IPCC for the 21st century. In general, the Italian climate is in fact becoming warmer and drier, particularly in the South, since the 1930s. At the same time, throughout northern Italy, rainfall intensity has been increasing over the last 60 to 80 years, with an increased risk of flooding in this region, particularly in the autumn when the risk of flooding is highest. Finally, rising temperatures and changing precipitation patterns will also have serious consequences for glaciers⁵⁶.

⁵⁴ Ibid.

⁵⁵ Ibid.

⁵⁶ Ibid.

CHAPTER TWO

THE RELATIONSHIP BETWEEN HUMAN BEHAVIOR AND CLIMATE CHANGE

2.1. Climate change in the Anthropocene

According to the current geological classifications, man is in the geological epoch of the Holocene. It is part of the Quaternary period of the Cenozoic era which began about 12,000 years ago, at the end of the last ice age. The Holocene was characterized by stable climatic conditions and allowed the proliferation of Homo Sapiens⁵⁷. In 1997, a group of scientists published a study on the consequences produced by human activity on Earth and the environment. The scientists showed that about half of the Earth's surface had been transformed by human action. The group of researchers pointed out that carbon dioxide in the atmosphere had increased by more than 30% since the beginning of the industrial revolution and that man was the living organism present on Earth that produced more nitrose; furthermore about a quarter of the bird species had become extinct⁵⁸. In light of these data, scientists concluded that "*we live on a planet dominated by man and no longer by nature*". In recognition of the human domination of nature, some scientists have proposed a new geological era, named "Anthropocene"⁵⁹.

The term "Anthropocene" was coined by Paul J. Crutzen, the 1995 Nobel Prize for Atmospheric Chemistry, to define the current historical period. It began with the modern industrial revolution and the advent of production machinery that made the exploitation of environmental resources easier and more efficient⁶⁰. The word "Anthropocene" comes from the Greek word "anthropos" which means "man", and from the suffix "cene", which comes from the Greek kainos and can be translated as "new" or "recent". Therefore, Anthropocene indicates a new era of the Earth dominated by human activity. This new geological

⁵⁷ Di Paola M., Jamieson D. W., *Political Theory For the Anthropocene*, in *Global Political Theory*, eds. David J. Held and P. Maffettone, Polity Press, Cambridge, 2016.

⁵⁸ Vitousek P., Mooney H., Lubchenco J., Melillo J., *Human Domination of Earth's Ecosystems*, *Science* 277 (5325): 494-499, 1997.

⁵⁹ Ibid.

⁶⁰ Di Paola M., Jamieson D. W., *Political Theory For the Anthropocene*, in *Global Political Theory*, eds. David J. Held and P. Maffettone, Polity Press, Cambridge, 2016.

era is different from the previous ones due to the decisive impact of man on the climate and the environment⁶¹.

The proposal of some researchers to declare the Anthropocene a new epoch in the history of the Earth is currently the subject of discussion by the International Commission for Stratigraphy (ICS), the authoritative scientific body that makes decisions on geological taxonomies. The question of the classification of geological eras is complex. In fact, according to geologists, this classification is only possible by analyzing the effects produced on the earth's crust during long time intervals⁶². The Holocene represents a still young age, only 12,000 years old, if we think that the last epoch, the Pleistocene, lasted two million years. According to geologists, in this short period of time there have not been radical modifications of the earth's crust. For this reason, it is not possible to talk about a new geological era. However, proponents of the Anthropocene believe that this new geological epoch began with the nineteenth-century industrial revolution. From 1950 to today the industrial activity of man has produced significant changes on the Earth⁶³.

Most of the scientific community agrees that a wide range of important anthropogenic processes that are modifying the Earth has arisen from the industrial revolution to today. These processes include: destruction of animal habitats, extinction of animal and plant species, increase in Earth temperature, ocean acidification and alteration of the hydrological cycle, increase in sedimentation and soil erosion, atmospheric pollution and melting glaciers. So, according to scientists, climate changes produced by human activity are altering the biology and geology of the planet in an irreversible way⁶⁴.

Climate change is the fundamental element for the advent of the Anthropocene. It represents the lifestyle of Homo Sapiens, characterized by globalization, consumerism and the intensive use of non-renewable resources of the Earth. The climate changes produced by humanity are producing unpredictable consequences, which are putting at risk the survival of the species, such as: extreme weather events, epidemics, lack of food and water in some areas of the planet, mass migrations and political instability⁶⁵.

The main characteristic of the Anthropocene is the increase in the human population and the increasing use of energy. At the beginning of Holocene there were about 6 million people, but today there are more than 7 billion people, which according to the researchers' forecasts, should become 11 billion by 2100⁶⁶. The improvement of living conditions and the greater availability of food have allowed many people to live longer. Furthermore, economic globalization and technologies allow constant access to all types of goods and services. However, there are still many areas of the world where 2 billion people live in extreme poverty and malnutrition. Technology has allowed the increase in production levels, bringing humanity to an

⁶¹ Ibid.

⁶² Ibid.

⁶³ Ibid.

⁶⁴ Di Paola M., Jamieson D. W., *Political Theory For the Anthropocene, in Global Political Theory*, eds. David J. Held and P. Maffettone, Polity Press, Cambridge, 2016.

⁶⁵ Ibid.

⁶⁶ Ibid.

exponential growth and becoming an integral part of human life. The increase in production processes, however, has led to an increase in global pollution and the alteration of the Earth's ecosystem, contributing to generating global climate change⁶⁷.

In this regard, Crutzen claims that in the air of the last two centuries carbon dioxide has increased considerably (from 280 to 360 parts per million in volume) reaching the highest levels that have been recorded in the last 15 million years. The researcher states: "*Today, the amount of greenhouse gas has exceeded the levels of the whole Quaternary and nobody knows what the consequences will be*⁶⁸". Planet Earth is transforming rapidly and significantly. The phenomena that characterize this transformation are anthropogenic, that is, produced by man due to the use of fossil fuels such as coal, methane and oil and the combustion of biomasses such as forests, waste and organic materials.

According to a study recently carried out by the United Nations, carbon dioxide emissions will reach by the end of the century a concentration of between 540 and 970 parts per million, that is, they will undergo an increase of between 90 and 250 percent compared to pre-industrial levels. In addition, the authors of the study argue that climate warming has never progressed so rapidly: by the end of the century the temperature could record an average increase of 4 degrees Celsius. It would be the most important climate change in the last millions of years on Earth. Global warming is producing irreversible consequences for the delicate and complex balances of the planet. According to Crutzen it is necessary to understand the processes of transformation underway, to learn to control them and to try to manage them⁶⁹.

Therefore, today man has become a real geological force able to change the global aspect of the Earth. In his book entitled "Welcome to the Anthropocene", Crutzen writes: "*the Anthropocene is the only geological epoch in which nature is not an external force that dominates the destiny of men, on the contrary, it is we who determine its equilibrium and we are therefore all called to behave with wisdom and responsibility*⁷⁰". This consists in committing oneself to adopt new technologies that use renewable energies such as sun, wind, geothermics and biomass. According to Crutzen, man must learn to "handle" the environment and to "control" the chemical composition of the atmosphere. The survival of planet Earth is therefore entrusted to the responsibilities of all men⁷¹.

Climate change is an effect that has always been present in nature but has been accelerated in recent years by anthropogenic activities that have led to a distortion in the natural conditions of our planet. The consequences of climate change have attracted the attention of global political nations, worried about the future of the Earth and the survival of mankind. Human activities have not only influenced, through the emission of greenhouse gases and global warming, but have also destroyed entire important ecosystems, to

⁶⁷ Ibid.

⁶⁸ Crutzen P. J., *Benvenuti nell'Antropocene*, Mondadori, Milan, 2005.

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ Ibid.

exploit their resources. This is why today, new global policies are developing different strategies to reduce climate change.

