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1.0 INTRODUCTION

In recent years we have all become aware of the fact that the climate is changing, an indisputable fact is that of the average global temperature, which has been growing for more than a hundred years. More and more frequently we are witnessing extreme events scattered all over the planet, to name a few, hurricanes in the United States, in the Philippines, droughts in Iraq, California or Brazil, incessant rains that involve significant damage, especially in France and Italy. Due to the drought, enormous damage to agricultural production has also been detected in the south of the United States, Russia, sub-Saharan Africa, and the increase in global average temperatures is also affecting glaciers, whose surface area has been reduced by 75% in ten years. Other events that have indelibly marked world stability in recent years have also been hurricanes, especially Hurricane Sandy in 2012 in New Jersey which destroyed in a few hours 9% of the GDP of that state and 4.5% of the GDP of the state of New York. But why is the climate changing? How could we act to control (at least partially) and make these phenomena "marginal"? How to reduce the cave of resources, which almost daily affects each of us? How can we make up for inequalities? The cause of this change can be said to be mainly the action of man, from the consumption of fossil energy to the irrational use of the soil, from the devastation and destruction of forests to the excess of urbanization. An action that began several years ago and is difficult today to contain. The change we are having today in terms of the environment could lead, tomorrow, to much more serious and complex economic damage, to be managed and contained, much more significant even than those of a possible economic crisis, with related problems related to unemployment, pension management and the monetary crisis. It is the climate itself that guarantee the stability of the economic systems we have and when this stability was to fail, everything would collapse. It is therefore our duty to ask ourselves: how can we limit climate change? The answer probably lies in the economic decisions that are taken daily, both at state, national, community, world, and individual and subjective level (therefore linked to the particularity of each of us), in investment decisions (for example with reference to also to the energy sector), in infrastructure policies, in models of sustainable development and in all those choices that can stem the ongoing climate change. To act in this way to safeguard ourselves in the first place, and the human species, but also future generations, the animal and plant species that currently exist, and our planet. It is necessary to emphasize the need to change our consumption behaviors, production systems, we must try to reduce as much as possible the emissions of any type of harmful substance that increases the greenhouse effect, (one of the main causes of the current climate situation), but not only at an individual level, also collectively. This

enterprise, today not too easy to implement, especially with reference to the habits and the system in which we live, which over the years we have matured and consolidated. It is much easier to invest with a view to mere profit without considering the "environment and protection" factor, rather than weighing all the investments or our actions according to what could be the consequences at the environmental level.
The work is structured as follows:

• Chapter 1: a general and scientific analysis of climate change is proposed in this chapter. The reference goes to the sixth and final IPCC Report of 2020, (Intergovernmental Panel on Climate Change, an international organization established in 1988 by the World Meteorological Organization (WMO) and (United Nations Environment Programme) UNEP.

• Chapter 2: this chapter provides an analysis of existing legislation on the "environment". The reference goes from international agreements and treaties to European legislation and UNFCCC (United Nations Framework Convention on Climate Change).

CHAPTER 1

2.0 THE WORLD WE HAVE CHANGED AND IN WHICH WE MUST LIVE

The climate today is changing, but, this has always changed, especially if the reference goes to rather long periods of time. Referring to a rather recent past, there have been significant changes, with reference to the trend of the average temperature variation, starting from the Industrial Revolution, which has led to a profound and irreversible transformation of the production system, the economic system and the social one. But what period does the reference go to? It is possible to list the succession of three types of Industrial Revolution:

• A first Industrial Revolution starting from the second half of the '700, with reference to the textile and metallurgical sector, which is responsible for the introduction of the flying fuse and the steam engine.

• A second Industrial Revolution that is conventionally made starting from 1870, which led to the introduction of electricity, chemicals, and oil.

• A third more recent Industrial Revolution, which began in the 1970s, which involved a massive introduction of electronics, telecommunications, and information technology.

Starting from the first Revolution, therefore, and then continuing to the present day, the climate and in particular the temperature, have undergone a significant increase, so much so that these last years have been the hottest in terms of average world temperature in recent centuries. But "with a steadily rising global average temperature due to an increasingly hot climate, climate extremes are becoming more frequent and intense" (Carraro C, 2015). A differentiation must certainly be made regarding the areas of the Earth, as the temperature variations were different between the various regions; probably in Italy we have witnessed

to phenomena much less significant than in areas such as Australia, Brazil, or Iraq, but this does not mean that change is not taking place. In a report entitled "Climate change, impacts and vulnerability in Europe 2016 – An indicator-based report", published by the EEA in 2017 (European Environment Agency) it is argued first that:

• Future climate change will have interactions with socio-economic developments

• Climate change, which is now affecting all European regions, has uneven impacts.

As far as the forecasts for Europe are concerned, the areas of the south and south-east will be the hottest regions and will have the greatest number of sectors seriously affected. Coastal areas and floodplains in

western Europe will also be affected in many areas. The Alps and the Iberian Peninsula will be affected in ecosystems and their services. Ecosystems and human activities in the Arctic will be significantly disrupted due to rising air and sea temperatures, which will result in a melting of land and sea ice (EEA, 2017). A recent report by the Intergovernmental Panel on Climate Change (IPCC) states that summer heat waves or heavy rainfall are much more frequent today than they were in the mid-twentieth century and it is possible to say that these are the direct consequence of the rapid global warming of the last 150 years. In addition, based on data provided by the Intergovernmental Panel on Climate Change, it is shown that the amount of solar energy that is absorbed by our planet is always growing and therefore the Earth, not being in energy balance, is destined to become increasingly hot in the coming years and decades.
But what is meant by extreme events? Examples can be the frequent and intense summer heat waves, disasters caused by fires and droughts, weather events such as heavy rains and hurricanes. The relationship between climate change and extreme weather events is becoming increasingly defined, as is the relationship between greenhouse gas emissions (among which carbon dioxide can be mentioned as the protagonist) and climate change. Over the last 20 years, the conclusions reached by the IPCC are increasingly certain and to date we can say that the main cause of climate change that we can witness daily is 95% human greenhouse gas emissions (IPCC, 2013a). If man is therefore the cause, it is man who must act in order to fix the damage. Research by a professor of physics at the University of California, Richard Muller, as part of a project called "PROJECT BEST", has shown that the earth's surface has warmed by about 1.5 °C (on average) in the last 250 years, of which 0.9 °C only in the last 50 years. Moreover, the correspondence between the increase in temperature and that of the concentration of carbon dioxide in the atmosphere, today represents the main explanation of climate change, which are therefore, also in this case, almost entirely attributable to human activity.
The analysis conducted by the teacher in the BEST project, considers data from 1753, data of about a century older than those of previous research and analyzes recordings from a few measuring stations about 5 times greater than those generally considered, in such a way as to be able to have almost the certainty of the fact that the world is really overheating and that the causes are really to be attributed to man. R. Muller's idea was to be able to disprove those who claimed that scientific research brought serious errors within it: for example, only the data of the campaigns were considered, as objectors argued that the contribution of urban heating was of significant impact, for the purposes of a reliable analysis, or that there was a poor quality of the weather stations or a human intervention directly on the data. The

result obtained led to the conclusion that none of the factors mentioned here has ever compromised the reliability of the research. The sudden temperature collapses that occurred between 1750 and 1850 had their explanation mainly in volcanic eruptions: these have in fact progressively spread in the atmosphere a substance called particulate matter, which reflecting sunlight causes the earth's surface to cool for a few years. The rapid but brief changes in temperatures, (in this case we are talking about changes that lasted a few years), were then attributed to changes in ocean currents, and the contribution of the Sun to global warming was considered irrelevant, an element that could be considered initially as a possible factor of influence in the increase in temperatures. The changes in temperature are therefore explained in the combination of the activity of volcanoes (which, however, have the effect of reducing them) and the emission by humans of greenhouse gases, which instead lead to their increase. It is possible to conclude the paragraph by stating that, the climate is changing today and the increase in temperatures we are witnessing (the reference goes to what was mentioned initially and then to the specific value of 1.5 ° C), explained by the difference between the measurement of the concentration of carbon dioxide detected by atmospheric samples and the air trapped in the polar ice , is mainly due to greenhouse gases emitted by man, considered today one of the major factors responsible for the rise in temperatures.

2.1 DEFINITION OF IPCC.

First, what is the IPCC referred to in the previous paragraph? The IPCC refers to the Intergovernmental Panel on Climate Change, an organization established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP). This organization aims to assess, based on scientific, technical, and socio-economic data and evidence, the risk of climate change induced by humanity, the possible consequences and has the possibility to suggest possible solutions for the reduction of such changes. To date, 195 countries take part in this body, and it is configured as a neutral information tool on which governments and policy makers can base their political decisions and actions. It is based mostly on the need for these (but not only) to have a scientific and reliable, transparent, and objective support to understand the risk deriving from climate change induced by human activities. The IPCC's scientific activity is based in Geneva and its main activity is to publish periodic reports on the state and stage of climate change. 11 The IPCC is a body that is part of the United Nations, and as such publishes its documents exclusively in the 6 official languages of the UN (Spanish, English, Chinese, Russian, French, and Arabic) (IPCC, 2012). The first report dates to 1990 and following this publication

an intergovernmental committee has created, within the United Nations, the United Nations Framework Convention on Climate Change, which came into force in 1994 and was ratified by 189 countries. The second report was issued in 1995 and led to the approval of the 1997 Kyoto Protocol. A third and fourth report were published in 2001 and 2007 respectively; these two reports have in particular confirmed and made increasingly evident the links between the accumulation of greenhouse gases in the atmosphere and the rise in temperature and have also underlined the growing probability of extreme weather events, with the clarification that when preventive measures are not taken to protect the environment, future climate developments could be much wider than those observed so far and in the past. The fifth and final report came out in 2013. (In the next paragraph, what emerged in the latest report on ongoing climate change will be examined in detail.) Another important contribution of the IPCC was the "Special Report on renewable energy sources and climate change mitigation" of 2011. The main objective of this report is to scientifically assess the potential of the use of renewable energy in the mitigation of climate change phenomena. The conclusions of the paper suggest the implementation of intervention policies aimed at fully exploiting the technological potential given by renewable sources, so that such an attitude can then lead to the coverage of about 80% of the world's energy needs by 2050.

2.2 SCIENTIFIC EVIDENCE – V IPCC REPORT.

The IPCC's Fifth Assessment Report, published in 2013, considers new evidence of climate change based on numerous independent scientific analyses: from observations of the climate system to paleoclimatic archives, to theoretical studies on climate processes, to simulations using climate models (IPCC, 2013). This report represents a fundamentally important basis for information on climate changes and extreme weather events in recent years. All the observations that have been made, with reference to the climate system, are based on direct measurements and remote sensing from satellites and other platforms. Global-scale observations of temperature and other variables began in the mid-nineteenth century, with complete and exhaustive observations particularly for the period from the 1950s onwards. Paleoclimatic reconstructions allow to reconstruct climatic data up to hundreds of millions of years ago. These data, therefore, taken together, provide a complete and comprehensive overview of long-term climate change and variability in the atmosphere, ocean, cryosphere and earth's surface. According to the IPCC, the warming of the climate system is undeniable and, since the 50s, many of the climate changes observed are unprecedented (on time scales ranging from decades to millennia): the atmosphere and oceans have

warmed, the amounts of snow and ice have decreased, sea levels have risen, and greenhouse gas concentrations have increased. Scientific evidence for the following categories follows:

• Atmosphere

• Oceans

• Cryosphere

• Sea level

• Carbon cycle and other biogeochemical cycles.

Atmosphere. The atmospheric temperature of the Earth's surface shows that each of the last three decades has been in sequence warmer than any previous decade since the 1850s.

In the northern hemisphere, the period 1983-2012 was probably the warmest thirty years in the last 1400 years.

• Global average earth surface temperature data (considering both land and ocean) show warming of 0.85°C in the period between 1880 and 2012. The total increase, considering the average of the period 1850-1900 and 2003-2012 is 0.78°C

• Since about 1950, changes have been observed for many weather events and extreme weather events. It is very likely that globally the number of cold days and nights has decreased, while the number of hot days and nights has increased. The frequency of heat waves is likely to have increased in large areas of Europe, Asia, and Australia, but it is likely that there will be more landmass where the number of intense precipitation events has increased than those where it has decreased. The frequency or intensity of heavy rainfall is likely to have increased in North America and Europe. In the table below you can get an overview of extreme weather and climate events. An assessment was made on a global scale:

• of the recent changes observed

• the anthropic contribution to change

• further changes planned for the period between 2016-2035 (early XXI century) and 2081-2100 (end of xxi century).

OCEANS. The warming of the oceans is connected to the increase in energy stored in the climate system and is responsible for more than 90% of the energy accumulated between 1971 and 2010. It is virtually certain that the surface ocean (0-700mm) warmed up between 1971 and 2010, and it is likely that it also warmed up between 1870 and 1971.

• On a global scale, ocean warming is greater near the surface. The upper 75 meters warmed by 0.11°C in the period between 1970 and 2010

• From 1957 to 2009 it is likely that the ocean warmed up between 700 and 2,000 meters, from 1992 to 2005 observations are available that allow to say that there has been a change in temperature below 2,000 meters. It is also likely that in this period the ocean warmed from 3,000 meters to the seabed, with the greatest warming observed in the Southern or Antarctic Ocean.

