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The Climate Crisis, an Historical Overview to Understand the Most Important Challenge of the 21st Century.

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Abstract

The main challenge humanity is facing in the 21_{st} century is definitely the Climate Crisis. For decades scientists have been warning about the consequences of climate change. The necessity to act in order to reduce CO_2 emission limiting global warming has often been postponed, underestimated, in the name of a denial machine covering economic interests of an entire world economy dependent on fossil fuels. The Cop26 held in Glasgow proves that time to act is running out and, at the same time, the realization of the ecological transition with the ambitious goal of a Net Zero Target by 2050 is revealing all the weakness of the political process in undertaking concrete actions to tackle climate change. The present work moves in two directions. On one side an analysis based on environmental history aiming at demonstrating that what has been until now underestimated, climate change, has played and plays a fundamental role in structuring the major steps in human evolution, defining the success and the failure of entire societies through history with undeniable social and political consequences. On the other side the aim is to investigate the origin of the philosophical conception of the natural world standing at the root of capitalism. From the undeniable core of the Latouche's Degrowth Theory to the Cradle-to-Cradle model, passing by the reading of the philosophical background of Severino in his *Il Declino del Capitalismo,* the main outcome of the present work is the awareness of the impossibility for the world to solve the climate crisis without questioning the bases of capitalism.

The economic system is the cause of the climate crisis. Therefore, finding a solution to the crisis means irremediably finding an alternative economic model to capitalism. Severino wisely indicates how the self descructive nature of capitalism will irremediably lead to the destruction of the earth and, therefore, to its self destruction. In order to save itself from self desctruction, the capitalism's primary aim of infinitely increasing the private profit will have to be subordinated to the safeguard of the earth. This shift will mark the end of capitalism economy and the ecological transition is basically the transition that will end the capitalist economic model.

Even if humanity follows the path undertaken by the United Nations aimed at decarbonizing the world economy, reaching the Net Zero target by 2050, the capitalist global and decarbonized economy will still have the problem of resource depletion.

The impossibility of conceiving an infinite growth model within a system of finite resources will lead the future decarbonized economy to the point of collapse, in which natural resources- because of their limitated quantity- could no longer sustain an infinite growth economy. Therefore, the necessity of structuring an alternative economic model in order to solve the climate crisis is undeniable and its aim is to support the transition of the capitalist economy towards a system based on the rationality of the modern technique being in a substantial equilibrium with the biota we all depend on. The present work reppresent an effort in this direction, defining some conceptual tools aiming at understanding and implementing the transition, eradicating the main contaddition of the actual system.

“ After all, the climate crisis in not just about the environment. It is a crisis of human rights, of justice, and of political will. Colonial, racist and patriarchal systems of oppression have created and fueled it. We need to dismantle them all. Our political leaders can no longer shrik their responsibilities.”

Greta Thunberg

Introduction

1. Climate change and sustainable development

The 26th Conference of Parties of the United Nations on Climate Change was concluded in Glasgow the 12th november 2021. The pressure was high as the conference was expected to be the point of no return concerning actions against climate change. The possibility of a failure was imminent, as the world's economies are still coping with the consequences of the Covid-19 pandemic. Climate change and sustainability have become one of the most important challenges that modern societies are facing in the present days. The efforts undertaken both at international and national levels aim to keep the rise in global temperature within the target of 1,5 Celsius degree and well below 2 degree compared to the preindustrial levels, as established in the United Nations 21st Conference of Parties held in Paris in 2015.
The scientific community has clearly stated that the actual climate change is caused by an average increase of the global temperature in comparison to the preindustrial levels, and the main cause of this phenomenon is imputable to human activity.
The rise in the global temperature is caused and accelerated by human activities since the beginning of the industrial revolution, defining the so-called Anthropocene, the age in which human development is the principal cause of climate change and the alteration of the Earth equilibrium. Scientific projections on the imminent future climate scenario of the Earth raised the priority of the environmental issue in the political agenda of governments and international organizations.

However, what is the meaning of climate change in the current debate? What is the scientific definition of this concept?

"Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use." [1]
Climate change is defined as a long term change in the weather patterns, and this change can concern the actual climate change but also changes in weather conditions of the Earth, both at local and global level. There is a distinction between the current climate change and other changes that happened in the past, such as the Little Ice Age, or the glaciations of the Pleistocene. The present climate change is caused by human activity, mainly by the use of fossil fuels, while all the other changes in the past observed were natural phenomena.
For the first time in history human beings have reached the negative capacity of altering the earth climate, and doing so we are threatening the means on which our life depends on.

[1] https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_AnnexI_Glossary.pdf

The definition of Climate Change given at the UNFCCC in 1992, the United Nation Framework Convention on Climate Change, held in Rio de Janeiro, is focused on the anthropogenic characteristic of the present change in climate, stating that climate change is defined as:
"A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." [2]
The current change in climate patterns has and will have more dramatic environmental and socio-political consequences as the increasing of global temperature in 21st century will lead to an intensification of environmental phenomenon already known, such as desertification, floodings, droughts, ice melting and consequent raising of the sea levels, dangerous hurricanes, depletion of natural resources and loss of biological heritage with dramatic impact on societies and ecosystems, especially in the poorest and most vulnerable countries.
In order to comprehend the contemporary climate crisis it is necessary to assume a long term perspective towards the historical processes that had defined the actual situation. A long term perspective investigating the causes of the climate crisis needs to be integrated with a long term perspective around possible solutions.
The following step is to translate solutions from a theoretical dimension into policies able to tackle the problems related to climate change, empowering a sustainable view of the planet's future, and redefining the asset of the economic system.

In the present work the terms climate crisis and climate emergency will be used to define the present situation concerning climate change and global warming. The choice to define the process of climate change and global warming as a crisis is meant to underline the critical situation in which the environmental equilibrium of the biota stands and the high probability of a worsening scenario in an imminent future.
Even though the word crisis or emergency are used at the institutional level, they are still not common at other levels of the debate and, in the public opinion, there is still some reluctance towards climate change and the possibility of a worsening environmental scenario on the planet. The definition of climate change as a climate crisis, is conceived with the necessity of defining the critical and the emergency situation, in order to increase the perception of the problem and stimulate more and more actions towards solutions implemented at all levels of governance and by any actors of the civil society.

The climate crisis has brought humanity into an irreversible crossroad in which the plates of the balance are composed on one side by the environment and the by economic growth on the other. The divergence between the two aspects arise as the question of tackling climate change is something related to social and political will. The political agenda will have to reach the point in which environmental protection must be prioritized with regard to economic growth for the climate policies to be effective.

[2] United Nations Framework Convention on Climate Change, Article 1, definition 2.

Since the rise of environmentalism in the late '60s, an increasing environmental consciousness both from the civil society in the developed countries and from international organizations flowed in the effort of prioritizing environmental matters in the global agenda, producing the first definition of Sustainable Development included in the Brundtland Report of 1987.

" Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits, not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities." [3] The first definition of Sustainable Development states clearly the necessity of introducing limitations to the state of technology and social organization, in other words, the necessity of limiting the impact of the economic growth on the environment in order not to compromise the possibility for the future generation to have access to resources and satisfy their needs. This statement is pioneering the future development of the concept, reflecting the main problematic core enclosed in it: the problem of reconciling two different souls that seems to go in opposite directions: environmental protection and economic growth.

The presence of these two players in the game has led the most radical and neo-marxist scholars to conceive the concept of sustainable development as an hoximor, as a basic contradiction in terms and concepts. The concept of sustainable development reflects how the actual system is trying to conciliate the idea that environmental protection can be implemented within the neoliberist economic model.

" We have polluted rivers, destroyed natural habitats, rendered land toxic or air unbreathable, released green-house gasses into the atmosphere, and consumed mineral and energy resources that cannot be renewed or regenerated. Economic growth has generally and inevitably meant more of the same, leading degrowth theorist Serge Latouche to argue that sustainable development is a pleonasm at the definitional level and an oxymoron in terms of content." [4] Facing climate change and designing sustainable policies is not a mere political aspect. The current challenge includes different dimensions, and the fact that climate issues can be solved only by science and technology is a statement completely out of the proportion of the issue.