Climate change is one of the main environmental challenges of our times. The causes and consequences of climate change overcome the ability of a single nation to change, but need the collaboration of all the countries of the industrialized world. The need to mitigate the effects of global warming has indeed become a global issue, for this reason in 1992 the United Nations Framework Convention on Climate Change (UNFCCC) has sanctioned the climate as a political problem⁷². Thanks to the UNFCCC, the problem of climate change was recognized for the first time in official documents. Its goal is "*achieve stabilization of greenhouse gas concentrations in the atmosphere at a low enough level to prevent dangerous anthropogenic interference with the climate system*"⁷³. The convention stipulated that "*such a level should be achieved within a sufficient time frame to allow ecosystems to adapt to climate change, to ensure that food production is not threatened*"⁷⁴.

The first report of the IPCC, which highlighted the correlation between anthropogenic greenhouse gas emissions and likely climate change, formed the scientific basis for the first negotiations of the Framework Convention on Climate Change (UNFCCC). In 1992, the delegates of 150 countries approved the Convention, adopted in New York on May 9th and presented to governments for signing during the Earth Summit held in Rio de Janeiro in June and entered into force on March 21st 1994. It defined a goal of stabilizing greenhouse gas concentrations for the projection of the climate system and promoted national and international measures to achieve this goal, but did not provide binding commitments for the reduction of greenhouse gas emissions, only a commitment for industrialized countries to bring their greenhouse gas emissions back to their 1990 levels by the year 2000. Every year the meetings of the Conference of the Parties assessed the actions undertaken and the commitments to be made also in the light of the findings of the IPCC reports⁷⁵.

The first Conference of the Parties (COP1) was held in Berlin in 1995 and it was concluded that the commitments agreed in the Convention were not sufficient. For this reason the "Berlin mandate" was established, which opened a new round of negotiations. A breakthrough in climate change policies took place at the Conference of Parties 3 (COP3) in Kyoto, in 1997, with the adoption of the Kyoto Protocol. The protocol foresaw that the industrialized countries would reduce, by the 2008-2012 period, the greenhouse gas emissions by 5% worldwide compared to the base year 1990. In order to achieve its specific reduction targets, the Protocol allowed the industrialized countries to make use of CO₂ (carbon dioxide) absorptions from forests and agricultural land (carbon sinks) and international cooperation mechanisms to reduce emissions. The operational details related to the use of these tools were however only defined by the Conference of the Parties 7 (COP7), held in Marrakech in November 2001. The Conference of the Parties 9

⁷² UNFCCC, *The United Nations Framework Convention on Climate Change*, Retrieved November 105, 2005.

⁷³ Ibid.

⁷⁴ Ibid.

⁷⁵ FitzRoy F., Papyrakis E., *An Introduction to Climate Change Economics and Policy*, Earthscan, London, 2010.

(COP 9), met in Milan in 2003, completed the preparatory activities for the implementation of the Protocol, approving the modalities for the realization of interventions of international cooperation in the agricultural and forestry sector. However, the Protocol entered into force only in 2005 after ratification by at least 55 signatory countries of the Framework Convention on Climate Change, responsible for at least 55% of the 1990 CO₂ emissions⁷⁶.

The Kyoto Protocol was the first official intervention to combat global climate change. According to some reports by the United Nations Organization, the emissions of signatory countries have decreased by 24% between 1990 (reference year of the protocol) and 2012. Later, at the Doha Conference of 2012, the objectives of the Protocol of Kyoto expanded, inviting industrialized countries to reduce their emissions by at least 18% between 2013 and 2020⁷⁷.

Another important pact recently signed by nations to prevent the risks associated with climate change concerns the Paris Agreements. At the Paris Climate Conference (COP21), in December 2015, 195 countries adopted the first universal and legally binding agreement on the global climate. The Agreement was reached on 12 December 2015 and entered into force on 4 November 2016, following ratification by the EU. The agreement defines a global action plan with the aim of avoiding dangerous climate changes and trying to keep global warming below 2 ° C. They will apply from 2020. In particular, the main points of what governments have agreed in the agreement are the following⁷⁸:

- Maintain the average global temperature increase well below 2 ° C compared to pre-industrial levels as a long-term objective.
- Aim to limit the increase to 1.5 ° C, as this would significantly reduce the risks and impacts of climate change.
- Ensure that global emissions reach the maximum level as soon as possible, while recognizing that more developing countries will take longer.
- Then proceed to rapid reductions in accordance with the most advanced scientific solutions available.

The European Environment Agency, in the article entitled "*Climate agreement: towards a low-carbon world capable of reacting to climate change*", states that: "*The Climate Agreement signed in Paris from 195 countries is the first universal and binding agreement of its kind. The Paris Agreement is the fruit of several years of preparation, dialogue and growing awareness of the need to address the current and potential consequences of climate change. The Accord is an important and promising step towards the creation of a low-carbon world that is able to cope with climate change. It is also a clear signal to policy*

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ European Environment Agency, *Accordo sul clima: verso un mondo a basse emissioni di carbonio in grado di reagire ai cambiamenti climatici*, 2017.

*makers and companies about the need to abandon fossil fuels and invest in clean energy and adaptation actions*⁷⁹.

The main objectives set by the Paris Agreement include: governments have agreed to keep the global average temperature rise below 2 ° C, compared to pre-industrial levels and to continue efforts to limit it to 1.5 ° C; the countries presented global national climate action plans aimed at reducing their emissions; governments have decided to communicate their contributions every five years to set more ambitious targets; the governments have also agreed to communicate to each other and to the public the results achieved in the implementation of their respective objectives in order to guarantee transparency and control; the EU and other developed countries will continue to provide climate finance to developing countries to help them both reduce emissions and become more resilient to the effects of climate change. The Paris Agreement therefore constitutes a global action plan, with the aim of restoring the planet, which aims to avoid dangerous climate change⁸⁰.

2.2. Psychological aspects in the environmentally responsible behavior

Climate change is a global problem and a risk for the survival and settlement of future generations. For this reason, the scientists have analyzed what are the psychological aspects that serve to develop responsible individual behaviors towards the environment. Therefore, the environmentally responsible behavior (ERB) has become one of the main priorities of the society, fundamental to support the political and social actions for the protection of the environment. The goal is to promote pro-environmental sensitivity and awareness in society as a whole, through different forms of intervention. For example, by promoting environmental education programs and a wide variety of communication and information campaigns on climate change. Based on this interest in recent years, an increasing number of studies have attempted to identify the characteristics that explain and predict ERBs⁸¹.

Most of the interventions in favor of the environment are based on principles coming from the functional analysis of behavior. This approach holds that the consequences of an action can be an incentive or a disincentive to implement it. These effects can therefore be used to modify or promote an ERB. Research has shown the effectiveness of this approach has been noted in relation to water saving and glass recycling and other environmental protection behaviors. However, research in this direction has revealed that even if incentives or punishments can be useful for generating ERB, their effects are practically nil in terms of long-term change. For example, in relation to programs designed to reinforce behaviors that help maintain

⁷⁹ Ibid.

⁸⁰ Ibid.

⁸¹ Valentin J., Gamez L., *Environmental psychology new developments*, Nova Science Publishers, New York, 2010.

a clean place, it was not possible to determine whether the positive effects produced are maintained over time or if they are generalized to other situations⁸².

In this regard, Eisenberger and Cameron question the effectiveness of reinforcements as instigators of change. In fact, when behavioral changes motivated by incentives are observed, they are less likely to remain stable over time. This happens because the person knows the reason that led to the change and once the reason disappears, the change is not maintained, as it is not supported by a mental attitude or underlying values. The researchers also noted that the change generated by persuasion could produce the opposite effect⁸³.

Behind every effective intervention, therefore, there must be a sufficiently structured theory that takes into account the factors that precede the behavior and their relationship. In this regard, environmental psychology has focused on optimizing the explanation of ERB, analyzing the impact on the pro-environmental behavior of variables such as economic status, rural or urban origin, the level of information and environmental knowledge, the the role of incentives and penalties, the level of self-esteem, perceived self-efficacy, personal beliefs, social control and environmental attitudes and altruistic, sociocentric and ecocentric attitudes⁸⁴.