• More than 60% of the climate system's net energy increase accumulated in the surface ocean (0-700 meters) between 1971 and 2010. About 30% was stored by the ocean below 700 meters

• It is very likely that since the 50s the regions with high salinity, in which evaporation predominates, have become more saline, while the regions with low levels of salinity, in which precipitation predominates, have become sweeter. This shows that the phenomena of evaporation and precipitation above the oceans have changed.

CRYOSPHERE.

What is cryosphere first? A cryosphere (from the Greek kryos = ice, cold) is the portion of the earth's surface covered by solid water and which includes the icy covers of seas, lakes and rivers, snow cover, glaciers, polar ice caps and icy soil in a temporary or perennial way. The cryosphere is an integral part of the global climate system and has important connections and feedbacks generated through its influence on solar radiation absorbed by the surface, moisture flows, clouds, precipitation, hydrology, and atmospheric and oceanic circulation. It also plays a very significant role in the response to global climate change. Over the past 20 years the ice sheets in Greenland and Antarctica have lost their mass, glaciers have continued to retreat across almost the entire planet, while the extent of Arctic Sea ice and spring nervous cover in the northern hemisphere have continued to decline in extent.

• The average rate of ice loss from glaciers worldwide (IPCC, 2013), except for some glaciers and ice sheets, is very likely to have been 226 Gt/year in the period between 1971 and 2009 and 275 Gt/year10 between 1993 and 2009.

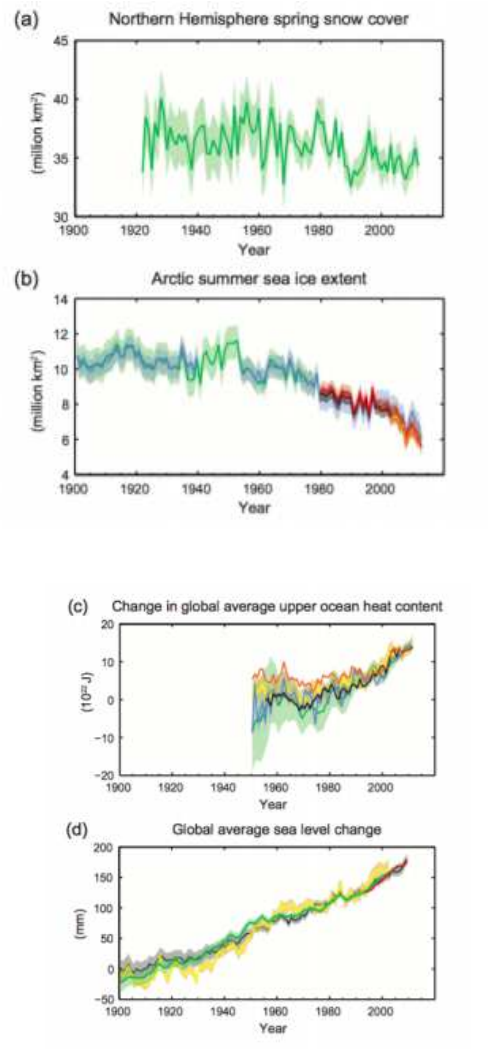
• The average rate of ice loss from the Greenland ice sheet is likely to have increased considerably from 34 Gt/year between 1992 and 2001 to 215 Gt/year between 2002 and 2011

• The average rate of ice loss from the Antarctic ice sheet is likely to have increased from 30 Gt/year between 1992 and 2001 to 147 Gt/year between 2002 and 2011

• The average annual extent of Arctic Sea ice decreased over the period 1979-2012 with a likely rate of

3.5/4.1% per decade. The average reduction per decade in arctic sea ice extent was faster in the summer; from the reconstructions there is an average confidence that in the last 30 years the retreat of arctic sea ice in summer has been unprecedented and that marine surface temperatures have been abnormally high at least compared to the last 1450 years

• It is very likely that the average annual extent of Antarctic Sea ice increased to a rate of between 1.2 and 1.8% per decade, in the period between 1979 and 2012. However, there are strong regional differences for this rate, with an extension increasing for some regions and decreasing for others. The following graphs present the observed multiple indicators of global climate change.



Source: IPCC (Intergovernmental Panel on Climate Change), (2013) "Climate Change 2013 – The Physical Science Basis", IPCC V Report, Scientific Dossier. "Summary for policy makers", p 8.

2.3 IPCC SIXTH ASSESSMENT REPORT

According to the latest report of the Intergovernmental Group of Experts on Climate Change (IPCC), released on August 9, scientists are observing changes in the Earth's climate in all regions and in the climate system. Many of observed changes in climate are unprecedented in thousands, but in hundreds of thousands of years, and some of the changes that are already taking place, such as the continued increase in sea level, they cannot be reversed for several centuries or millennia.

However, a substantial and sustained reduction in carbon dioxide emissions carbon (CO_2) and other greenhouse gases would limit climate change. Although improvements in air quality would be rapid, it could take between 20 and 30 years until global temperatures stabilized, according to the report by the Group of IPCC Work I, Climate Change 2021: Physical Bases, approved on Friday by the 195 Member governments of the IPCC, in an approval meeting held in virtual format throughout It lasted two weeks and started on July 26.

The report of Working Group I represents the first delivery of the Sixth Report of IPCC Assessment (IE6), to be completed in 2022. "This report reflects extraordinary efforts made under circumstances exceptional," said Hoesung Lee, Chairman of the IPCC. "Innovations and advances in climatology reflected in this report constitute an invaluable contribution to the negotiations and decision-making on climate. "

- Accelerated heating

The report offers new estimates of the odds of surpassing the global warming level of 1.5°C in the coming decades, and concludes that, unless greenhouse gas emissions are reduced immediately, rapidly and on a large scale, limiting warming to about 1.5°C or even 2°C will be an unattainable target.

According to this report, greenhouse gas emissions from human activities are responsible for a warming of about 1.1 °C from 1850-1900, and the global temperature averaged over the next 20 years is projected to reach or exceed a warming of 1.5 °C. This data is the result of the improvement of observational datasets to assess historical warming, as well as progress in scientific knowledge of the response of the climate system to human-produced greenhouse gas emissions. "This report is a reality check," said IPCC Working Group I Co-Chair Valérie Masson-Delmotte. "We now have a much clearer view of the climate. past, present and future, which is fundamental to understanding where we are headed, what can be done and how we can prepare."

While many of the characteristics of climate change depend directly on the level of global warming, often

what people experience is very different from that global average. For example, warming on the earth's surface is higher than the global average and, particularly in the Arctic, warming is more than double. "Climate change already affects all regions of the Earth in multiple ways. Any increase in warming will exacerbate the changes we are experiencing," said IPCC Working Group I Co-Chair Panmao Zhai. The report's projections indicate that in the coming decades climate change will increase in all regions. According to the report, with global warming of 1.5 °C, there will be an increase in heat waves, warm seasons will lengthen, and cold seasons will be shortened, while with global warming of 2°C episodes of extreme heat would more often reach critical tolerance thresholds for agriculture and health. However, it is not just a question of temperature. As a result of climate change, different regions are undergoing different changes, which will intensify if warming increases; in particular, changes in humidity and dryness, winds, snow and ice, coastal areas, and oceans. For example:

- Climate change is intensifying the hydrological cycle. This leads to higher rainfall intensity and associated flooding, as well as more intense droughts in many regions.
- Climate change is affecting precipitation patterns. At high latitudes, rainfall is likely to increase, while it is forecast to decline in much of the subtropical regions. Changes in monsoon rainfall are expected, which will vary by region.
- Coastal areas will experience continued sea-level rise throughout the twenty-first century, contributing to coastal erosion and making coastal flooding more frequent and severe in low-lying areas. Extreme sea level-related phenomena that formerly occurred once every 100 years could be recorded with an annual frequency by the end of this century.
- Further warming will amplify the melting of permafrost, as well as the loss of seasonal snow cover, the melting of glaciers and ice sheets, and the loss of Arctic Sea ice in summer.
- Changes in the ocean, such as ocean warming and acidification, increased frequency of marine heat waves, and reduced oxygen levels, are clearly related to human influence. These changes affect both ocean ecosystems and the people who depend on them and will continue to occur for at least the rest of the century.
- In the case of cities, some aspects of climate change can be amplified, heat (as urban areas tend to be warmer than their surroundings) and flooding due to episodes of heavy rainfall and rising sea levels in coastal cities.

The Sixth Assessment Report provides for the first time a more detailed analysis of climate change at the

regional level
— with a particular focus on useful information that can serve as a basis for risk assessment, adaptation, and other decision-making
— as well as a new framework that helps translate physical changes into climate. (Heat, cold, rain, drought, snow, wind, coastal flooding, etc.) in what they represent for society and ecosystems. This regional information can be found in detail in the new Interactive Atlas interactive-atlas.ipcc.ch.
Human influence on past and future climate "For decades it has been evident that Earth's climate is changing, and the role of human influence in the climate system is indisputable," Masson-Delmotte said. However, the new report also reflects important advances in the scientific underpinnings of attribution, i.e., in understanding the role of climate change in the intensification of certain meteorological and climatic phenomena, such as extreme heat waves and heavy rainfall. The report also shows that human actions can still determine the future course of the climate. There is clear evidence that carbon dioxide (CO_2) is the main cause of climate change, although other greenhouse gases and air pollutants also affect the climate. "If we want to stabilize the climate, it will be necessary to substantially, rapidly and sustainably reduce greenhouse gas emissions to finally achieve net zero CO_2 emissions. Also, limiting other greenhouse gases and air pollutants, especially methane, could be beneficial for both health and climate," Zhai said.
Climate Change 2021: Physical bases. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change The report of Working Group I addresses the most up-to-date physical understanding of the climate system and climate change, bringing together the latest developments in climatology and combining diverse lines of evidence from paleoclimate, observations, knowledge of global and regional climate processes and simulations. It sets out how the climate has changed to date and the reasons for that change, as well as a better understanding of human influence on a wider range of climatic characteristics, including extreme events. Greater attention will be paid to regional information that can be used to assess climate risks.

2.4 IEA ROADMAP FOR THE GLOBAL ENERGY SECTOR TO 2050

So that the average temperature of the planet does not rise more than 1.5 ° C compared to the pre-industrial era, an explicit objective of the Paris Agreement backed by IPCC scientists to avoid a global climate cataclysm, more and more countries have set the goal of climate neutrality for the year 2050,

including Italy. However, it is still not too clear how this milestone can be achieved while continuing to pursue economic growth, as most countries and even international organizations such as the EU have not yet fully detailed how they intend to achieve it, focusing for the moment on intermediate objectives for the next decade. Something you want to remedy the International Energy Agency (IEA), which has designed for the first time a roadmap to achieve net zero emissions by mid-century in the energy sector, one of the main responsible for the generation of greenhouse effect emissions.

The good news is that, thanks to this report, you can see that the planet really has " a viable path to build a global energy sector with net zero emissions by 2050." The bad news is that, according to the IEA, this path " is narrow and requires an unprecedented transformation of how energy is produced, transported and used worldwide." In other words, it is necessary to carry out far- reaching energy reforms as soon as possible, including measures such as vetoing new oil or gas operations from now on and banning combustion cars in less than 15 years.

“Our roadmap shows the priority actions needed today to ensure that the narrow but achievable opportunity to reach net zero emissions by 2050 is not missed. The scale and speed of the efforts required to achieve this formidable goal, our best opportunity to address climate change and limit global warming to 1.5 ° C, make this perhaps the greatest challenge humanity has ever faced”, said Fatih Birol, executive director of the IEA.

And it is that, according to this international agency, the climate promises of governments to date, even if fully achieved, would not meet what is required to bring global carbon dioxide emissions related to energy to zero for half a century. It would also be necessary to meet the more than 400 milestones established by the roadmap, including prohibiting any investment in new fossil fuel supply projects or the construction of new thermal plants. The ultimate goal is none other than for the global electricity sector to reach climate neutrality by 2040, which would allow governments to focus in that last decade on other less polluting areas.

According to the IEA, complying with this roadmap would not only be essential for the climate fight, but would also allow an increase in world GDP of 4% compared to current trends. This "robust economic growth" would further establish "a profitable and economically productive path, resulting in a clean, dynamic and resilient energy economy dominated by renewable energies such as solar and wind rather than fossil fuels." In addition, as the IMF recently pointed out, the jump in public and private spending that would mean an acceleration of the energy transition would create "millions of jobs in clean energy."

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A short-term turnaround

In the short term, the report ensures that the path to climate neutrality requires the immediate and massive deployment of all available clean and efficient energy technologies, since it is necessary that the annual additions of photovoltaic solar energy reach 630 gigawatts by 2030, and those of wind energy reach 390 gigawatts. Figures that are difficult to achieve since, together, they mean exceeding four times the record level established in 2020; in fact, in the case of photovoltaic solar energy, this acceleration would be equivalent to installing almost every day "the largest solar park in the world"

In addition, from the IEA they ensure that increasing energy efficiency is also an essential part of these efforts, since a global rate of improvements in energy efficiency of 4% per year on average is needed until 2030, approximately three times the average of the last two decades. In other words, it is not only necessary to accelerate the pace of installation but also to decisively drive innovation.

The report entitled "Net zero by 2050: a roadmap for the global energy sector" begins with an analysis of the commitments of governments, which even if fulfilled would not be enough to reach climate neutrality by 2050 and thus limit the global temperature increase to 1.5 ºC. In this roadmap, with more than 400 milestones, he guides the way indicating what must be done and when it must be done to reach net zero by 2050.