Hines, Hugenford and Tomera believe that two fundamental factors for ERBs are environmental knowledge and skills development, as well as personal characteristics as an aptitude for collective and individual well-being and a sense of responsibility. Bamberg and Möser, on the other hand, believe that ERBs derive from a combination of personal interest and the influence of social motivations. According to these authors, the factors that act as predictors of ERB are⁸⁵:

- positive attitude towards behavior;
- perception of control;
- moral sentiment;
- personal commitment.

Most of the ERB explanations agree that these behaviors are intentional and supported by specific motivations, aimed at avoiding a problem, for example to reduce health threats, to reduce water consumption etc .. According to the model by Schwartz, behavior is motivated by the individual value system, characterized by beliefs and attitudes that precede action. Furthermore, the values that drive behavior are ordered hierarchically and have a general functional motivation. The model defined by Schwartz identifies ten types of values that are, in turn, structured in four dimensions: self-transcendence, self-valorization, openness to change and conservatism. Based on this universal structure of human values, the researchers

⁸² Ibid.

⁸³ Ibid.

⁸⁴ Ibid.

⁸⁵ Ibid.

analyzed different pro-environmental behaviors including: recycling, resource saving, the environment, responsible consumption and the acceptability of sustainable energy policies. Specifically, altruism was considered as one of the main motivations in the explanation of ERB. It is presumed that pro-environmental behaviors are largely the product of an altruistic view of people and the environment⁸⁶.

According to Schwartz, people are motivated to get involved in altruistic behavior if two mechanisms occur: if they are aware that the behaviors they engage in have consequences that affect other people and if they feel they have control over the situation and develop feelings of responsibility for chosen action. According to Schwartz's model, behavior is motivated by the individual value system, characterized by beliefs and attitudes that precede action. Furthermore, the values that drive behavior are ordered hierarchically and have a general functional motivation⁸⁷.

Other popular models are the Reasoned Action Theory and the planned behavior theory. These models consider the ERB the consequence of the intention to carry out significant positive actions for the environment, an intention that in turn depends on the attitude of the individual towards the behavior itself and the subjective norm. The attitudes that motivate behavior are partly defined on the basis of beliefs about environmental consequences and the assessment of these consequences⁸⁸.

According to environmental psychology, the beliefs that determine the ERBs are distinguished between motivations based on ecocentric interests and those based on anthropocentric interests. Anthropocentrism sees the human being as the dominant entity in nature and is in favor of environmental transformations in order to satisfy his needs and interests. This approach was considered at the origin of the practices that caused the current global environmental crisis. Ecocentrism, on the other hand, considers human beings only as another element within the ecological system. The human being is considered as one of the many living beings on Earth⁸⁹.

Thompson and Barton found that only ecocentrism is positively connected with pro-environmental behavior. Kasser and Ryan analyzed the content of the objectives that people set themselves, distinguishing between intrinsic motivations and extrinsic motivations. The former seek to satisfy the psychological needs of autonomy and competence, such as self-acceptance, affiliation or community sentiment or health, while the latter refer to obtaining social recognition such as economic success and popularity. De Young analyzed the intrinsic satisfaction felt by implementing the ERBs as a source of motivation. The author has identified three types of motivators: the satisfaction of having specific skills to perform in a specific way, the satisfaction of engaging in responsible consumption, the satisfaction of maintaining a sense of community helping to preserve the environment. According to De Young, when a person perceives himself as skilled in

⁸⁶ Ibid.

⁸⁷ Ibid.

⁸⁸ Ibid.

⁸⁹ Ibid.

behavior, the sense of competence produces an intrinsic satisfaction that promotes the choice and generalization of new behaviors⁹⁰.

Another famous model is Bandura's social cognitive theory. According to the author, there are two fundamental processes in the acquisition of mechanisms that regulate behavior: one is based on direct experience with the reinforcements and punishments received and the other is based on the role of modeling or vicarious learning. Learning through reinforcements or mistakes is a long process because it requires an exhaustive analytical strategy and can be overly expensive if the mistakes made involve a high penalty. Furthermore, if there is no analytical strategy, the duration of the motivation is limited to the presence of the reinforcement or penalty. However, learning from others is less expensive and is an equally powerful process. Modeling or vicarious learning is a process based on social confrontation when one observes the behavior of others and ascertains the effects that this behavior generates. When, in this process of confrontation, the observer identifies with the model, the observer perceives that they can perform the same behavior with equally satisfactory results⁹¹.

Therefore, it is not necessary to perform an action as it is sufficient to observe the others in order to feel able to carry out the aforementioned action. Bandura says that modeling is a mechanism of motivation that can act both on a personal level, causing personal development, and on a collective level, generating social change. Among the different mechanisms of self-regulation of behavior, Bandura argues that self-efficacy is the best predictor of the actions that one chooses to implement. Self-efficacy can be defined as "the belief in one's ability to organize and guide the actions necessary to face certain situations in the immediate future". From the point of view of social cognitive theory, self-efficacy is the most important cognitive-affective variable in the understanding of how personal and situational factors influence behavior⁹².

People who think they can perform a task well experience high levels of perceived self-efficacy for similar tasks and circumstances. Since self-efficacy judgments come from a self-assessment of past performance, there is a high correlation between past performance and self-efficacy. For this reason, some authors believe that self-efficacy is simply the product of past performance and, therefore, does not help to explain performance in relation to the future. Self-efficacy helps people to focus their attention on the actions to be performed, reduce the perception of the difficulty of the objectives and facilitate the search for efficient strategies. Therefore, although there are other motivation mechanisms that could guide the action, such as objectives and incentives, if a person does not feel capable of carrying out a behavior, no matter how high the premium is, that individual will not do it or not will feel able to do it in the long run. However, self-efficacy does not act in isolation but motivation is explained by the relationship between this cognitive

⁹⁰ Ibid.

⁹¹ Ibid.

⁹² Ibid.

judgment of ability and the emotional state, as well as some personality variables such as the perception of control⁹³.

Regarding the theories on the psychological aspects that hinder environmental behavior, Espen Stoknes, director of the Center for Green Growth at the Norwegian Business School in Oslo, believes that there are five internal defenses that prevent people from implementing these actions⁹⁴. The first is the distance, expressed in terms of place and time. Generally, the problems of climate change affect distant geographical areas and refer to long timescales that do not personally affect individuals. The second defense is desensitization to catastrophic events that is determined by the habit that people develop by frequently hearing bad news related to the climate. The third defense mechanism is dissonance. Common sense says we should not continually use cars or other polluting means of transport. However, everyone uses cars, take planes or trains to go to work or on vacation. This contradiction between thought and action generates dissonance. The fourth defense is denial and is connected to dissonance. Because of the unpleasant sensations generated by dissonance, individuals pretend not to be aware of the risks of their behavior. The last defense is identity. Identity defines who the individual is and is related to how the government identifies him. If the government is insensitive to environmental issues, the individual will also tend to identify with this behavior⁹⁵.

To counter these defenses, Espen Stoknes proposes some solutions. Distance can be eliminated with the help of social networks that can increase information and awareness of the effects of climate change. Dissonance can be transformed into support by implementing simple and convenient actions to reduce the contradiction between thought and action. Denial can be reversed by viewing individual progress. If you get motivational feedback for small daily gestures, you are more motivated to change your behavior. Finally, it is possible to change the identity by finding positive individual beliefs about oneself, in relation to the environmental commitment⁹⁶.

2.3. Climate Change and Governance

Modern democracy is faced with innumerable and complex challenges caused by climate change, such as: air pollution, global warming, melting ice, rising seas, water crisis, desertification, loss of biodiversity, environmental exodus, loss of non-renewable sources, energy crisis, food crisis, toxic waste disposal, etc ... Modern civilization that, thanks to science, technology and industry, believed to become more and more independent from nature, finally rediscovers in a dramatic way its dependence on 'environment. The dream of man's victory over nature has turned into the nightmare of rediscovering victims of ungovernable and

⁹³ Ibid.