2020- Paths to zero emissions are narrow

Staying on the path to zero emissions requires the massive deployment of all available clean energy technologies - such as renewables, electric vehicles, and the rehabilitation of energy efficient buildings - by 2030.

In the case of solar energy, it is equivalent to installing the largest solar park in the world today approximately every day.

2025- Increasing investment in clean energy will create millions of new jobs

It will significantly boost global economic growth and achieve universal access to electricity and clean cooking around the world by the end of the decade.

2030- We need to drive big leaps in clean energy innovation

Most of the reductions in CO_2 emissions until 2030 come from technologies that are already on the market. But in 2050, almost half of the reductions come from technologies that are currently in the demonstration or prototype phase.

In this decade, great innovation efforts must be made so that these new technologies reach the market on time.

2035- A rapid abandonment of fossil fuels

Net zero implies a huge decrease in the use of coal, oil and gas. To do this, it is necessary to take measures such as stopping the sale of new combustion engine passenger cars before 2035 and phasing out all coal and oil power plants before 2040.

2040- Electricity becomes the core of the energy system

It will play a critical role in all sectors, from transport and buildings to industry. Electricity generation will have to reach net zero emissions worldwide by 2040 and be on track to supply almost half of total energy consumption.

This will require a huge increase in the flexibility of the electrical system - such as batteries, demand response, hydrogen-based fuels, hydropower and others - to ensure a reliable supply.

2045- New low-emission industries flourish

New energy technologies will be very widespread. The vast majority of cars on the road will run on electricity or fuel cells, airplanes will rely heavily on advanced biofuels and synthetic fuels, and hundreds of industrial plants will use carbon capture or hydrogen around the world.

2050- A world of clean energy

The global energy sector in 2050 relies heavily on renewable energy, with solar being the largest source of supply. Achieving this cleaner and healthier future will depend on a singular and unwavering approach by all governments, working closely with businesses, investors, and citizens. It will also require increased international cooperation between countries, especially to ensure that developing economies have the finance and technologies they need to reach zero on time.

Energy efficiency

Today there are many energies efficient solutions for buildings, vehicles, appliances, and industry that can be scaled up quickly, creating many jobs in the process. Our path quickly implements all of these on a large scale so that the average rate of energy efficiency improvement in the 2020s is triple the average of the last two decades.

3.0 THE IMPACTS OF CLIMATE CHANGE ON AGRICULTURE

The second volume of the 2013 IPCC V Report deals with the impacts of climate change for the future and in particular highlights the fact that these will be mostly negative and will only increase and/or worsen if significant action is not taken to reduce greenhouse gas emissions. The environmental damage that we have all helped to create is not only a threat to nature or animals, but also to our own species, our well-being, and our survival. Some examples of environmental conditions that could negatively affect our lives could be the following:

• The low availability of fresh water (due to drought or overexploitation of the resource) implies a serious risk for many African, European, Asian, and Central American regions

• The agricultural income can be compromised (for example due to lack of water, due to a high level of soil pollution, excessive pesticides, etc.), so we could see a progressive reduction in agricultural production in the future (which could in turn impact on human health in terms of food safety), which will then probably be followed by a significant increase in product prices

• A rise in sea level, with a progressive erosion of the coasts that can bring considerable damage to the populations concerned. Environmental conditions therefore affect the quality of life of all of us and other species, as well as our health. Poor water quality or the presence of harmful substances in water or air can also lead to serious consequences: in 2012, exposure to air pollution in outdoor environments led to about 3.7 million deaths in low- and middle-income countries. The specialized agency of the World Health Organization (WHO), the International Agency for Research on Cancer (IARC), has classified air pollution among the main causes of lung cancer. Focusing at this point on the European reality, according to what was stated in a Report of the European Environment Agency of 2017, ("Climate change, impacts and vulnerabilities in Europe to 2016"), the changes we have observed in the climate are already having their repercussions in Europe on:

• Ecosystems

• Economy

• Human health (and not only)

• Well-being.

New records continue to be set for global and European temperatures, rising sea levels and the reduction of sea ice in the Arctic. Rainfall is changing, making some regions even wetter and other regions even

wetter. The volume of glaciers and snow cover is decreasing, while extreme weather events are increasing heat waves, heavy rainfall, or drought, and according to forecasts, these events are set to increase in the coming years in many European regions. "Climate change will continue for many decades to come. The extent of future climate change and its impact will depend on the effectiveness of the implementation of global agreements to reduce greenhouse gas emissions.

- AREAS SENSITIVE TO CLIMATE CHANGE.

As already mentioned, all European regions are vulnerable to climate change, but the repercussions will differ from region to region. It is estimated that southern and south-eastern Europe will be areas that are more sensitive to climate change, particularly about the negative repercussions. These regions are and have already faced heat waves, decreases in rainfall and river flow, which have in turn led to droughts, falling crop yields, loss of biodiversity and increased forest fires. Frequent heat waves and changes in the distribution of infectious diseases sensitive to climate change could increase risks to human health and well-being. Coastal areas and flood plains in the west of Europe, on the other hand, are exposed to a different risk: that of flooding linked to rising sea levels and a possible increase in storm surges. Climate change is also, as previously anticipated, is having great changes in marine ecosystems in terms of acidification of the oceans, due to warming and expansion of oxygen-free dead zones. The Arctic region, on the other hand, will be affected by a rapid increase in temperatures, both air and sea, and there will be a progressive melting of both land and sea glaciers. Most European regions will therefore suffer negative consequences, except for some areas of northern Europe, which could see positive effects including an improvement in the conditions for agriculture.

3.1 ECOSYSTEMS, HUMAN HEALTH AND THE ECONOMY.

Climate change and other stressors (such as changes in land use) could lead to pressure in European ecosystems and protected areas, in terms of the threat to terrestrial and marine biodiversity. Many animal and plant species are progressively undergoing changes in their life cycle, many animals are migrating, for example to the north or to higher altitudes, while other species have invaded certain territories and have expanded their area of influence. These changes, including the migration of species, could have important consequences from the point of view of agriculture and fisheries and in turn also affect the food chain. The effects of climate change on health are linked to extreme weather events, changing the distribution of infectious and climate-sensitive diseases, and changing environmental and social conditions. Flooding of rivers and coastal areas has caused injuries, infections, and exposure to chemical

risks in recent years; heat waves have led, for example, to premature deaths; the spread of ticks or mosquitoes could lead to the development and spread of new, even serious diseases. If preventive measures are not taken to reduce all activities involving risks to health and the environment, these events will increase and intensify. The economic costs of climate change can often be very high. Since 1980, extreme weather events that have occurred in the member countries of the European Environment Agency have led to economic losses of more than 400 billion euros. It is difficult, however, to estimate what the costs for the future could be, both as regards Europe and as regards the entire planet.
In an article in the Sole24Ore of September 10, 2015 entitled "The ten threats that dictate the agenda of the great – The greatest concerns according to a survey among 1,800 opinion 25 leaders conducted by the World Economic Forum" (Vittorio Da Rold, 2015), the 10 most important global threats are indicated, among which we can mention, in particular, pollution in developing countries, the occurrence of extreme climate phenomena, stress in terms of water supply and a greater incidence of health in the economy. The ten threats according to what was published by Sole24Ore are as follows:

• Income inequalities: growing inequalities are identified as one of the reasons why the world economy, with the fall in consumption, has jammed
• Unemployment: understood as economic growth without job creation
• Lack of leadership: the risk is that political weakness will transfer to the level of foreign policy, thus also weakening relations at global level
• Geostrategic competition: there are fears of a movement of greater local tensions and crises that favors confrontation over dialogue. These tensions would be added to those already present, for example, in Ukraine, Syria, Iraq, etc.
• Increasingly weak democracy: risk of populism, political movements offering easy solutions to complex problems
• Pollution in developing countries: we often choose excessive growth at the expense of quality and respect for the environment, thus creating problems for future generations and for the territory itself
• Extreme climatic phenomena: water bombs, violent rainfall, rivers in flood, extreme drought, all phenomena that are spreading with increasing frequency and that must be faced in a vision of international collaboration
• Increased nationalism: erecting barriers to trade would be a serious mistake
• Stress on water supply: water is becoming a strategic resource not only in desert or drought-prone areas,

but also, in regions that have never had supply difficulties

• A greater incidence of health in the economy: a greater weight of health due to the difficulties of adapting health systems to demographic trends (ageing), also linked to a greater risk deriving from the spread of infectious diseases.

3.2. THE IMPACTS OF CLIMATE CHANGE IN DEVELOPING COUNTRIES.

As already mentioned in the previous paragraphs, progressive climate change has negative implications on global health, and this can be called one of the greatest threats of the twenty-first century. The health risks due to climate change are numerous and derive from the increased intensity of extreme phenomena that contribute to the worsening of health, especially of the elderly. The focus in this paragraph is on developing countries. In Africa it is estimated that the population at risk of malaria will increase by 170 million by 2030 and that at risk of dengue, a tropical infectious disease transmitted by mosquitoes, by 2 billion by 2080. The floods will intensify the contamination of drinking water reserves, hence the health risks to those who use them. The drought, too, will affect food and agricultural product security. To these elements are also added indirect effects, but to these related, such as:

• Economic instability

• Increase in conflicts

Both linked to the scarcity of resources, which will then have their consequences in terms of security and equity and may be determining factors for the spread of phenomena such as climate migration.

Developing countries are perhaps the most exposed and most vulnerable to diseases and extreme weather events that occur due to climate change and perhaps also the least equipped to overcome losses and possible damage. The World Health Organization (WHO) is the United Nations Agency specialized in health issues and is joined by 194 Member States divided into Europe, the Americas, Africa, the Eastern Mediterranean, the Western Pacific, and Southeast Asia. It was established in 1948 and is based in Geneva.

Also, in the Section Climate Change (www.who.int/topics/climate/en/), (WHO – World Health Organization), it is stated that it is now known to all that the climate is changing and that the earth is becoming warmer. This change, however, has the effect of affecting the health of human beings, and this can happen in many ways, for example:

• Altering the balance of some geographical areas, also with reference to infectious diseases

• Altering ecosystems to produce food

• Increasing the frequency of extreme weather events, such as hurricanes.

A report by the World Health Organization entitled "Climate change is affecting our health – Something should be done now", dated November 12, 2009 (WHO, 2009), provides an overview of how climate change is affecting human health, with reference to the African reality. Climate change is progressively endangering the security of life in Africa: this region is also suffering the consequences of global warming as temperatures are gradually increasing in a way that is no different from the world average (although it can be said that this continent is only marginally responsible for the changes taking place compared to other countries). Even in Africa the intensity and extent of the rains has undergone changes, the trend that has manifested itself in recent times is that of more variable rains or extreme rains, or rains combined with periods of drought in key areas, for example in South Africa. The perspectives given by the IPCC indicate that the African continent will also undergo a progressive warming in the coming years, as well as the globality of the Earth, especially in the 2nd subtropical regions. East Africa and the northernmost part of the Indian Ocean are likely to see an annual increase in rainfall, while in southern Africa there is likely to be a gradual reduction in rainfall in many regions. In the others on the other hand, the trends are more uncertain, but a general increase in variability is expected to occur with a higher rate of floods and a greater drought. Africa has long suffered from the hardships deriving from climate sensitivity, with the highest rate of malnutrition, diarrhea, and malaria, which is close, as far as malaria is concerned, to about 90% of the global rate. In recent years, human health within the African region has been negatively affected by climate variability and we have seen progressive changes in the transmission of infectious diseases via water and/or air. In addition, among the phenomena that can put the health of African populations at risk, we can also indicate the scarcity of water, the occurrence of natural disasters such as those initially mentioned (floods and droughts) and finally the decrease in the variety of agricultural production and food, which can worsen and / or increase the risk of malnutrition. All this is exacerbated by the fact that, in the African region, there is a great weakness in the provision of prevention and treatment services, mainly due to a low availability of water and sanitation and sanitation. The effects of climate change can therefore affect the African region more quickly and more seriously than other countries, this being a country certainly with few or less defenses than others. There will therefore be an increased risk to human health due to:

• Extreme weather events

• Further reduction in the availability of food and drinking water

• Increased spread and transmission of infectious diseases.

The African population has so far developed many strategies to address climate variability, but these could be compromised when climate change continues and occurs over a long period of time. So, what could be the answers to protect the health of African populations? The answer to this question depends primarily on the decisions that are being taken today. (In the next chapter, the national, European, and international legislation in force on the preservation and protection of the environment, as well as human health and other species) will then be presented, analyzed, and examined. Current health systems already provide protection against risks that could arise from climate variability and climate change (polluted air, water contaminated, spread of disease, food uncertainty), but these systems could have weaknesses and could occur unsuitable when the impacts of climate change were to change or occur that are particularly decisive for African health. It is therefore necessary to act urgently, in terms of strengthening current policies and health protection measures not only for the African reality but in a global perspective, so as to be able to improve the capacity of health systems and cope with the possible difficulties arising from the problems related to climate change. In fact, the problem in question does not only affect Africa or developing countries in general: the heat waves of 2003 led to 70,000 deaths in Europe and a study by the Department of Public Health and Clinical Medicine of a Swedish university estimates that the mortality due to heat waves between 1980 and 2009 was twice as high as it would have happened without the effect of climate change. It is therefore a problem of global importance that affects all of us, regardless of the country, continent, or region in which we live.