⁹⁴ Stoknes P. E., *A cosa pensiamo quando cerchiamo di non pensare al riscaldamento globale: Verso una nuova psicologia dell'azione per il clima*, Chelsea Green Pub Co, 2015 .

⁹⁵ Ibid.

⁹⁶ Ibid.

potentially catastrophic processes. Faced with the problems of global society, nations find themselves having to find new, more sustainable and ecological styles of production and life.

The model of modern well-being based on growth and development is faced with environmental, social, political and cultural limits. Yet despite the awareness of the risks caused by climate change, politicians have not yet managed to establish a strict course of action to safeguard the environment. In recent years, extreme weather events caused by climate change have prompted governments to discuss preventive measures to be taken to avoid catastrophic scenarios in the future. In this regard, Vice President Al Gore argues that the risk of a terrible catastrophe is real and it is necessary to act with global measures to prevent this from happening. Many environmentalists believe that it is necessary to adopt the so-called precautionary principle, specifically designed for situations where the damage is not a certainty but a concrete probability⁹⁷.

In fact, according to the precautionary principle, threats to the environment must not be established with certainty, but a small risk of catastrophic or irreversible damage is also sufficient to put in place preventive actions. However, there is a group of economists and politicians who believe that a low risk of catastrophe due to climate change does not require security measures. One example was that of the Bush administration that opposed the implementation of significant actions to stop climate change in America, due to the burdens and costs of such interventions. In fact, prevention interventions often require political and social changes of great economic impact on nations, making them difficult⁹⁸.

At the moment, therefore, democratic governments have not yet managed to give a strong and decisive response to halting the process of environmental degradation. Multilateral agreements between nations are needed to stop climate change so that joint actions can be implemented to reduce pollution and change harmful lifestyles and production. However, multilateral pacts are not well seen by democratic nations. Indeed, cooperation agreements tend to weaken national sovereign power and the relationship between politicians and the electorate⁹⁹. In fact, they imply strict restrictions for the member countries that do not always produce advantages for citizens in the short term.

A significant example is that of the Trump administration, which has decided not to accept the Paris Agreements for the global protection of the environment: "*Paris Climate Accord is simply the latest example of the United States to the exclusive benefit of other countries, leaving American workers - who [sic] I love - and taxpayers to absorb the cost in terms of lost jobs, lower wages, shuttered factories, and vastly diminished economic production*"¹⁰⁰. International cooperation, therefore, still appears difficult and complex today and is responsible for political and social interventions that are not sufficiently effective to counteract the risks of climate change. In democracies, it is citizens who authorize their representatives to negotiate and

⁹⁷ Sunstein C. R., *Worst-case scenarios*, Harvard University Press, Cambridge, 2009.

⁹⁸ Ibid.

⁹⁹ Di Paola M., Jamieson D. W., *Climate Change and the Challenges to Democracy*, University of Miami Law Review, USA, 2018.

¹⁰⁰ Ibid.

stipulate the terms of international cooperation. For this reason, the Democrats who try to tackle the problems of the Anthropocene face challenges of legitimizing environmental interventions towards civil society¹⁰¹.

The problems that democracy has to face include: the consequences of climate action have long-term effects, while in the short term they do not seem to produce benefits. This may discourage citizens from supporting political interventions that require substantial costs and sacrifices to the community since there is no perceived immediate benefit¹⁰²; disinformation and intertemporal prejudices of citizens can influence and be influenced by politics. The unawareness of the extent of the risks caused by climate change, often conveyed by the bad information of the media, hinders a responsible position towards the environment by citizens and politicians¹⁰³; another problem concerns intergenerational legitimacy. In fact, there is no guarantee that long-term policies can achieve their goals or that people's living conditions will improve in the future¹⁰⁴; another aspect concerns the planning of participatory events. Democracy requires frequent elections to ensure that people can express their will and change the politicians that they think have failed. However, the short duration of electoral mandates leads politicians to constantly worry about elections and are driven to continually seek support from voters, making popular decisions that yield immediate benefits, rather than engaging in initiatives that require large amounts of political capital. and cheap and that do not produce appreciable results in time for the next elections¹⁰⁵; in the democracies there is a right of veto that can allow minorities to oppose political decisions to favor some sections of the population. This can hinder and delay the approval of interventions in favor of environmental protection¹⁰⁶.

Modern democracy represents the most sophisticated form of social organization. It is also the most hospitable environment for the expression of human values such as individual freedom and the politics of equality. Despite the vulnerabilities of the modern democratic system, it still represents the right tool to face the challenges of climate change in the future, thanks to its resilience and flexibility. The anthropocene democracies will have to work with targeted interventions in space and time, incorporating the interests of the global with those of the local and those of the future with those of the present¹⁰⁷.

2.4. Examples of sustainability in Sweden and Denmark

The city and, more generally, the territory is the place where the conflict between modes of consumption and negative effects on the environment is expressed. The city is the result of a politically expressed intention

¹⁰¹ Ibid.

¹⁰² Ibid.

¹⁰³ Ibid.

¹⁰⁴ Ibid.

¹⁰⁵ Ibid.

¹⁰⁶ Ibid.

¹⁰⁷ Ibid.

that interprets current trends, needs of the inhabitants, taking into account the collective good and the general interest that the city represents¹⁰⁸. The fundamental characteristics that the sustainable city must assume for the near future are the following:

- The sustainable city must be regenerated inside, rehabilitating the degraded neighborhoods environmentally and socially. Land consumption must be reviewed in terms of sustainability. The distribution of the city in a large space leads to an increase in soil erosion and pollution. Greater ecological benefits and social opportunities can be achieved with adequate planning of a more compact model of the city¹⁰⁹.
- The sustainable city must be holistic. It must be considered as a whole and not as a sum of parts (neighborhoods, services, infrastructures). An urban intervention to be considered sustainable must satisfy the three areas of sustainability: environment, economy and society. An environmentally friendly and technologically innovative project is not in itself sustainable if for example it imposes such high costs as to prevent access to part of the population. Many new neighborhoods, developed in Europe, with a view to sustainability are respectful of the most advanced technologies applied to construction, but are inaccessible to most. An intersectoral approach to urban policies is an essential condition for sustainability¹¹⁰.
- The sustainable city must be a participant, it hypothesises scenarios of future development and shares their definition with its inhabitants. Sharing choices with the local community must be understood as continuous and recurring participation. The local government must have a stable attitude to implement decision-making processes with respect to the strategic choices for a given territory, redefining its role, so that all the actors involved in the processes, including inhabitants, are called to assume responsibility towards future generations. New lifestyles can only be developed in cities designed to favor them¹¹¹.

Since 1996, the European Commission on the Environment is responsible for assigning the title of "Green Capital" to a European city with at least 200,000 inhabitants, which has distinguished itself in the field of sustainability and policies adopted on the themes of: local contribution to the struggle to climate change, public transport and sustainable mobility solutions, waste disposal, accessibility of public green spaces, noise pollution, water use and air quality and sustainable land management¹¹².

The first to reach this milestone was Stockholm. The Swedish capital has achieved important results concerning the reduction of noise pollution, the achievement of high standards of water cleaning and the development of an innovative waste disposal system. No less important, 95% of the population lives less

¹⁰⁸ Musco F., *Rigenerazione urbana e sostenibilità*, Franco Angeli, Milano, 2009.

¹⁰⁹ Ibid.

¹¹⁰ Ibid.

¹¹¹ Ibid.

¹¹² Giffinger R. et al, *Smart Cities: Ranking of European Medium-Sized Cities*, Centre of Regional Science, Vienna, 2007.

than 300 m away from green areas. The Swedish capital produces 60% of its energy from renewable sources, in particular 48% derives from the hydroelectric: percentages that increase, if we consider that 80% of the residents of Stockholm use energy cogeneration systems. The most surprising fact is that concerning mobility: 90% of the inhabitants move by bike, on foot or by public transport¹¹³.