3.3 THE AGRICULTURAL SECTOR.

As also mentioned in paragraph 2 of this chapter, the possible impact of climate change in the various food chains and in the agricultural sector should not be overlooked either. Inevitably, in fact, changes in terms of climate are also synonymous with changes in terms of food and, above all, food security. Global warming has already had its influence in the agricultural sector and in the future the impacts on food production are likely to be increasingly significant. According to the forecasts made by the IPCC, if we continue to emit a rate of polluting gases and fumes similar to the current one, we could reach more than 4 °C of increase in the global average temperature (compared to pre-industrial levels) by the end of the century, also by adopting urgent measures to mitigate emissions (despite the fact that the international community has set itself the goal of limiting the increase in the global average temperature to no more

than 2 ° C compared to the pre-industrial era – in the next chapter the theme in question will be analyzed in detail). Considering the aspect from an international perspective, as already mentioned initially, many countries are already suffering the consequences of climate change, with reference to the increase in the average temperature of 0.8 ° C that we have witnessed in this last century. The entire ecosystem is undergoing changes, 84% of the economic impacts related to drought are absorbed by the agricultural sector and the food security of many people is endangered (especially if the reference goes to developing countries, as they are less equipped and therefore more vulnerable to change). The World Bank has repeatedly raised the alarm for the food emergency because if temperatures were to rise, even if only by 2 ° C, there would be a reduction in productivity, for example: of soybeans of 30-70% in Brazil and 50% of wheat in Brazil, Central America, and the Caribbean.

3.3.1 AFRICA.

In Sub-Saharan Africa, a warming of temperatures of, for example, 1.5°C or 2°C would result in a loss of 40-80% of maize, millet, and sorghum crops between 2030 and 2040. If, on the other hand, the increase in temperatures were to reach 4 ° C, in Southern Africa there would most likely be a reduction in annual rainfall of 30% in 2080 and in East Africa instead, these would undergo a progressive increase, with a possible start of conflicting migration processes. Sub-Saharan Africa is a region in great demographic expansion, expected to go from 800 million people to 1 and a half billion by 2050 and given the forte economic dependence on the agricultural sector, the severity of impacts such as those described above is evident (strong reduction in precipitation related to a reduction and loss of crops).

3.3.2 ASIA.

In Southeast Asia, especially in coastal areas, there will be a rise in sea level, which could reach up to 30 cm in 2040 and connected to this there will be a loss of crops (of about 12%) in the Mekong Delta area, the largest production area in Vietnam. South Asia, on the other hand, will be hit by monsoons with unstable frequency, these will divide the dry areas from the areas with an overabundance of water. The snow loss of the Himalayas will then reduce the inflow of water in some rivers such as in the Inns, Ganges, Brahmaputra. South Asian agricultural productivity is expected to increase by about 60% in 2040 when there is no climate change, but this percentage would be reduced to 12% when temperatures were to rise by even just 2°C.

In the scientific dossier, published by the Food and Agriculture Organization of the United Nations (FAO) and the Intergovernmental Panel on Climate Change (IPCC) in January 2017, entitled "FAO-

IPCC – Expert meeting on climate change, land use and food security" (FAO-IPCC, 2017), it is possible to have a scientific report on ongoing climate change, land use and food security. A translation and personal summary of some of the contents of the dossier are provided in the following paragraphs.

3.4 CLIMATE IMPACTS ON LAND USE, FOOD AND AGRICULTURE, AND RELATED ECOSYSTEMS (Climate change has an influence on crop production, livestock production, fisheries, and aquaculture).

Today we have a high awareness of what could be the negative consequences of too high temperatures and lack of water in crops, but less awareness of what the consequences are in terms of livestock feeding, livestock production, fisheries, and aquaculture. We have at our disposal a wide literature (reports, surveys, dossiers, etc.) on what are the effects of climate change or available water resources, but despite this many doubts and uncertainties remain about the role of carbon dioxide (CO_2) and its effects in the terrestrial system and ecosystem and in the global system of the water cycle. In addition, very often the information concerning the impact of climate change on current and future resources, (especially groundwater), is limited in scope and probably needs to be further developed in the future. We need to know in detail the future impact of sea rise and related climate change, both with reference to the quality of coastal waters, and about coastal agriculture (coastal currents, temperatures, degree of salinity of water, nutritional factors, etc.). There are many studies that address climate change in soils, but many of them overlook the link between agriculture and food security, probably due to the great diversity of data available. The literature we have today, concerning topics such as:

• Climate impacts

• Pests of animal crops

•Possible diseases

is mainly based on case studies but it is necessary that it is used in a more understandable and practical way, as we need to have much broader and more reliable data on these aspects, so that we can integrate them with the available models and then better study the yields of crops and their effects in the supply of food. In terms of food safety, two elements of fundamental importance require particular attention:

• Use

• Stability.

About the use of food, the focus is in this case on the impact of climate change on food quality. We are witnessing a progressive reduction in the proteins and nutrients contained in crops and milk-based

products and this are probably the result of an increase in the concentration of carbon dioxide in the atmosphere. On the other hand, about the stability of food, agricultural shocks caused by extreme weather events have their consequences in terms of:

• Increase in product prices

• Reduction of the variety of food supply (and therefore also of food).

The (increasing) change in the frequency and intensity of extreme weather events and the volatility of the prices of agricultural products, are today much more harmful than the effects of gradual climate change. It is therefore of fundamental importance to try to analyze the impact of climate change through risks ("food shocks") and their transmission in the various sectors, to be able to assess the impact of food security in all its dimensions and have an overall picture of the situation at 360 °.

4.0 CLIMATE CHANGE AND FOOD SECURITY - THE FRAMEWORK DATA

Climate change will affect food security in several ways have: The rising temperatures influence the growth conditions of plants. Climate change is increasing in many parts of the world Change precipitation pattern. In rain-fed agriculture, the rain only comes for a few weeks too late, or if the distribution is concentrated on a few heavy rain events, this can have a negative impact on the harvest results. In addition to the changes in the Precipitation patterns will result in entire regions becoming drier. The available more water resources will become significantly scarcer. This affects both the water for personal use as well as for agriculture. In numerous regions to which the extreme weather increases. Heavy rain events, heat waves, floods, drought as well as the severity of hurricanes, typhoons and other strong storms gain weight. The expected rise in sea level threatens a whole range of fruitful lands to flood or to flood the most volatile lands worldwide in coastal plains and river delta areas to contribute to salinization in the soil and in the groundwater. It is still difficult to quantify the number of people whose food security entity may be affected by the effects of climate change, as the existing studies still have high uncertainties and mainly focus on the global balance sheet from produced food. With the regional studies, however, there is one strong north-south divide. While the effects of climate change in industrial countries are examined more closely, the study density in developing countries is considerable.

- With a temperature increase of up to one degree compared to the pre-industrial era the possible increase in hunger or malnutrition will be very small. Foremost temperate climates, especially in industrialized countries, are even being improved growing conditions predicted during most tropical countries Will see

declines in average crop yields.

- Should the temperature rise be between one and three degrees Celsius the negative effects increase significantly. Some studies then always see still a profit in the industrialized countries, whereby these effects vary depending on the developments the scenarios for the expected amount of precipitation accept genes. In "drier" scenarios, declines in harvest for northern America, Russia and Eastern Europe predicted, while in the "wetter "rise. Once again, tropical countries and regions that are already dry are becoming special be affected by declines in crop yields. With an increase of approx.2.5 ° C, around 45-55 million additional people will suffer from hunger and under-nutrition, with an increase above 2.5 °C 65-75 million people.

At 3-4 ° C. An increase in temperature is estimated to reach 80-125 million people will also suffer from hunger and malnutrition. Other studies estimate that if the temperature rises by more than 3 ° C, between 3.3and 5.5 billion people live in countries / regions where losses are severe are to be expected in terms of plant growth potential.

- The effects of the temperature increase on the lower amounts of precipitation and the distribution of precipitation. Should the temperature rise If the temperature remains below 2 ° C, the studies assume that up to 1.5 billion. In addition, people could be affected by water scarcity, a number that goes up at the end of the century will decrease again, as the water consumption and Water retention techniques will improve significantly. Beyond one According to a study, 600 million people and with an increase of up to 2.5 ° C possibly up to 2.4-3.1 billion people will be affected by increasing water scarcity. A major role estimating these numbers, the enormous demand for water plays the fast-growing megacities, especially in China and India.

- Drought regions will continue to grow on all continents and especially from Heavy rainfall will be affected.

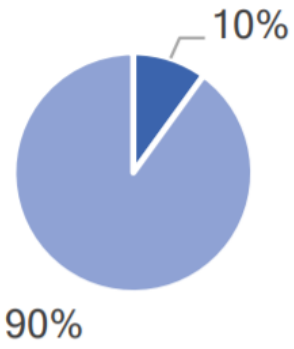
4.1 AGRICULTURE AND CLIMATE CHANGE, THE OPINION OF THE EUROPEAN ENVIRONMENT AGENCY.

The European Environment Agency (EEA), on the theme "Agriculture and climate change", claims that agriculture contributes to climate change, but in turn suffer the effects (EEA, 2016). To tackle climate change, the EU should reduce greenhouse gas emissions from agriculture and review food production systems. Climate change, however, is only one of the pressures to which agriculture is subjected, in fact, given the ever-increasing world demand and the race for resources, the production and consumption of

food in Europe are almost "irrelevant", if compared to world demand. It is therefore necessary to find the right balance between agriculture, energy, and food security. Food is a primary need of fundamental importance, for human beings but not only and, for the purposes of our health and well-being, it is necessary to try to pursue a healthy and balanced diet. In recent years we have developed an increasingly complex and increasingly globalized system for the production and supply of food, to be able to meet the different demand for food, (for example today a fish from the Atlantic could be served after a few days in a restaurant in Prague perhaps with rice from India). European food products are in fact exported daily all over the world and vice versa, we import products from other countries every day. But at this point the questions that can be asked can be the following: how does agriculture contribute to climate change? What are the effects of climate change on agriculture? Most of the food we eat comes from: • Produced; • Preserved; • Worked; • Packaged; • Transported; • Prepared; • Served. In each of these phases, however, greenhouse gases are produced, harmful to our planet and our ecosystem, in particular methane and nitrous oxide. Methane is produced by cattle during digestion, due to enteric fermentation and is subsequently excreted through flatulence; nitrous oxide emissions are instead an indirect product of the use of organic and mineral nitrogen fertilizers. In 2012, agriculture contributed 10% of greenhouse gas emissions from the EU. Between 1990 and 2012 there was a reduction in greenhouse gas emissions from the EU of 24%, thanks to a significant decrease in the number of livestock, the use of fertilizers and better management of manure.

2012: % GREENHOUSE GAS EMISSIONS IN THE EU

- AGRICULTURE
- REST



In the rest of the world, however, agriculture is taking the opposite direction: between 2001 and 2011, global emissions from agriculture and livestock increased by 14%. This increase has taken place in many developing countries and is due to the increase in overall agricultural production. The phenomenon described here derives from a greater demand for food products and changes in the dynamics of food consumption, mainly caused by the increase in income in some developing countries. Emissions from enteric fermentation increased by 11% in this period and in 2011 contributed to 39% of total greenhouse gas production. However, a further reduction in greenhouse gas emissions from the agricultural sector is problematic (also considering the prospect of a global population increase), although there is scope to reduce and mitigate emissions related to food production in the EU, given by the integration of innovative techniques and production methods (e.g. methods of capturing methane from manure , a more efficient use of fertilizers, a more organized food production leading to a reduction in emissions per unit of product). Beyond these advantages in terms of reducing emissions in the agricultural sector (given by innovative techniques and production methods), changing one's lifestyle habits can contribute to further lowering greenhouse gas emissions attributable to the production of food products: for example, meat and dairy products have the greatest impact in terms of carbon production and consumption of raw materials and water per kg of food. Therefore, by reducing food waste and the consumption of foods that generate this large amount of greenhouse gases, we can help reduce emissions from agriculture. To answer the second question posed at the beginning of the paragraph, namely what the effects of climate change on agriculture are, it is first necessary to know that, to grow and develop, crops need the right quantity and quality of:

• Land
• Water
• Sunlight
• Heat.

The increase in temperatures certainly affects the duration of the growing season, especially cereals ripen and are harvested several days earlier than in the past, and these changes will continue to occur for a long time and in many regions. In northern Europe, agricultural productivity could increase because of the extension of the growing season and the fact that ice could not remain in the soil and new products could also be grown. In southern Europe, on the other hand, extreme heat waves, the reduction of precipitation and therefore also the availability of water could have a negative impact on agricultural productivity,

which may therefore be increasingly variable from year to year, particularly due to extreme climatic phenomena or the spread of pests and diseases. Changes in temperatures and growing seasons could also affect the proliferation and spread of certain species, such as insects, weeds, and diseases, which could therefore significantly ruin agricultural production. Part of the potential losses could be offset by agricultural practices, for example:

• Crop rotation according to periods of water availability

• Change of sowing dates depending on of temperatures and precipitation

• Cultivation of agricultural varieties more suited to new conditions.

Food from the soil is not the only one to suffer the consequences of climate change: the distribution of fish resources has also undergone changes in the North-East Atlantic area, with consequences for communities that base their food chain on the consumption of fish. The rise in water temperature has 36 caused an increase in maritime traffic, but it can also facilitate, at the same time, the settlement of invasive marine species, with the consequent collapse of fish resources. (European funds have been set up to help populations suffering economic damage from climate change, including the European Agricultural Fund for Rural Development, the Common Agricultural Policy (CAP), and funding has been provided by the European Investment Bank so that it can help farmers and fishing communities adapt to climate change.)

The forecasts for the future, however, in a medium-long term perspective, are as follows:

• Population increase

• Change in eating habits in favor of greater meat consumption.

The global demand for food could increase by up to 70% in the coming decades and since agriculture is one of the economic sectors that already generate a great environmental impact, this could further increase in the future. How, then, can the growing demand be reduced and at the same time reduce the environmental impact of the production and consumption of these products in the EU? Reducing food is not a possible solution, as the EU is also one of the largest producers of food in the world. (The EU produces 1/8 of the cereals, 2/3 of the wine, 1/2 of the sugar beets, 3/4 of the olive oil produced worldwide). A reduction in EU products would have consequences in terms of food security and would contribute to the rise in food prices globally. Increasing the amount of food produced using an already exploited soil often implies greater use of nitrogen-based fertilizers, which emit nitrous oxide, which is harmful to the environment. Intensive agriculture and fertilizers also release nitrates into soil and water:

their presence in water can cause eutrophication, which promotes the growth of algae, reduces the amount of oxygen present in the water and thus also affects life and water quality. It is therefore a real problem to satisfy a future growing demand for food, since:

• Allocating additional land areas for cultivation has consequences in terms of climate and environmental impact

• Converting wooded areas into agricultural land generates an additional emission of greenhouse gases, as deforestation endangers biodiversity and undermines nature's ability to adapt to climate change.

CHAPTER 2

5.0 INTERNATIONAL POLICIES AND AGREEMENTS FOR THE PROTECTION OF THE ENVIRONMENT

International policies and agreements have a very significant importance today, for the purpose of safeguarding our planet. An example that can be given concerns the importance of these with reference to the agricultural sector. It is now known that the world needs to produce an ever-greater quantity of goods (food, water, electricity, etc.) and that the resources we have available are limited. We have already examined that agriculture has a strong impact on the environment and the climate, and the ongoing climate change in turn affects the quantity, quality, and location of food production. What to produce, how to produce and where to produce are now socio-political issues, of great importance both for the present and for the future. In recent years, a global competition has developed to grab essential resources, also in view of the impact of climate change: the most developed countries are buying large areas of agricultural land in the least developed countries, but this phenomenon, together with the effects of climate change, poses doubts about food security, (with particular reference to developing countries), as food security is not only given by the available amount of food but also by the nutritional levels available for each product.

This rather complex problem, however, requires the adoption of coherent and integrated policies to address issues such as:

• climate change
• energy,
• food safety.

Given the ongoing climate change and the competition for scarce resources, the entire food system must be transformed to become more rational, including from the point of view of resources. In addition, the idea of working with a view to constant commitment, to reduce environmental impacts, including greenhouse gas emissions, must be shared. It is therefore necessary to increase productivity and, at the same time, reduce dependence on chemical fertilizers, reduce food waste and the consumption of food goods that, like meat, involve intensive exploitation of resources and the production of greenhouse gases. Policy interventions, therefore, aimed at addressing this problem, cannot fail to consider the impact of agriculture on the environment (and beyond) and its socio-economic importance (EEA, 2016).

Climate change is a topic of constant importance for economic activities, for governments and for all societies. Our future (and that of the entire planet) depends on the actions that are taken today (for

example aimed at reducing greenhouse gas emissions), but the less we change from the point of view of political choices, probably the greater the future impact of climate change (University of Cambridge, 2013).

The European Environment Agency, in the "Policy Instruments" section, states that policies play a key role in determining and improving the state of our environment. Since the adoption of the First Environmental Action Program in 1973, environmental policies in Europe have made significant progress and since then several hundred environmental legal acts have been adopted. In particular, the evaluation of environmental policies makes it possible to identify the most effective policies and ways of working, as well as the contributions that can be made to "live well within the limits of our planet" (EEA, 2016).

5.1 LEGAL CONCEPT OF ENVIRONMENT AND PROTECTION.

The environment constitutes a unitary juridical good of primary and absolute constitutional value. The evolution of constitutional jurisprudence has contributed to the overcoming of the traditional interpretative thesis that supported the versatile nature of the "environmental matter" and as such capable of combining within it both the protection of landscape and cultural heritage (environment cultural), both the discipline against pollution (ecological environment), and the government of the territory (urban environment).

5.2 OBJECTIVE: TO MAINTAIN THE GLOBAL AVERAGE TEMPERATURE WITHIN 2°C.

According to the IPCC's V Report (as explained in Chapter 1 of the paper), our climate is changing, and the extent of this change depends on how quickly and to what extent we will be able to reduce greenhouse gas emissions into the atmosphere. It is therefore necessary to try to limit the increase in global average temperatures and try to reduce greenhouse gas emissions to avoid possible negative consequences of the climate system (EEA, 2015).

Worldwide, the average temperature of the earth's surface has increased by about 0.8°C since 1880, but on the European continent the increase has been greater, by about 1.4°C. Scientific evidence indicates that, with increasing probability, irreversible and potentially catastrophic environmental changes could occur if the global average temperature were to exceed by 2°C that of the pre-industrial era (or exceed current levels by 1.2°C). Thirteen of the fourteen warmest years ever recorded so far belong to this century. Recent analyses indicate that current interventions by governments around the world are not sufficient to prevent temperatures from rising by more than 3°C by the end of this century, but an

increase of 4°C or 6°C is not excluded.

5.2.1 INTERNATIONAL POLICY FOR MAINTAINING THE TEMPERATURE WITHIN 2°C.

As already mentioned in the previous paragraph, from an international point of view, within the framework of the United Nations Framework Convention on Climate Change, the international community has set itself the goal of limiting the increase in the average global temperature to no more than 2 °C compared to the pre-industrial era. In fact, as already mentioned, if the average temperature were to rise above 2 °C, climate change could have a much more serious impact on our health, the natural environment, and the economy. An average increase of 2°C means that, in fact, the temperature could most likely rise a lot in some parts of the planet, especially in the Arctic, where warming risks jeopardizing ecosystems unique to the world (EEA, 2015).

Globally, forecasts indicate that greenhouse gas emissions are likely to continue to increase year by year. This global challenge therefore implies an equally global response. International action is therefore essential, as climate change has no borders. The steps that have been taken so far in the international arena are as follows:

• 1992: ADOPTION OF THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC). The United Nations Framework Convention on Climate Change (UNFCCC), (approved in 1992). It was the first international agreement of rather large scope on combating climate change. It was ratified by 196 countries, including all the EU Member States of the time, and established a framework that allows countries to work together with the aim of preventing human activities from generating dangerous interference with the global climate system. The Convention has as its objective "the stabilization of greenhouse gas concentrations in the atmosphere at a level low enough to prevent anthropogenic interference harmful to the climate system"

• 1997: ADOPTION OF THE KYOTO PROTOCOL. The Convention examined above was supplemented by the Kyoto Protocol, the International Treaty that obliges industrialized countries to reduce greenhouse gas emissions. The Protocol was adopted at the third session of the Conference of the Parties (COP3) held in Kyoto, Japan, entered into force in 2005 and represents the first attempt to reverse the global upward trend in emissions. In fact, it provides for reductions or quantitative limitations of greenhouse gas emissions for 38 industrialized countries and the EU with the possibility of using flexible mechanisms, such as emissions trading (in Paragraph 3.1 of the following Chapter it is treated in detail).

• 2011: AGREEMENT ON A NEW PLATFORM TO NEGOTIATE A POST -2020 AGREEMENT. At the initiative of Europe and developing countries, the UN Climate Conference (2011) decided to launch a new round of negotiations, this time with the aim of agreeing a global climate treaty that requires the intervention of all countries, both developed and developing. This agreement should enter into force in 2020 (European commission, 2014).

• 2015: THE PARIS AGREEMENT HAS BEEN REACHED, THE FIRST UNIVERSAL AGREEMENT TO FIGHT CLIMATE CHANGE. After more than 20 years of negotiations, governments adopted the First Universal Agreement to combat climate change at COP21 (the 21st Conference of the Parties), the United Nations Framework Convention on Climate Change (UNFCCC) in Paris.

• 2016: THE PARIS AGREEMENT ENTERS INTO FORCE (4 November 2016). This Agreement seeks to keep the increase in the global average temperature "well below" 2°C and at the same time seeks to limit the temperature increase to 1.5° above pre-industrial levels. "To achieve this objective, the Parties aim to stabilize global greenhouse gas emissions as soon as possible and to achieve net zero emissions in the second half of the century. The sources of funding must follow up these objectives. For the first time, all parties must make ambitious efforts to reduce greenhouse gas emissions following the principle of 'common but differentiated responsibilities and capacities', based on their respective situations and possibilities. Every five years, all countries must renew and update their climate action plans ("nationally determined planned contributions") and report them in a transparent manner to allow for the assessment of collective progress ("global budget"). In particular, the most vulnerable countries, the least developed countries and small island developing states will be supported both through financing and through capacity building. The concept of adaptation – which appears on an equal footing with that of mitigation – is recognized as a global challenge, as is the importance of coping with the 'losses and damage' associated with the adverse effects of climate change. The agreement entered into force in November 2016 after being ratified by at least 55 governments representing at least 55% of global greenhouse gas emissions (European Parliament, 2017)

5.2.2. EUROPEAN POLICY FOR MAINTAINING THE TEMPERATURE WITHIN 2°C.

As already mentioned, the European Union has also set itself long-term objectives for the mitigation of climate change; in 2013 the EU had already reduced greenhouse gas emissions by 19% compared to 1990 levels and in 2015 targets were:

• A further 20% reduction in emissions by 2020,

• A reduction in domestic emissions, (which means emissions emitted in the EU), by at least 40% by 2030 and by 80-95% by 2050.

The success of these objectives depended (or even will depend, as not all the objectives set for 2015 have been achieved and as we will see later what has not been achieved has been taken up as a target in the 2030 framework) on Europe's ability to channel adequate public and private financial resources towards sustainable and innovative technologies and on the adoption of effective prices and regulations on carbon dioxide emissions, useful in diverting investments towards innovative and climate-friendly solutions, towards renewable energies and towards greater energy efficiency.

It may also be necessary, in some cases, to adopt decision-making processes that allow investments to be diverted from some sectors of the economy to others, so that they can be restructured. However, reducing emissions by Member States is only a partial solution to the problem, as the EU currently emits only around 10% of the greenhouse gases released into the atmosphere globally. Therefore, to reach the 2°C target, a strategy of significant cuts in greenhouse gas emissions is needed at a global level. The scientific community estimates that, to reach the 2°C target, the amount of carbon that can be released into the atmosphere before the end of the century is very limited, as unfortunately, we have already spent a good part of the "available carbon budget" available and proceeding at this rate the entire budget will be exhausted long before 2100. Scientific studies have shown that to be able to contain the average increase in temperatures to less than 2°C, global emissions, once they have passed the peak of 2020, should begin to decrease.

5.2.3 EUROPE "FIT FOR 55"

The European Commission unveiled on Wednesday, July 14, 2021, the legislative package known as "Fit for 55" is to prepare Europe to be the first emission-neutral continent in the world. This proposal establishes the way forward, by the and different sectors affected, the reforms and actions necessary to take, so that Europe achieves its climate goals by 2030 through a fair, green, and competitive transition. To this end, and in line with the commitment of the different countries to the Paris Agreement, the 27 Member States of the community bloc have promised a reduction in their emissions of "at least -55% compared to 1990 levels." This new package of measures hopes to generate new opportunities in research, innovation, and the creation of new "green" jobs. In the words of the commission: "The world

is facing a crucial moment to definitively tackle the great problem of climate change, and we are the last generation that can act in time and reverse this serious situation."

According to the analysis of Factor Ideas for change, groups specialized in climate solutions, with yesterday's proposal, the European Commission offers the legislative tools necessary to achieve climate objectives, strengthens 8 existing legislation and presents 5 new initiatives, which will affect a wide range of economic areas and sectors: climate, energy and fuels, buildings, land use and forest uses. The proposed policies have been based on setting a price for CO_2, new objectives, standards, and support / financing measures.

- EU Emission Trading System (ETS) Market

The EU ETS oversees pricing CO_2. In the last 16 years, it has managed to reduce emissions from electricity generators and electro-intensive industries by 42.8% and currently covers 41% of total emissions. The commission proposes that sectors affected by the EU ETS reduce their emissions by 61% by 2030 from 2005 levels, representing an 18% increase from the current target of 43%. Other outstanding proposals are:

- Carry out a rebasing of 117 million tons and increase the LRF from 2.2% to 4.2%.
- Maintain the Market Stability Reserve “MSR” withdrawal percentage at 24% until 2030.
- Gradual withdrawal of the free allocation for the aviation sector, also included in the EU ETS, and auctioning 100% of the rights by 2027. In addition, it mentions aligning the sector with CORSIA.

Eric Bernard, corporate trader at Factor Trading, assures that the measures adopted will help achieve the established goals and make Europe the first neutral continent in emissions. "It is the first time in history that we know where we have to go and which way to go. However, the counterpoint exists in the lack of price control in CO_2, since in recent times we are witnessing a roller coaster of price rises and falls and that hinders the role of the industry in planning their deliveries and fulfilments, "says Bernard.