As regards waste management, they are appropriately separated and collected in underground tanks emptied of huge vacuum cleaners and sent for recycling, thus avoiding unsightly bins and minimizing the costs of collection. Thanks to the efficient reuse and recycling system only a small part of the waste must end up in the local incinerator. In any case, their combustion produces enough heat to cover 47% of the domestic heating. The remaining 50% is supplied by the combustion of organic oil (16%) and by the water energy produced by wastewater (34%). With regard to energy production and means of transport, electricity comes from solar panels on the roofs of buildings, able to ensure the lighting of common areas and half of the hot water needs for domestic use. The means of transport are also environmentally conscious: public buses, with which the City of Stockholm is gradually replacing the old means of transport, go to ethanol. In 2005, a service station was also set up to supply hydrogen cars for a long time in production in Sweden: economic and zero-impact¹¹⁴.

Another city awarded by the European Commission for the Environment in 2014 was Copenhagen. Copenhagen came into being in the tenth century as a fishing village for the Vikings and in the space of 100 years it has turned into a bustling commercial town. Thanks to its port, it has become a very important trade hub until in the fifteenth century it assumed the role of capital of Denmark. It is surrounded by water, parks and green spaces and is one of the most populous cities in the entire nation. According to data collected in 2014, in fact, it hosts approximately 1,246,611 inhabitants¹¹⁵. In recent decades it has become a cultural heart of Scandinavia, with internationally renowned museums and numerous cultural activities. It is also at the forefront of research and development, which is one of the most important sectors of the local economy. Also following the Denmark-Sweden link over an 8 km bridge connecting Copenhagen to Malmö, the entire resund region has become known as the Medicon Valley, one of Europe's leading life science regions, with industries and technologies at the forefront of biotechnology, healthcare, pharmaceuticals and clinical research. Furthermore, in the last decades Denmark has distinguished itself for having embraced the philosophy of the all-round green economy, activating numerous initiatives regarding environmental sustainability, the reduction of GHG emissions and energy efficiency; it is no coincidence that Copenhagen has recently maintained high positions in international rankings concerning these aspects¹¹⁶.

The capital of Denmark works with companies, universities and organizations to develop and support the growth of the sustainable economy. It successfully uses eco-technologies and is considered a true model for urban planning and design. Copenhagen excels in the political-regulatory area: thanks to recent building

¹¹³ Ibid.

¹¹⁴ Ibid.

¹¹⁵ Ibid.

¹¹⁶ Ibid.

regulations that put tight constraints on efficiency and consumption, the city aims to increase its green share of 5 thousand cubic meters. Its waste recycling system is one of the most stringent in Europe because it makes it possible to recycle 55% of the waste produced¹¹⁷.

Copenhagen has initiated a number of sustainability initiatives that have involved the municipality and its citizens. One of these concerns the reduction of gas emissions, with the aim of eliminating them by 2025. Thus, the capital of Denmark aims to become a model for European cities. A model that presents a unique vision of city life, balancing initiatives for the environment, economic growth and quality of life. This was also made possible by the support provided at national level, in fact Denmark since 1971 established the Ministry of Environment and was the first nation in the world to implement environmental legislation in its regulatory framework. To achieve the most ambitious goal, which is to become the first zero emission city in the world, in 2009 a plan called "Carbon neutral by 2025 - Climate Plan Copenhagen" was drawn up and thanks to the first initiatives of this plan already in recorded emissions reductions of 24% compared to 2005, exceeding the targets set for 2015 four years in advance¹¹⁸.

¹¹⁷ Ibid.

¹¹⁸ Ibid.

Conclusion

Climate change is a global phenomenon that can damage the natural and anthropic systems of the planet. In this paper it has been analyzed how climate alterations are related to human activity and why it is necessary to modify the lifestyles and production models of today's society, in order to stop the process of environmental and climate degradation. Being a global phenomenon, it needs actions from all industrialized countries that must be equipped with suitable measures to counteract their effects. Indeed, climate change is affecting the whole world, producing different effects depending on the geographical location. Each nation must adapt to the global goals of reducing greenhouse gas emissions by maintaining and structuring policies in this regard that are consistent with the internal political systems of the nation¹¹⁹.

Taking care of the environment represents an act of responsibility towards future generations. The emissions of greenhouse gases that are the cause of global warming are rapidly increasing, so much so that, in the absence of corrective measures, the Earth's heating is expected to exceed 5 ° by the end of the century compared to the age industrial, with extremely dangerous consequences for the environment and for humans. Furthermore, according to scientists' forecasts, maintaining high levels of pollution and the Earth's temperature will lead to increasingly frequent extreme weather events such as floods, droughts and hurricanes, with evident repercussions on the ecosystem and human health¹²⁰.

It is therefore necessary to drastically reduce the production of greenhouse gases, the main source of which derives from the use of fossil fuels. The efforts of the international community to tackle climate change have so far focused on the cap-and-trade system and have produced the Kyoto Protocol in 1997 as the most important result. This was the first international agreement that sets binding targets for reducing emissions for those developed countries that have ratified it. However, the extent of the decrease established by it was decidedly insufficient with respect to environmental needs. Moreover, the lack of involvement of the United States and the emerging countries has deeply limited its scope¹²¹.

The need to build an international regime able to overcome the weaknesses of the Kyoto protocol and to prevent the most disastrous consequences of climate change clashes with the great difficulties of reaching an agreement among the countries that takes into account the historical responsibilities of emissions. From a political point of view, the situation is exacerbated by the physical characteristics of the phenomenon: since its most dangerous consequences will only be produced in the long run, the governments in office are not encouraged to take decisive action. To this must be added that the protection of the environment has the classic characteristics of the public good: each country therefore has a strong incentive to behave like free riders, in order to benefit from the sacrifices of others without cooperating¹²².

¹¹⁹ FitzRoy F., Papyrakis E., *An Introduction to Climate Change Economics and Policy*, Earthscan, London, 2010.

¹²⁰ Ibid.

¹²¹ Ibid.

¹²² Ibid.

Nevertheless, there are signs that lead to moderate optimism about the outcome of future negotiations: public opinion is gradually raising awareness of the problem, which poses a potential stimulus to governments. Furthermore, several countries have announced emission stabilization targets in a unilateral way. In particular, the European Union has set a series of very ambitious targets to be achieved by 2020. In addition, it has institutionalized a market for greenhouse gas emission rights¹²³.

This commitment, if maintained, would represent a powerful message to those countries that until now have been the most reluctant to intervene and could approach the solution of one of the greatest collective action problems of contemporary international relations. As for the private sector, the probability that it will be affected by climate change seems very high. However, the level of such influence will crucially depend on a number of factors, the most obvious being the industrial sector. All companies will be affected, with varying intensity, by reputational and competitive pressures. Utilities, energy, mining, metallurgy and manufacturing industries will be the ones most affected by regulatory aspects, while the insurance, pharmaceutical and construction sectors will be the most affected by the physical consequences of the phenomenon. Firms destined to benefit from climate change are those that will be able to anticipate the main consequences for their industry, adapting the development strategy in a compatible way¹²⁴.

Renewable resources have the property to regenerate and that is why the future is based on them or an inexhaustible source of energy. The hope is that this innovation can produce wealth, opportunities for employment and changes in climate change. In fact, companies operating in the field of clean technologies take advantage of the investments made by the public sector to grow, through support measures, clean technologies. Each country has differentiated growth in a different way, thus obtaining different results. The most serious obstacles to clean technologies are rarely technical, but political and social. In order to grow new and risky sectors, we need support, we need subsidies and we need long-term commitment, both on the production side and on the market side. Moreover, governments must take account of a factual reality, that is that in most developed countries, cleaner technologies are already widespread, so investments must go towards the development of already existing technologies¹²⁵.

¹²³ Ibid.

¹²⁴ Ibid.