The maritime sector has been proposed for inclusion in the EU ETS. The Commission proposes to include ships of more than 5,000t regardless of the flag with which they sail. Its intention is that its scope includes ships that sail within the EU and affect 50% of the trips that have as a starting point or final berth in a European port. Its implementation will be gradual as of 2023 and with compliance with 100% of its emissions in 2026.

- Buildings and road transport

Fossil fuels used in road transport and buildings are an important source of pollution, respecting almost 20% of emissions and to date, it has been shown how difficult it is to decarbonise them. The Commission wishes to implement a new ETS independent of the current one and plans to launch it from 2026.

Responsibility for compliance will lie with fuel suppliers and a “cap” similar to that used in the “EU ETS” will be established.

The Commission also sets a reduction in emissions in new vehicles of between 60% and 90% compared to today's emissions and a ban on the sale of any fossil-burning vehicle by 2035.

- European forestry strategy and carbon sinks

Member States will also be responsible for capturing and absorbing emissions from the atmosphere. That is why through the “Fit for 55” package we want to reinforce the role of natural sinks and establish an absorption target of 310 million tons of CO_2 by 2030. The targets for this section will be established nationally and it will be the task of each State to put the necessary measures to achieve it. By 2035, the EU targets neutrality in the use of land, forest uses and the agricultural sector, which includes fertilizers. The forestry strategy, whose goal is to improve the quality, quantity and resilience of forests, sets a goal of planting 3 billion trees across Europe by 2030.

- Renewable energy

Energy production and use reaches 75% of total emissions in the EU. Therefore, accelerating the energy transition towards cleaner production seems essential. The new renewable energy directive establishes a production target of 40% of our energy from renewable sources by 2030. The previous target was set at 32%. The objectives of the diffuse sectors are also increased, which includes all those that are not affected by the EU ETS, establishing this at -40%.

- CBAM (Carbon Border Adjustment Mechanism) and free assignment.

The Commission has put into operation the CBAM (carbon *border adjustment mechanism*), a kind of border adjustment, whose objective is to include the cost of CO_2 to those products imported from outside the European Union block and that do not show that your products have already been taxed in their countries of origin. With this, Europe wants to protect the industry from possible relocation while encouraging third countries to introduce mechanisms that tax the cost of polluting and raise the problem of reducing emissions to an international dimension.

- Fuels

The Commission also proposes more sustainable fuels for the aviation and maritime sectors in addition to the ETS. The Commission wants fuel suppliers at community airports to increase the sustainable fuel mix, as well as to increase the percentage of use of so-called “e-fuel”. It also leaves the door to the participation of future innovative arrivals to the sector, such as electricity or hydrogen.

For the maritime sector, the European Commission will ensure and promote the use of efficient and sustainable biofuels, as well as electro-fuels that have the best performance in terms of CO_2 emissions.

5.3 AGREEMENTS AND TREATIES (INTERNATIONAL AND EUROPEAN) ON CLIMATE ACTION.

The main international agreement on climate action and climate change is the United Nations Framework Convention on Climate Change (UNFCCC), one of the three conventions adopted at the Rio Earth Summit in 1992. So far it has been ratified by 195 countries. Initially, it was a tool for countries to work together to limit the increase in global average temperature and climate change and to address its consequences.

DEFINITION. The United Nations Framework Convention on Climate Change (UNFCCC), also known as the United Nations Framework Convention on Climate Change (UNFCCC), also known as the Rio, is an international environmental treaty produced by the United Nations Conference on Environment and Development (UNCED), also known as the "Earth Summit"), held in Rio de Janeiro in 1992. On June 12, 1992, 154 nations signed the UNFCCC, which, after ratification, obliged governments to pursue a "non-binding target" (later explained why the Convention is not binding), to reduce atmospheric concentrations of greenhouse gases, with the aim of "preventing dangerous anthropogenic interference with the Earth's climate system". These actions were mainly aimed at industrialized countries, with the intention of being able to stabilize greenhouse gas emissions at 1990 levels. The nations that signed the Convention agreed to recognize "common but differentiated responsibilities", with greater responsibility for reducing greenhouse gas emissions in the short term for developed countries (Annex I – Industrialized countries: Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Denmark, Estonia, Russian Federation, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Norway, New Zealand, Holland, Poland, Portugal, United Kingdom, Czech Republic, Romania, Slovakia, Slovenia, Spain, United States of America, Sweden, Switzerland, Turkey, Ukraine, Hungary, European Union).

The Treaty therefore has as its priority objective the reduction of greenhouse gas emissions, to be able to stem the phenomenon of global warming. As mentioned earlier, it is important to underline the fact that the original stipulation did not impose mandatory limits for greenhouse gas emissions on individual nations but was based on the possibility that the signatory parties would adopt, in special conferences, further acts (protocols), with the task of placing mandatory limits on emissions. The UNFCCC entered into force on 21 March 1994, and since then, every year, the parties have met in the "Conference of the Parties" (COP), to analyze progress in tackling climate change. Below is the list of COPs – Conferences of the Parties – that have taken place so far:

- COP1, Berlin Mandate, 1995.
- COP2, Geneva, Switzerland, 199.;
- COP3, Kyoto Protocol, 1997.
- COP4, Buenos Aires, Argentina 1998.
- COP5, Bonn, Germany, 1999.
-

COP6, The Hague, The Netherlands, 2000.

• COP6 "BIS", Bonn, Germany, 2001.

• COP7, Marrakesh, Morocco, 2002.

• COP9, Milan, 2003

• COP10, Buenos Aires, Argentina, 2004

• COP11, Montreal, Canada, 2005

• COP12, Nairobi, Kenya, 2006

• COP13, Bali, Indonesia, 2007

• COP14, Poznan, Poland, 2008

• COP15, Copenhagen, Denmark, 2009

• COP16, Cancun, Mexico, 2010

• COP17, Durban, South Africa, 2011

• COP18, Doha, Qatar, 2012

• COP19, Warsaw, Poland, 2013

• COP20, Lima, Peru, 2014

• COP21, Paris – Paris Agreement, France, 2015

• COP22, Marrakech, Morocco, 2016.

One of the main Protocols, adopted by the parties to the Convention, was adopted in 1997, the Kyoto Protocol and one of the most significant agreements was the Paris Agreement of 2015

5.3.1. KYOTO PROTOCOL.

The Kyoto Protocol is an international environmental treaty on global warming, drafted and signed on December 11, 1997, in Kyoto, Japan, by more than 180 countries at the Third Conference of the Parties, (COP3), to the United Nations Framework Convention on Climate Change (UNFCCC). The Protocol entered into force on 16 February 2005, after ratification by Russia. As of May 2013, the states that have acceded to the Protocol are 192. According to the IPCC and sharing the view that human activities are likely to be responsible for the increase in the global average temperature, the Protocol:

• Provides for the obligation to implement a substantial reduction in emissions of pollution Elements.

• Its objective is to stabilize the concentration of greenhouse gases at global level.

The gases capable of altering the greenhouse effect of our planet are 6:

• Carbon dioxide (CO_2)

• Methane (CH_4)

• Nitrous oxide (N_2O)

• Hydrofluorocarbons (HFCs)

• Perfluorocarbons (PFCs)

• Sulfur hexafluoride (SF_6).

The Protocol, based on the principle of "common but differentiated responsibilities", commits industrialized countries and those with economies in transition, to a reduction in emissions of the main greenhouse gases compared to the 1990 values. The countries subject to issuance are 39 and include European countries, Japan, Russia, the United States, Canada, Australia, and New Zealand. The specific emission reduction targets have been quantified for the period 2008 – 2012. Subsequently, other objectives will be negotiated for the periods after 2012, which could also include a larger number of countries. The Protocol would become binding when it was ratified by several countries whose total emissions, as of 1990, accounted for at least 55% of the greenhouse gas emissions of all countries with constraints. Italy, together with other EU countries, is one of the countries that have ratified the Protocol.

- EMISSION REDUCTION TARGETS.

The Kyoto Protocol commits the countries listed in Annex I of the Convention (industrialized countries – in the previous paragraph it is available to view the list of Annex I countries – and countries with economies in transition) to reduce annual greenhouse gas emissions by 5.2% compared to the values of 1990, in the period 2008 - 2012, with different reductions for each individual country. In particular, the EU has an 8% reduction target, under which Italy has committed to reducing emissions by 6.5%. The Italian target was determined on the basis that Italy is characterized by a low energy intensity but, since 1990, our greenhouse gas emissions have increased very significantly. For this reason, the effort required to comply with the obligations set out in the Protocol in 2008-2012 is about 19%. For some Annex I countries, no reduction in emissions is planned, but rather their stabilization is imposed (this applies to the Russian Federation, New Zealand, Ukraine). Compared to 1990, Norway can increase their emissions by up to 1%, Australia to 8% and Iceland up to 10%. No restrictions on greenhouse gas emissions have been planned for developing countries.

Selected UNFCCC Annex I (Developed) Country	GHG Emission Reduction Target in 2020
Australia	5% (unconditional) up to 15% (conditional on international agreement to reduce GHGs in atmosphere with target beyond 450 ppm CO_2-eq) or 25% (conditional on international agreement to reduce GHGs in atmosphere with target below 450 ppm CO_2-eq) compared to 2000 levels.
Canada	17% compared to 2005 levels, to be aligned with the final GHG emission reduction target of the US in enacted legislation.
European Union	20% (unconditional) up to 30% (conditional on comparable targets from other developed countries and on adequate efforts from developing countries) compared to 1990 levels.
New Zealand	10% up to 20% compared to 1990 levels (actual target conditional on there being a global agreement whereby temperatures cannot rise more than 2 degrees Celsius, developed countries make comparable efforts, major developing countries contribute adequately, and there are LULUCF rules and an international carbon market regime).
Russian Federation	15% up to 25% compared to 1990 levels (actual target conditional on how Russia's forests are accounted for as anthropogenic sinks and on major GHG emitters committing to legally binding GHG reduction targets).
United States of America	In the range of 17% compared to 2005 levels, in conformity with anticipated US energy and climate legislation. (The proposed legislation entails a 30% reduction in 2025 and a 42% reduction in 2030, in line with the goal to reduce GHG emissions 83% by 2050.)

Fig X GHG emission reduction targets of selected UNFCCC Annex I countries in 2020

Major Developing Country	Voluntary GHG Emission Reduction Target in 2020 and NAMAs
Brazil	Between 36.1% and 38.9% below projected GHG emissions. NAMAs: reduction in deforestation; restoration of grazing land; crop-livestock system; no-till farming; biological nitrogen fixation; energy efficiency; increase of biofuel use; increase in energy supplied by hydroelectric power plants and alternative energy sources.
China	Between 40% and 45% of CO_2 emissions per unit of GDP compared to 2005 levels. NAMAs: increase share of non-fossil fuels in primary energy consumption to around 15% by 2020 and increase forest coverage by 40 million ha. Increase forest stock volume by 1.3 billion cubic meters by 2020 from 2005 levels.
India	Between 20% and 25% of the emission intensity of its GDP (excluding agriculture) compared to 2005 levels.
South Africa	34% below "business as usual" GHG emissions in 2020 and 42% below in 2025.

Fig. XI GHG emission reduction targets of major developing countries in 2020

INSTRUMENTS IMPLEMENTING THE PROTOCOL.

The Protocol provides for two types of instruments to achieve the proposed reductions:

• Policies and measures. Policies and measures are those interventions envisaged by the State through specific implementation programmes carried out within the national territory

• Flexible mechanisms. The flexible mechanisms give the possibility to use on your credit emission reduction activities carried out outside the national territory. This is allowed because climate change is a global phenomenon and any reduction in greenhouse gas emissions is effective regardless of the place on the planet where it is carried out. Flexible mechanisms are economic tools aimed at reducing the overall cost of reducing greenhouse gases, allowing to reduce emissions where it is economically more convenient while respecting environmental objectives. Three types of flexible mechanisms are distinguished:

• International Emissions Trading (EIT) – consists of the possibility that a state, and possibly a company, can buy or sell to other states or other companies emission permits to align its emissions with the allocated quota: the interested party will sell such permits when its emissions are below the allocated quota, while it will buy them when its emissions are above the allocated quota. Issuance permits are called Assigned Amount Units (AAUs). (The concept is like the EU ETS, except that in this case the sale of emission permits is internationally).

• Clean Development Mechanism (CDM) – is a collaborative mechanism through which companies or states that carry out clean technology projects in developing countries receive emission credits equal to the reduction obtained compared to the levels that would have occurred without the project. These credits are called Certified Emissions Reductions (CERs)

• Joint Implementation (JI) – is a mechanism for collaboration between industrialized countries and those with economies in transition, to achieve their respective emission reduction targets. Like the CDM, it allows emission credits to be obtained through investments in clean technologies in other countries. These credits are called Emissions Reductions Units (ERUs) (Ministry of the Environment and Protection of Land and Sea, 2014).

5.3.2. PARIS AGREEMENT.

At the Paris Climate Conference (COP21) in December 2015, 195 countries adopted the world's first universal and legally binding climate agreement. The Agreement was reached on 12 December 2015 and entered into force on 4 November 2016, following ratification by the EU (the various "steps" that have characterized this agreement are explained in detail below). The agreement sets out a global action plan, aimed at putting the world back on track, with the aim of avoiding dangerous climate change and seeking to limit global warming below 2°C. It will apply from 2020.

In particular, the salient points of what the governments agreed in the agreement are the following5 according to (European Commission, 2017):

• Keeping the average increase in global temperature well below 2°C above pre-industrial levels as a long-term goal

• 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 their maximum level as soon as possible, while recognizing that developing countries will need more time

• Subsequently make 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" (last modification 06 July 2017) (EEA, 2017), states that: "The Climate Agreement signed in Paris by 195 countries is the first universal and binding agreement of its kind. The Paris Agreement is the result of several years of preparation, dialogue, and growing awareness of the need to address the current and potential consequences of climate change. The agreement is an important and promising step towards creating a low-carbon world that can cope with climate change. It is also a clear signal, addressed to policymakers and companies, about the need to move away from fossil fuels and invest in clean energy and adaptation actions".

Main elements of the Paris Agreement:

• Long-term objective: Governments agreed to keep the global average temperature increase well below 2°C above pre-industrial levels and to continue efforts to limit it to 1.5°C

• Contributions: before and during the Paris Conference, countries presented global national climate action plans aimed at reducing their emissions

• Ambition: governments decided to communicate their contributions every 5 years to set more ambitious targets

• Transparency: they also agreed to communicate – to each other and to the public – the results achieved in the implementation of their respective objectives to ensure transparency and control

• Solidarity: 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 (European Council, 2017).

OBJECTIVES.

The Paris Agreement is therefore a global action plan, with the aim of getting the planet back on track, which aims to avoid dangerous climate change. In fact, it seeks to contain global warming well below 2 °C and to implement initiatives to try to limit even more the increase in temperature to 1.5 ° C above pre-industrial levels.

CONTRIBUTIONS AND AMBITION.

In preparation for the Paris Conference, countries presented their "Nationally Agreed Pledges" (INDC), to outline their commitment to tackling climate change. But these contributions presented by 186

countries are not enough to keep the increase in the global average temperature below 2°C by the end of the century. Much more needs to be done to achieve long-term goals, both globally and in the EU, and the Paris Agreement recognizes the need for further efforts. Precisely to this end, governments have agreed to meet every 5 years to set more ambitious goals that meet the needs identified by science.

TRANSPARENCY AND SOLIDARITY.

The countries agreed on the need to share the progress made in implementing their objectives and to ensure transparency and control possibilities. A robust system based on transparency and accountability will monitor progress in the long term. The Paris Agreement focuses on the principle of transparency therefore, (just mentioned), and on the principle of solidarity in the fight against climate change. The EU and other developed countries will continue to support actions to reduce emissions and improve the capacity to cope with the effects of climate change in the most vulnerable developing countries.

In the document of the European Environment Agency, updated to 2017, entitled "Climate agreement: towards a low-carbon world capable of reacting to climate change", (to which reference has also been made previously), it is also stated that the latest projections of the EU Member States, show that by 2020 the EU can achieve a 24% reduction in greenhouse gas emissions with the current measures in force, and 25% with additional measures already under planning in the Member States

5.3.3 REDD+ POLICY

Introduction to REDD+

The rate of forest degradation and loss in recent decades has created concern for many reasons, including biodiversity loss, negative impacts on rural livelihoods, and damage to ecosystem services such as water supply. However, since 2005, particular attention has been paid to the link between forest loss and climate change. In response, a debate on deforestation was launched in 2005 within the negotiations of the United Nations Framework Convention on Climate Change (UNFCCC). From this debate came the concept of reducing emissions from deforestation and forest degradation (REDD). The concept of REDD was later expanded to include the conservation of forest carbon stocks, the sustainable management of forests and the increase of forest carbon stocks. The combination of REDD and those three additional activities is what is known as REDD+.

The REDD+ mechanism proposed by the UNFCCC is relatively simple: tropical countries that reduce emissions from their forests from a calculated baseline will receive financial compensation, thus creating an incentive to keep forests intact. The concept of REDD+ continues to receive much support from the

UNFCCC. After lengthy negotiations, the REDD+ technical guidelines were completed by the end of 2013. The guidelines include the establishment of reference levels, appropriate safeguard frameworks and approaches to monitoring, measurement, reporting and verification. However, REDD+ funding sources remain the key outstanding issue. A major complicating factor is the failure to reach a binding international agreement on climate change. How REDD+ will contribute to a climate change agreement will depend on the overall architecture of the climate change agreement and the emission reduction targets proposed by developed and developing countries for 2020.

REDD+ addresses practical approaches and positive incentives to reduce emissions from deforestation and forest degradation and to support the conservation of existing forest carbon stocks, sustainable forest management and the increase of forest carbon stocks in developing countries.

However, several approaches and initiatives are under way to reduce, halt and reverse forest carbon and cover loss. These include activities that directly support the development of a global REDD+ mechanism within the UNFCCC, such as the fast-start initiatives and activities that contribute to reducing deforestation and forest degradation with or without the intervention of a global REDD+ mechanism. The latter include FLEGT, private sector approaches (Working with the Private Sector on REDD+), and many regional and national initiatives. Each of them will be able to complement any global mechanism, but also function without it.

As a result, the concept of REDD+ has become much broader than the global mechanism negotiated at the UNFCCC, with many ongoing approaches and initiatives and a wide variety of actors involved in the development and implementation of activities.

Source: *wikipedia.org*

FORESTS AND CLIMATE CHANGE

Climate change is caused by an increase in the concentration of greenhouse gases in the atmosphere. Several greenhouse gases are increasing in concentration, but the one that clearly predominates is carbon dioxide (CO_2). All plants, including trees and other forest plants, use photosynthesis to absorb CO_2 and convert it into the organic compounds that make up plant material, such as wood, bark and leaves. This removes CO_2 from the atmosphere. The Intergovernmental Panel on Climate Change and others estimate that forests are responsible for up to 25% of all CO_2 absorbed from the atmosphere. When forests or other ecosystems are disturbed and plants die, plant material decomposes or is burned, and CO_2 returns to the atmosphere. The Intergovernmental Panel on Climate Change estimates that between 10 and 20% of all CO_2 released comes from land-use changes, particularly from tropical forest degradation and loss. Therefore, conserving carbon in forests or at least reducing the rate at which it is emitted as CO_2 could significantly reduce global greenhouse gas emissions. Also, increasing the amount of CO_2 absorbed by forests by planting or replanting areas with trees can accelerate CO_2 uptake, thereby reducing the total concentration of greenhouse gases in the atmosphere.

HOW REDD+ WORKS

The principle on which REDD+ is based is that, as CO_2 emission occurs when forests are damaged or destroyed, reducing the rate of deforestation or forest degradation would result in lower CO_2 emissions. Deforestation means the complete loss of forests and forest degradation means damage to forests due, for example, to logging. To calculate the volume of reduction of CO_2 emissions, it is first necessary to calculate a baseline or reference level. The reference level is a standard used to evaluate the actual performance of a country. The reference level indicates the emissions that would have been there would have been no intervention. Actual emissions are compared below with that level. Emission reductions can be calculated at any scale, but the intention of the global mechanism is to do so at the country level.

Therefore, national reference levels are needed. These benchmarks should be based on historical emission rates and projections of likely future trends in the absence of a forest loss control programme. From there, the actual emissions must be measured. This is a difficult task, and much work is being done on the development of effective methods. The difference between the baseline level and actual emissions is reduced emissions from deforestation and forest degradation. The final stage is to financially

compensate a country or jurisdiction based on the tons or millions of tons of CO_2 that have not been emitted due to the intervention.

The initial focus within the climate change negotiations was to reduce emissions in countries with high rates of deforestation. However, it became clear that other countries that had retained much of their forest cover and had historically low rates of forest loss should also be included in any global mechanism, because many causes of deforestation are highly mobile, particularly industrial logging and large-scale agriculture. That is, if a mechanism is applied only in countries with high rates of deforestation, there is a very high risk of international displacement: while deforestation is reduced in countries with high rates, it increases in countries that previously had low rates as logging and agriculture continue to expand.

Therefore, the concept of REDD was extended to REDD+, to include:

• the conservation of existing forest reserves, which means conserving forests in countries with low deforestation rates.

• sustainable forest management

• increasing forest stocks, which means increasing the amount of carbon in forests by re-reclamation or replanting forests.

Making REDD+ work in practice will require more work in three areas:

- Governance reforms and institutional framework

Managing a jurisdictional REDD+ programme will require effective and transparent institutions. In many countries, this will require reforming governance and strengthening institutions.

- Monitoring, measurement, reporting and verification

Mechanisms for collecting, analyzing and reporting forest data should be agreed and established. These mechanisms must be robust, but at the same time respect national sovereignty.

- Safeguards

Despite the potential positive effects of REDD+ programs, they could have negative impacts on indigenous populations, forest communities and biodiversity if not implemented correctly. Therefore, safeguards are necessary to maintain a balance between reducing greenhouse gases and optimizing other social and environmental benefits.

REDD+ IN PRACTICE

A functional REDD+ mechanism, whether the global mechanism being negotiated in the UNFCCC, or

another initiative aimed at achieving the same objectives, has two main aspects: 1.reducing emissions
2. providing offsets or incentives.

The complexity surrounding REDD+ means that mechanisms must be able to function in an extremely complex and dynamic environment.

EMISSION REDUCTION

To reduce emissions or conserve existing forest reserves, the causes of forest loss and forest degradation need to be identified and addressed. This seemingly simple concept is difficult to apply in practice due to the large number of direct and indirect triggers and the wide variety of actors involved.

• Direct causes include logging, large-scale forest conversion for agricultural expansion, collection and production of firewood and charcoal, and subsistence agriculture by the rural poor.

• Indirect causes include poor governance, weak institutions and inadequate land tenure regimes.

Addressing indirect causes, particularly institutional and governance weaknesses, is often a prerequisite for any progress in addressing direct causes. Both direct and indirect factors vary considerably between countries and between regions within countries. Therefore, a useful starting point in any country is to identify the triggers for forest loss and develop a national strategy to address them. This is a crucial objective of several immediate. Many tropical forest countries are developing a national low-carbon development strategy to guide the simultaneous pursuit of economic development and greenhouse gas minimization; national strategies to address the triggers of deforestation must be part of this broader process. Once the causes are understood, many actions by a wide variety of actors are needed to effect change.

In some cases, new actions and programs need to be developed, but in many others government policies, business and community initiatives, or international aid programs already exist to address the triggers. For example, programs to alleviate rural poverty and provide better livelihoods can lead to less loss of forest for subsistence uses. Programs and policies aimed at improving forest governance and law enforcement can also reduce forest degradation and loss caused by illegal logging. Therefore, addressing the direct and indirect causes of deforestation typically requires a combination of improving or scaling up existing activities and initiatives and developing new ones.

OFFSETTING OR INCENTIVES

Sources of funding for a global REDD+ mechanism

The global REDD+ mechanism being negotiated at the UNFCCC provides for payments from developed

to developing countries in exchange for reducing greenhouse gas emissions from forests or increasing forest carbon stocks. The source of this money is still being debated. The first funding has come from public funds, but public funds cannot cover the cost of a comprehensive REDD+ mechanism. For this reason, the use of private financing is being discussed. This could involve some form of compensation-linked market mechanism or other innovative approaches to attracting private sector investment (see Box 3). In principle, payments would be made to support actions that allow developing countries to conserve or sustainably exploit their forests, giving value to intact forests that make them economically competitive with other uses.

However, country-level compensatory payments within a global mechanism are not the only way to incentivize to reduce forest degradation and deforestation. Other initiatives at the project, landscape or region level seek to achieve the same results. These include government incentives such as cheaper access to finance, private initiatives to open markets for "non-deforestation" products, and bilateral and multilateral subsidies and funds for activities that directly or indirectly contribute to reducing forest loss. More than eighty countries across Africa, Asia Pacific and Latin America and the Caribbean have received support from FAO in their REDD+ readiness and implementation phases.

FUNDING SOURCES FOR A GLOBAL REDD+ MECHANISM

UNFCCC parties agreed that countries with tropical forests should be compensated for reducing emissions from deforestation and forest degradation. The source of this compensation is less clear. The main potential sources of funding for a global REDD+ mechanism are international funds, compliance-based funding and voluntary funds.

International funds

These funds are like development aid. They come from national governments and are paid for through bilateral agreements or through multilateral organizations such as the World Bank, the Global Environment Facility (GEF) or UN-REDD. Funds pledged by developed countries for fast-start initiatives are an example of this type of funding.

The main limitation of this approach is that it is very difficult to generate funding at the required scale – particularly in a difficult economic climate – based entirely on contributions from developed country Governments. However, using these funds to develop policies and regulatory frameworks is crucial to reduce investment risks and leverage private sector support for REDD+.