¹²⁵ Ibid.

Environmental Psychology: Killing ourselves consciously.

In questo Elaborato è stato affrontato il tema del cambiamento climatico e le conseguenze prodotte dall'attività umana sull'ambiente. Il cambiamento climatico è un pericoloso fenomeno di portata mondiale che sta danneggiando i sistemi naturali ed antropici della Terra, mettendo a repentaglio la sopravvivenza di numerose specie animali e vegetali. Nella prima parte della Tesi sono state analizzate alcune delle conseguenze prodotte dalle alterazioni climatiche. Quella principale riguarda il riscaldamento globale. La scoperta di questo fenomeno risale alla fine del XIX secolo quando lo scienziato svedese Svante Arrhenius, illustrò per la prima volta la teoria secondo la quale il biossido di carbonio generato dalla produzione industriale era una delle sostanze responsabili del cambiamento climatico. Da allora in poi, la consapevolezza che l'umanità ha un'influenza sul clima è cresciuta considerevolmente.

Il riscaldamento globale è un fenomeno caratterizzato dall'incremento della temperatura terrestre, determinato da un'eccessiva concentrazione di CO₂ e di altri gas inquinanti presenti nell'atmosfera. La causa principale del riscaldamento globale riguarda l'utilizzo indiscriminato di combustibili fossili nell'industria umana. Essi vengono utilizzati per soddisfare i consumi di elettricità e di riscaldamento legati al settore dei trasporti. L'incremento di metano e ossido di azoto, invece, è dovuto principalmente al settore agricolo. Anche il fenomeno della deforestazione contribuisce all'aumento di diossido di carbonio nell'atmosfera. Infatti, la distruzione delle foreste altera il fisiologico processo di assorbimento del CO₂ da parte degli alberi, aumentando indirettamente le sue concentrazioni nell'aria.

L'aumento delle temperature ha causato molte conseguenze negative per l'ambiente. Nello specifico, da alcuni anni si sta assistendo allo scioglimento dei ghiacciai in tutto il mondo, e in particolar modo nei poli terrestri. Secondo alcune previsioni, i ghiacci artici potrebbero addirittura essere soggetti a scioglimento completo già nell'ultima parte del secolo. La criosfera svolge un ruolo fondamentale nel sistema climatico globale e delle alterazioni delle sue caratteristiche possono produrre mutazioni del clima a livello mondiale. Uno degli effetti principali dello scioglimento dei ghiacciai riguarda l'innalzamento del livello dei mari che sta portando ad un aumento del rischio di inondazioni e sta mettendo a repentaglio la sopravvivenza degli ecosistemi marini che nei prossimi anni rischiano di sparire, a causa di questi cambiamenti repentini.

Un'altra conseguenza del riscaldamento globale riguarda la desertificazione. Secondo gli studiosi, se nei prossimi anni la situazione non cambierà, aumenteranno le aree desertiche e ciò comprometterà l'agricoltura. Il calo delle colture potrebbe provocare una minore disponibilità di cibo e un aumento del rischio di denutrizione della popolazione globale. Il cambiamento climatico sta danneggiando anche la biodiversità terrestre. Le attività antropiche e i mutamenti ambientali stanno portando ad un'estinzione di massa di numerose specie animali e vegetali sul pianeta. Secondo alcuni studiosi, la perdita di biodiversità, in particolare la scomparsa delle piante, potrebbe rallentare la lotta alle malattie e aumentare la diffusione di patologie infettive e autoimmuni.

Altri effetti del cambiamento climatico riguardano l'incremento di eventi meteorologici estremi, come ad esempio: uragani, cicloni, tsunami, alluvioni, siccità ecc... Negli ultimi decenni, infatti, si è assistito un aumento nella frequenza di questi fenomeni in varie aree del globo, anche in quelle tradizionalmente con condizioni climatiche più miti e stabili. Si tratta sempre più spesso di fenomeni improvvisi che mettono a repentaglio la sopravvivenza della specie umana e dei suoi insediamenti.

Negli ultimi anni c'è stato un crescente interesse per il tema del cambiamento climatico a livello globale. I governi del mondo e le comunità scientifiche hanno iniziato a svolgere importanti processi di negoziazione, al fine di trovare delle soluzioni efficaci per ridurre le emissioni di gas inquinanti nell'aria e ridurre il riscaldamento globale. Uno degli accordi più significativi è stato il protocollo di Kyoto che è stato ufficializzato nel 1997 e attuato negli anni duemila. Esso consisteva in una serie di azioni internazionali finalizzate alla riduzione dell'impatto delle attività umane sull'ambiente. Anche l'Unione Europea ha intrapreso azioni in tal senso, imponendo ai suoi membri una riduzione delle emissioni nei processi di produzione e nel consumo di fonti energetiche rinnovabili.

La Convenzione delle Nazioni Unite sui cambiamenti climatici (UNFCCC) ha definito il cambiamento climatico come: *"un cambiamento climatico che è direttamente e indirettamente attribuibile all'attività umana e che altera la composizione dell'atmosfera terrestre in misura maggiore rispetto alla sua naturale variabilità in periodi di tempo comparabili"*. Dunque, secondo l'UNFCCC, è l'uomo il principale responsabile dello stravolgimento del clima terrestre e degli effetti negativi prodotti sugli ecosistemi e sul benessere delle specie presenti sulla Terra, compresa quella umana. Essendo un fenomeno globale, necessita di azioni da parte di tutti i paesi industrializzati che si devono munire di misure adatte a contrastarne gli effetti. Infatti, il cambiamento climatico sta colpendo tutto il mondo, producendo effetti differenti a seconda della posizione geografica.

Attualmente l'uomo si trova nell'epoca geologica dell'Olocene. Essa fa parte del periodo quaternario dell'era cenozoica che cominciò circa 12.000 anni fa, al termine dell'ultima era glaciale. Durante l'era dell'Olocene, le condizioni climatiche sono state stabili, consentendo all'uomo di potersi espandere ed insediarsi in varie aree del globo. Tuttavia, in seguito ad alcune indagini condotte dagli scienziati, dove venivano analizzate le conseguenze prodotte dall'attività umana sulla Terra e sull'ambiente, si è ipotizzato che l'uomo possa trovarsi in una nuova era geologica denominata Antropocene. Tale ipotesi è nata dalla constatazione che negli ultimi decenni, circa la metà della superficie terrestre è stata trasformata dall'azione umana. Ciò è avvenuto principalmente in seguito alla rivoluzione industriale che ha modificato in maniera significativa l'attività dell'uomo e il suo stile di vita. Le ingenti produzioni di biossido di carbonio hanno modificato l'atmosfera e gli ecosistemi terrestri. Dunque, partendo da questa constatazione, gli scienziati hanno affermato che per la prima volta nella storia, l'essere umano è diventato una forza geologica in grado di modificare significativamente l'ambiente in cui si trova.

Il termine "Antropocene" fu coniato da Paul Crutzen negli anni Novanta, e indica una nuova epoca della terra dominata dall'attività umana. Questa nuova era geologica si distingue dalle precedenti per

l'impatto determinante dell'uomo sul clima e sull'ambiente. I sostenitori dell'Antropocene ritengono che questa era sia iniziata con la rivoluzione industriale del diciannovesimo secolo. Infatti, la maggior parte della comunità scientifica ritiene che dalla rivoluzione industriale ad oggi siano sorti una vasta gamma di importanti processi antropogenici che stanno modificando in maniera imprevedibile e irreversibile la Terra. Tra questi vi sono: la distruzione degli habitat degli animali, l'estinzione di specie animali e vegetali, l'aumento della temperatura della Terra, l'acidificazione degli oceani e l'alterazioni del ciclo idrologico, l'incremento dei processi di sedimentazione e di erosione del suolo, l'inquinamento atmosferico e lo scioglimento dei ghiacciai.