Compliance-based financing

Under this approach, many countries have legally binding emission reduction targets, such as in the Kyoto Protocol, and can purchase carbon credits to help meet their targets. These credits can come from:
• other target countries that have emitted less greenhouse gases than they were granted and can sell allowable emissions that they have not used.
• greenhouse gas reductions in countries that do not have emission reduction targets; these are often referred to as 'carbon offsets'.
In this compliance-based approach, REDD+ payments could be generated by the sale of REDD+ carbon offsets, either at the national level from government to government or at the project level by companies developing projects to reduce emissions and secure credits. Compliance-based financing—particularly the company-based approach to buying and selling carbon credits—is often referred to as "market-based payments."
The advantage of this system is that the availability of funding depends on meeting the requirements, which has the potential to raise funds at the required scale. A big problem, however, is that the mechanism for generating demand for offsets is weak in the absence of firm national emission reduction targets in most countries, which at best will not be adopted before 2020. An additional problem is that some Governments and stakeholder groups oppose market-based mechanisms.
Voluntary funds
In the voluntary carbon market, companies and other organizations without legal emission reduction targets voluntarily purchase carbon credits to offset the activities they carry out. This is becoming more and more prevalent in the aviation sector, currently excluded from agreed targets.
A STEP-BY-STEP APPROACH
A long-term objective of the REDD+ mechanism under negotiation is for countries to receive compensation when results have been achieved, based on actual emission reductions against the agreed baseline; this approach is known as pay-for-results. To receive pay-for-results, each country will need an institutional framework for REDD+ within which it can develop baselines, agree on methodologies, monitor and report on progress, and make and receive compensatory payments. The development of this institutional framework and the formulation of a national emission reduction strategy is what is often referred to as "REDD+ Readiness".
Most of the work to achieve REDD+ lies between the initial stage of preparation and the final goal of full implementation and payment for results. Mechanisms should be developed to address the direct and

indirect causes of deforestation. It will take time and money to achieve changes in areas directly related to less forest loss, such as better governance, greater clarity in land tenure or effective land-use planning. Countries differ by the number of changes required and the speed at which the changes can be implemented but, in most cases, putting the necessary reforms in place will take many years.
In addition, for payments for results to work globally, a global REDD+ mechanism must be fully developed and funded. It is unlikely that there will be a mechanism completed for a while, especially since within the UNFCCC a binding agreement will not apply until 2020 at the earliest.

5.4. EUROPEAN LEGISLATION.

Initially, when defining Europe's first environmental policies, many policy instruments dealt with specific environmental problems. However, on the assumption that no single policy instrument can provide solutions to all problems, the spectrum of policies has gradually widened to increasingly complex environmental and health problems. To date, many environmental policy interventions combine:
• Traditional regulatory approaches, also called "Command and Control Measures" (e.g., imposition of emission standards, bans on toxic substances, spatial planning tools)
• Market instruments (e.g., environmental taxes, transfer of greenhouse gas emission rights)
• Awareness-raising initiatives (e.g., energy labelling and communication campaigns).
Sustainable development, climate change, biodiversity, environmental technologies are just some of the sectors that the EU (and the EU Commission's Directorate-General for the Environment) deals directly with in environmental matters and that make our continent a region with the highest standards.
OBJECTIVES. EU environmental policy contributes to the following objectives:
• Safeguarding, protecting, and improving the quality of the environment.
• Protection of human health; • Prudent and rational use of natural resources.
• Promotion at international level of measures to solve regional or global environmental problems and to combat climate change.
It defines the long-term ambition to "live well within the limits of our planet". Some of the salient considerations of the 7th EAP (2013) are as follows:
• PARAGRAPH 1: "The Union has set itself the goal of becoming a smart, sustainable and inclusive economy by 2020, putting in place a series of policies and actions aimed at making it a resource-efficient and low-carbon economy"
• PARAGRAPH 3: "The Sixth Environment Action Program ended in July 2012, but many of the

measures and actions undertaken under that program are still being implemented"

• PARAGRAPH 9: "The 7th EAP should contribute to achieving the environmental and climate change objectives already approved by the Union and to identifying shortcomings in policies for which additional objectives need to be set"

• PARAGRAPH 10: "The Union has set itself the objective of reducing greenhouse gas (GHG) emissions in the Union by at least 20% by 2020 (30% provided that other developed countries commit to similar reductions and that developing countries contribute appropriately according to their capacities and responsibilities), to increase the share of energy consumption from renewable energy sources to 20% by 2020 and to achieve a 20% reduction in primary energy consumption compared to the estimated levels, thanks to the improvement of energy efficiency"

• PARAGRAPH 11: "The Union has set itself the objective of ending the loss of biodiversity and the degradation of ecosystem services in the Union by 2020, restoring them within the limits of the possible and, at the same time, intensifying the Union's contribution to preventing the loss of biodiversity at global level.

• PARAGRAPH 20: "In accordance with Article 191(2) of the Treaty on the Functioning of the European Union (TFEU), Union policy on the environment shall aim at a high level of protection, taking into account the diversity of situations in the various regions of the Union and shall be based on the precautionary principle and the principle of preventive action, on the principle of correcting damage caused to the environment, as a matter of priority at source, as well as on the 'polluter pays' principle"

• PARAGRAPH 23: "The loss of biodiversity and the degradation of ecosystems in the Union not only have considerable implications for the environment and human well-being, but also have an impact on future generations and are burdensome for society as a whole and in particular for economic operators in sectors directly dependent on ecosystem services"

• PARAGRAPH 27: "The Union's environmental policy should continue to be based on sound knowledge and should ensure that the scientific basis on which policy decisions are based, including cases where the precautionary principle has been invoked, can be better understood at all levels"

• PARAGRAPH 33: "An appropriate combination of policy instruments would help economic operators and consumers to gain a better understanding of the environmental impact of their activities and to manage it. These policy instruments consist, inter alia, of economic incentives, market-led instruments, information requirements, as well as voluntary measures and instruments that engage stakeholders at

various levels, complementing the legislative frameworks" (European Parliament and of the Council, 2013).

The priority objectives of the Program are as follows:

1. To protect, conserve and improve the Union's natural capital
2. Transforming the Union into a low-carbon, resource-efficient, green, and competitive economy
3. Protect union citizens from environmental pressures and risks to health and well-being.
4. Maximize the benefits of Union environmental legislation by improving its implementation
5. Improving the knowledge bases and scientific bases of union environmental policy
6. Ensure investments in support of environmental and climate policies and consider environmental externalities
7. Improve environmental integration and policy coherence.
8. Improving the sustainability of cities in the Union
9. Increase the effectiveness of Union action in addressing regional environmental and climate challenges and international.

Finally, the program establishes a support framework for the achievement of these objectives, by promoting better implementation of EU environmental legislation, the extension and updating of scientific knowledge, the investments needed to support environmental and climate change policy, as well as a more effective transposition of environmental requirements into other European policies.

5.5 AGRICULTURE AND MULTILATERAL CLIMATE MITIGATION IN THE UNFCCC

The Copenhagen Accord focus on the pertinent areas which has been articulated in the Bali Action Plan (Copenhagen Climate Summit (December 2009)).

Long-term GHG emission reduction objective: the accord states that the global temperature as an aspirational goal must not exceed $2^{O}C$ by 2050.

• Adaptation: UNFCCC Annex I countries agreed to provide international financing, technology and capacity building to support the implementation of adaptation actions in developing countries.

• Mitigation: UNFCCC Annex I countries "commit to implement" GHG emission reduction targets for 2020, and non-Annex I countries "will implement mitigation actions."

• Forests: The Accord declares the immediate establishment of a mechanism to enable the mobilization of financial resources from developed countries to support REDD+ efforts; Australia, France, Japan, Norway, the United Kingdom and the US announced on 16 December 2009 that they had collectively

agreed to an amount of USD 3.5 billion as initial public finance for REDD+ (Actoncopenhagen, 2010).

- PROSPECTS FOR A ROLE FOR AGRICULTURE IN THE UNFCCC

The detailed role for agriculture in the UNFCCC was addressed in a draft designed by AWG-LCA for the Copenhagen meetings, entitled "Cooperative sectoral approaches and sector-specific actions on agriculture (AWG-LCA, 2009). The document listed the commitments by the member parties to cooperate and promote in development and in research and development and technology transfer to promote the practices that reduce or prevent anthropogenic emissions of GHG, especially those that promote efficient agricultural practices.

- UNFCCC Financing

1. The Clean Development Mechanism: The CDM which was established under the Kyoto Protocol enables a country to earn CER points by implementing an emission reduction project in a developing country. A CER, worth one ton of CO_2, can be sold and may be applied to any country's emission reduction commitments under the Kyoto Protocol.

   The international community came together through the Nairobi Framework in November 2006 to increase the participation of a greater number of developing countries in the CDM. The Nairobi Framework serves to build capacity in developing countries to more fully participate in the CDM, with a focus on subSaharan Africa.
2. The Global Environment Facility: Established in 1991, the GEF Trust Fund operates as the financial mechanism of the UNFCCC. GEF funding comes from voluntary donor country contributions. Since 1991, the GEF has distributed approximately USD 6.8 billion in grants leveraged by more than USD 24 billion in co-financing in support of nearly 1,900 projects in more than 160 countries (GEF, 2011c). The GEF funds five project types: renewable energy, energy efficiency, sustainable transportation, adaptation, low GHG energy technologies and enabling activities (IPCC, 2007)

Non-UNFCCC Financing

A wide array of mechanisms has been instituted to finance climate change mitigation actions in developing countries. See Annex A for a non-exhaustive summary table of funding initiatives. The following section provides an overview of efforts accomplished by Multilateral Development Banks (MDBs) and donor countries to support climate change mitigation efforts.

Multilateral Development Banks. MDBs are public financial institutions that aim to reduce poverty through project and policy financing in developing countries. MDBs use a variety of financial instruments (concessional loans, grants, guarantees, etc.) to funnel large sums of money in support of development goals. MDBs invested an estimated annual average of USD 44.7 billion from 2003 to 2007 in developing countries and EITs, approximately half of which went to sectors relevant to climate change mitigation (OECD – IEA, 2009)

The World Bank has valued commitments to clean energy and energy efficiency in developing countries at USD 4.1 billion annually for 2006 and 2007, 85 percent up from a USD 2.2 billion annual average from 2000 to 2005 (without accounting for the Climate Investment Funds). A significant part of this mitigation-specific capital is invested to purchase CERs from the CDM or Emission Reduction Units (ERUs) from the JI scheme of the Kyoto Protocol.

The Asian Development Bank (ADB) has spearheaded a variety of programmes to support climate change mitigation in developing countries, after launching its Energy Efficiency Initiative in July of 2005. The ADB reported investments of USD 1.6 billion for 2008 alone under this initiative. The ADB adopted a new energy policy in 2009 and expects to increase its investments in clean energy and energy efficiency to USD 2 billion a year from 2013 onward (IISD, 2009).

- Global Trade Rules and Environmental Policies

Global trade is governed by the General Agreement on Trade and Tariffs (GATT). This multilateral trade agreement to reduce trade tariffs and other barriers to international trade was signed in 1947 by 23 countries and has since been ratified by 153 countries. GATT is based on two fundamentals non-discrimination principles: Most favoured nation (MFN) and national treatment. The MFN principle (GATT Article I) requires that each party treat imported products from every other party in the same way it treats like products from its most favoured trading partner. National treatment (GATT Article III) requires that each party treat products from other parties at least as favourably as it treats its own products. With respect to climate change, another key rule underlying GATT is that countries may not apply prohibitions or restrictions to imports, except tariffs or other charges, that do not also apply to like domestic products (GATT Article XI). Any such measures must comply with the national treatment principle.

6.0 CONCLUSION.

Agriculture is by far one of the most important human economic activities and it remains a key sector in many developing and developed countries. It makes fundamental to the socioeconomic development to countries. Give its role in human welfare, any future challenges to the agricultural sector are of scientific, political, and public concerns.

The Fifth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC), suggests that climate change impacts on water resources will be unequal across all sectors and regions according to (Field et al., 2014). Floods and droughts caused by changes in precipitation and temperature could seriously threaten water availability for different users, including agricultural sector according to (Stocker et al., 2013). Within this context, pertinent attention should be taken into consideration to the most vulnerable groups among small-scale farmers which are the rural producers whose households incomes come mainly from agricultural activities.

Regardless of what science and forward-looking policy can do, farms across the country will be challenged and some more than others. It's important that we provide farm families and communities with the help they need to survive the climate crisis and become more resilient in terms of strengthening agricultural products. This includes better crop insurance programs, health care access for farmers and farm workers, and effective, responsive disaster relief programs. We need to rank policies to severely reduce our climate emissions and give us a chance of getting to net zero as soon as possible.

In this thesis, my contribution has been to try to outline the way forward to meet the challenge of climate change and how it has or is affecting agricultural sector, even though, as we have seen, there are many and sometimes conflicting opinions and positions on the subject. I started initially from an awareness of what are the climate changes taking place today: according to scientific organizations, the climate change we are witnessing has now reached an advanced stage and it is therefore no longer possible to underestimate it. Probably the anthropic activities have contributed in large part to the rise in temperatures that we are witnessing in recent years and to all the phenomena connected to this.

If the origin of climate change is therefore man (according to what was also communicated by the IPCC in the VI Report of 2020), it is man in the first place who must intervene to limit its disastrous impacts. To achieve this, however, many elements are needed: from the policies of collaboration between States and countries, to the adherence to these by all, to the commitment on the part of all individuals in such a

way as to safeguard the planet, living beings, biodiversity and promote the continuation of life on Earth. Local agencies, state agencies, federal agencies, businesses, multilateral organizations, scientists, politicians and other stakeholders can meet this climate change problem which is negatively affecting the agricultural production rate challenge by taking concrete actions to:

1. Sequester a large amount of carbon per year in forests and other working lands and naturals.
2. Cut into half the amount of food loss and waste and consume conscientiously.
3. Improve better food production and fiber by unlocking finance, fostering public-private collaboration, providing tools to increase transparency and protecting local rights.

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