Dunque, il cambiamento climatico rappresenta l'elemento fondamentale dell'avvento dell'Antropocene. Questa era rappresenta lo stile di vita dell'Homo Sapiens, caratterizzato dalla globalizzazione, dal consumismo e dall'utilizzo intensivo delle risorse non rinnovabili della Terra. I cambiamenti climatici prodotti dall'umanità stanno producendo conseguenze imprevedibili, che stanno mettendo a rischio la sopravvivenza della specie, come ad esempio: eventi meteorologici estremi, epidemie, mancanza di cibo e acqua in alcune aree del pianeta, migrazioni di massa e instabilità politica. Uno degli aspetti principali dell'Antropocene riguarda l'aumento della popolazione umana e l'utilizzo sempre maggiore di energia e risorse. Se agli esordi dell'Olocene la popolazione umana era composta da circa 6 milioni di persone, oggi invece si parla di oltre 7 miliardi di individui, che secondo le previsioni dei ricercatori, dovrebbero diventare 11 miliardi entro il 2100. Ciò è dovuto principalmente al miglioramento delle condizioni di vita e alla maggiore disponibilità di cibo che hanno permesso a molte persone di vivere più a lungo.

Nonostante ciò, vi sono ancora 2 miliardi di persone che vivono in condizioni di estrema povertà e malnutrizione. La tecnologia ha consentito l'aumento dei livelli di produzione, portando l'umanità ad una crescita esponenziale e diventando parte integrante della vita dell'uomo. Tuttavia, l'incremento della produttività ha portato ad un aumento dell'inquinamento globale e all'alterazione dell'ecosistema terrestre, contribuendo a generare il cambiamento climatico globale. Secondo Crutzen, l'ideatore del termine Antropocene: *“l'Antropocene è l'unica epoca geologica in cui la natura non è una forza esterna che domina il destino degli uomini, al contrario, siamo noi a determinare i suoi equilibri e siamo perciò tutti chiamati a comportarci con saggezza e responsabilità”*. Lo scienziato ritiene che gli uomini debbano impegnarsi nell'adottare nuove tecnologie che utilizzano energie rinnovabili come il sole, il vento, la geotermia e le biomasse. Secondo Crutzen, quindi, la sopravvivenza del pianeta Terra è nelle mani di tutti gli uomini.

Il primo intervento politico di salvaguardia ambientale è stato il Protocollo di Kyoto ed era finalizzato a combattere il cambiamento climatico a livello globale. Secondo alcuni report dell'Organizzazione delle Nazioni Unite, grazie a questo protocollo, le emissioni dei Paesi firmatari sono diminuite del 24% tra il 1990 (anno di riferimento del protocollo) ed il 2012. Successivamente, nella Conferenza di Doha del 2012, gli obiettivi del Protocollo di Kyoto furono ampliati, invitando i Paesi industrializzati a ridurre le loro emissioni di almeno il 18% tra il 2013 ed il 2020.

Un altro importante patto stipulato recentemente dalle nazioni per prevenire i rischi legati al cambiamento climatico riguarda gli Accordi di Parigi. Ciò è avvenuto nella Conferenza sul clima di Parigi del 2015, dove 195 Paesi hanno firmato il primo accordo universale e giuridicamente vincolante sul clima mondiale. L'Accordo è stato raggiunto il 12 dicembre 2015 ma è entrato in vigore il 4 novembre 2016. Esso definisce un piano di azione globale con l'obiettivo di evitare cambiamenti climatici pericolosi e cercando di abbassare il surriscaldamento globale. Questo protocollo si applicherà a partire dal 2020. Il punto saliente riguarda il mantenimento dell'aumento medio della temperatura mondiale al di sotto di 2°C per ridurre in misura significativa i rischi e gli impatti dei cambiamenti climatici.

Tra i principali obiettivi stabiliti dell'Accordo di Parigi ci sono: mantenere l'aumento della temperatura media globale intorno a 1,5°C; ridurre l'inquinamento prodotto dai paesi industrializzati, attraverso la presentazione di piani d'azione nazionali globali improntati sulla sostenibilità ambientale; realizzare dei report ogni 5 anni per informare gli altri paesi degli obiettivi raggiunti; aumentare l'emissione di finanziamenti europei a sostegno della salvaguardia del clima sia nei paesi industrializzati sia in quelli in via di sviluppo; aiutare i governi a divenire più resilienti agli effetti dei cambiamenti climatici. Dunque, l'Accordo di Parigi costituisce un piano di azione globale, con l'obiettivo di rimettere in sesto il pianeta, che punta ad evitare pericolosi cambiamenti climatici.

Il cambiamento climatico rappresenta un problema globale e un rischio per la sopravvivenza e l'insediamento delle generazioni future. Per questo motivo, gli studiosi hanno analizzato quali sono gli aspetti psicologici che servono a sviluppare comportamenti individuali responsabili nei confronti dell'ambiente. A tal proposito, gli studiosi ritengono che l'analisi dell'environmentally responsible behavior (ERB) sia fondamentale per sostenere le azioni politiche e sociali per la salvaguardia dell'ambiente. L'obiettivo è promuovere la sensibilità e la consapevolezza pro-ambientale nella società nel suo complesso, attraverso diverse forme di intervento. Molti studi hanno tentato di identificare le caratteristiche che spiegano e predicono gli ERB. La maggior parte degli interventi a favore dell'ambiente sono fondati su principi provenienti dall'analisi funzionale del comportamento. Questo approccio sostiene che le conseguenze di un'azione possono rappresentare un incentivo o un disincentivo a metterla in atto. Questi effetti, quindi, possono essere utilizzati per modificare o promuovere un ERB.

Tuttavia, la ricerca in questa direzione ha rivelato che anche se gli incentivi o le punizioni possono essere utili per generare ERB, i loro effetti sono praticamente nulli in termini di cambiamento a lungo termine. A questo proposito, alcuni autori come Eisenberger e Cameron hanno messo in discussione l'efficacia di rinforzi come istigatori del cambiamento. Infatti, quando si osservano cambiamenti comportamentali motivati dagli incentivi, ci sono meno probabilità che questi rimangano stabili nel tempo. Ciò accade poiché la persona conosce la ragione che ha portato al cambiamento e una volta che il motivo scompare, il cambiamento non si mantiene, in quanto non è sostenuto da un atteggiamento mentale o da dei valori sottostanti.

La maggior parte delle spiegazioni sugli ERB sono concordi nel ritenere che questi comportamenti sono intenzionali e sostenuti da specifiche motivazioni, finalizzate ad evitare un problema, ad esempio per ridurre le minacce per la salute, per ridurre il consumo di acqua ecc. Secondo il modello di Schwartz, il comportamento è motivato dal sistema di valori individuale, caratterizzato da credenze e atteggiamenti che precedono l'azione. Inoltre, i valori che guidano il comportamento sono ordinati gerarchicamente e possiedono una motivazione generale funzionale.

Secondo la psicologia ambientale, le credenze che determinano gli ERB si distinguono tra motivazioni fondate su interessi ecocentrici e quelle fondate su interessi antropocentrici. L'antropocentrismo vede l'essere umano come l'entità dominante in natura ed è a favore delle trasformazioni ambientali al fine di soddisfare le sue esigenze e i suoi interessi. Questo approccio è stato considerato all'origine delle pratiche che hanno causato l'attuale crisi ambientale globale. L'ecocentrismo, invece, considera gli esseri umani solo come un altro elemento all'interno del sistema ecologico. L'essere umano è considerato come uno dei tanti esseri viventi della Terra. Thompson e Barton hanno scoperto che solo l'ecocentrismo è collegato positivamente con il comportamento proambientale. Kasser and Ryan hanno analizzato il contenuto degli obiettivi che le persone si prefiggono, distinguendo tra motivazioni intrinseche e motivazioni estrinseche. Le prime cercano di soddisfare i bisogni psicologici di autonomia e competenza, come auto-accettazione, affiliazione o sentimento comunità o salute, mentre i secondi si riferiscono all'ottenimento di un riconoscimento sociale come il successo economico e la popolarità.

Un altro modello famoso è la teoria cognitiva sociale di Bandura. Secondo l'autore, sono due i processi fondamentali nell'acquisizione di meccanismi che regolano il comportamento: uno è basato sull'esperienza diretta con i rinforzi e le punizioni ricevute e l'altra si basa sul ruolo della modellizzazione o dell'apprendimento vicario. L'apprendimento attraverso i rinforzi o gli errori è un processo lungo perché richiede un'esaustiva strategia analitica e può essere eccessivamente costoso se gli errori commessi comportano una penalità elevata. Inoltre, se non esiste una strategia analitica, la durata della motivazione è limitata alla presenza del rinforzo o penalità. Tuttavia, imparare dagli altri è meno costoso ed è un processo altrettanto potente. La modellizzazione o l'apprendimento vicario è un processo basato sul confronto sociale quando si osserva il comportamento degli altri e si accertano gli effetti che questo comportamento genera. Quando, in questo processo di confronto, l'osservatore si identifica con il modello, l'osservatore percepisce che possono eseguire lo stesso comportamento con risultati ugualmente soddisfacenti. Pertanto, non è necessario eseguire un'azione poiché basta osservare gli altri per sentirsi in grado di realizzare la suddetta azione.

Per quanto concerne le teorie sugli aspetti psicologico che ostacolano i comportamenti pro ambientali, Espen Stoknes, direttore del Center for Green Growth presso il Norwegian Business School di Oslo, ritiene che ci siano cinque difese interiori che impediscono alle persone di mettere in atto queste azioni. La prima è la distanza, espressa in termini di luogo e tempo. Generalmente, i problemi del cambiamento climatico interessano aree geografiche lontane e si riferiscono a tempistiche lunghe che non

riguardano personalmente gli individui. La seconda difesa è desensibilizzazione agli eventi catastrofici che si determina per l'abitudine che le persone sviluppano udendo frequentemente brutte notizie legate al clima. Il terzo meccanismo di difesa è la dissonanza. Il buon senso dice che non dovremmo utilizzare continuamente automobili o altri mezzi di trasporto inquinanti. Tuttavia, tutti usano macchine, prendono aerei o treni per andare al lavoro o in vacanza. Questa contraddizione tra pensiero e azione genera una dissonanza. La quarta difesa è la negazione ed è collegata alla dissonanza. A causa delle sensazioni sgradevoli generate dalla dissonanza, gli individui fingono di non essere a conoscenza dei rischi dei loro comportamenti. L'ultima difesa è l'identità. L'identità definisce chi è l'individuo ed è connessa a come il governo lo identifica. Se il governo è insensibile alle tematiche ambientali, anche l'individuo tenderà ad identificarsi con questo comportamento.

Per contrastare queste difese, Espen Stoknes propone alcune soluzioni. La distanza può essere eliminata con l'aiuto dei social network che possono accrescere l'informazione e la consapevolezza degli effetti del cambiamento climatico. La dissonanza può essere trasformata in supporto, attuando azioni semplici e convenienti per ridurre la contraddizione tra pensiero e azione. La negazione può essere ribaltata con la visualizzazione dei progressi individuali. Se si ottengono dei feedback motivanti per i piccoli gesti quotidiani, si è più motivati a modificare il proprio comportamento. Infine, è possibile cambiare l'identità trovando credenze individuali positive su di sé, in relazione all'impegno ambientale.

Attualmente, i governi democratici non sono ancora riusciti a dare una risposta forte e decisiva per arrestare il processo di degradamento ambientale. Per fermare il cambiamento climatico sono necessari accordi multilaterali tra le nazioni affinché si possano realizzare azioni congiunte per ridurre l'inquinamento e modificare stili di vita e di produzione dannosi. Tuttavia, i patti multilaterali non sono ben visti dalle nazioni democratiche. Infatti, gli accordi di cooperazioni tendono ad indebolire il potere sovrano nazionale e la relazione tra politici ed elettorato. Essi, infatti, implicano rigidi vincoli per i paesi aderenti che non sempre producono vantaggi per i cittadini nel breve termine. La cooperazione internazionale, dunque, appare ancora oggi difficoltosa e complessa ed è responsabile di interventi politici e sociali non sufficientemente efficaci per contrastare i rischi del cambiamento climatico.

Nelle democrazie, sono i cittadini che autorizzano i loro rappresentanti a negoziare e stipulare i termini della cooperazione internazionale. Per questo motivo, i democratici che tentano di affrontare le problematiche dell'Antropocene devono affrontare sfide di legittimizzazione degli interventi ambientali nei confronti della società civile. Le problematiche che la democrazia si trova a dover affrontare includono: le conseguenze degli interventi sul clima producono effetti a lungo termine, mentre nel breve termine sembrano non produrre vantaggi; la disinformazione e i pregiudizi intertemporali dei cittadini possono influenzare ed essere influenzati dalla politica; un'altra problematica riguarda la legittimità intergenerazionale, infatti, non vi sono garanzie che le politiche a lungo termine possano raggiungere gli obiettivi previsti o che in futuro le condizioni di vita delle persone miglioreranno; nelle democrazie è presente il diritto di veto che può consentire alle minoranze di opporsi alle decisioni politiche per favorire

alcuni strati della popolazione. Ciò può ostacolare e ritardare l'approvazione di interventi a favore della tutela ambientale.

Il crescente interesse dell'Unione Europea nei confronti della salvaguardia ambientale, ha portato alla nascita di una serie di iniziative per incentivare le città che adottano uno stile produttivo e di vita sostenibile. Dal 1996 la Commissione Europea sull'Ambiente ha deciso di assegnare il titolo di "Capitale Verde" a una città europea con almeno 200.000 abitanti, che si sia distinta in ambito di sostenibilità e di politiche adottate sui temi di: contributo locale per la lotta al cambiamento climatico, trasporti pubblici e soluzioni di mobilità sostenibile, smaltimento dei rifiuti, accessibilità degli spazi verdi pubblici, inquinamento acustico, impiego dell'acqua e qualità dell'aria e gestione sostenibile del territorio.

La prima ad aver raggiunto questo traguardo è stata Stoccolma. La capitale svedese ha conseguito importanti risultati riguardo alla riduzione dell'inquinamento acustico, al raggiungimento di elevati standard di pulizia dell'acqua e all'elaborazione di un innovativo sistema di smaltimento rifiuti. La capitale svedese produce il 60% della sua energia da fonti rinnovabili. Il dato più sorprendente è quello che riguarda la mobilità: il 90% degli abitanti si muove in bici, a piedi o con mezzi pubblici. Per quanto riguarda la gestione dei rifiuti, essi vengono opportunamente separati e raccolti in cisterne sotterranee svuotate da enormi aspiratori e avviati al riciclaggio, evitando così antiestetici cassonetti e minimizzando i costi della raccolta. Grazie al sistema di riutilizzo e riciclaggio efficiente solo una piccola parte dei rifiuti finisce nell'inceneritore. Per quanto riguarda la produzione di energia e i mezzi di trasporto, l'energia elettrica proviene da pannelli solari presenti sui tetti degli edifici, in grado di garantire l'illuminazione degli spazi comuni e metà del fabbisogno di acqua calda per uso domestico. I mezzi di trasporto sono anch'essi attenti all'ambiente, ad esempio gli autobus pubblici vanno ad etanolo.

Un'altra città premiata dalla Commissione Europea sull'Ambiente nel 2014 è stata Copenhagen. Copenhagen è circondata da acqua, parchi e spazi verdi ed è una delle città più popolose dell'intera Danimarca. Inoltre è all'avanguardia nel campo della ricerca e sviluppo, che costituisce uno dei più importanti settori dell'economia locale. Negli ultimi anni, la città si è distinta per aver abbracciato la filosofia della green economy a tutto tondo, attivando numerose iniziative riguardanti la sostenibilità ambientale, la riduzione delle emissioni di GHG e l'efficienza energetica.

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