Tackling climate change requires the convergence of different dimensions of human knowledge, such as historical, philosophical, socio-cultural beyond the fundamental scientific and technological approach. Many scholars have underlined the necessity of a polycentric approach to sustainable development. The evident necessity of facing the climate crisis with all tools available, in terms of knowledge and disciplines, implies a polycentric approach able to converge in a multidisciplinary task force capable of finding effective solutions to the present crisis.

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[3] https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

[4] J. Blewit, *Understanding Sustainable Development,* Earthscan- Routledge, New York, 2018, p. 33.

The definition of sustainable development as a polycentric diversity, is a clear starting point for this analysis which is focused on the historical backgrounds of the actual economic system in order to give contribution to the conversion of the actual economic model based on fossil fuel energy towards the achievement of a carbon neutral economy, as established in the Paris Agreement.

1.2. The importance of an historical approach to climate change: the link between environmental history and sustainable development.

Within the historical enquiry, the environmental history arose as a new branch of investigation in the '60s due to a growing interest of the public opinion to environmental issues and the spreading of ecologists movement in the US and Europe. The consciousness about the human-caused environmental alteration enriched the investigation on the relationship between human beings and natural environment in different fields of study, one of those is environmental history. " In view of the environmental problems of our own time, we are increasingly addressing the question of the historical roots and conditions of ecological crises. " [5] The relationship between humans and environment is the main key of investigation of environmental historians. The knowledge of the past provides a wide contribution to the understanding of the present climate crisis. One of the main studies on environmental history is the book of J. D. Huges, *What is Environmental History? 2006,* followed by another contribution of Verena Winiwarter and Martin Knoll, Environmental History, 2007. [6]

Huges identifies mainly three drivers constituting the environmental historical approach:

" (1) the influence of environmental factors on human history; (2) the environmental changes caused by human actions, and the many ways in which human-caused changes in the environment rebound and affect the course of change in human societies; and (3) the history of human thought about the environment and the ways in which patterns of human attitudes have motivated actions that affect the environment." [7]

In the same direction the definitions given by the following work of Winiwarter and Knoll, structuring and defining these three mayor drivers as follows:

" 1. The material environment: the material conditions of the habitat, such as the availability and quality of water; the climate; the types and conditions of the soil; the infrastructure; and the availability of natural resources such as wood, building materials, mineral resources etc.

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[5] L. Thommen, *An Environmental History of Ancient Greece and Rome,* Oxford University Press, 2012, p.1.

[6] V.Winiwarter and M.Knoll, *Umweltgeschichte.* Eine EinfÜhrung. Cologne, 2007.

[7] J. D. Hughes, *Environmental Problems of the Ancient Greeks and Romans*, Johns Hopkins University Press, Baltimore, 2014, p.3.

2. The structural environment: the possibilities and conditions for the utilisation of the material environment; the relations of ownership; the availability of technology for the exploitation of natural resources; the basic legal, political and economic conditions.

3. The intellectual environment: the possibilities and conditions for human access to phenomena, such as a concept of nature; the religion; the technical and philosophical level of knowledge." [8]

The first and the second chapter of this thesis are based on a environmental historical approach, identifing the connections between the fenomena linked to the present climate crisis such as deforestation, population growth and resource exploitation. The keystone of the analisis is to investigate how these processes are deep rooted way back in human history , they were diffused globally during the Early Modern Period and have exponetially grown Anthropocene with the implementation of an economic system dependent on fossil fuels.
The first chapter is structured starting from the neolithic hunters gathers groups, focusing on the impact of those groups of humans on the natural environment, in the particular case of deforestation caused by firing. Going back to the neolithic hunter gatherers groups, is a necessary passage to understand the complexity and the entirety of the interaction between humans and the environment. Even though at a superficial view can result useless to understand the present climate crisis, it is an important step which demonstrate the basic connaturation of human behavior and environment's alteration since its origins. Humans have altered the natural environment since they have been humans, this is a fundamental understanding, which discredits the idea that environmental alteration finds its origin with the industrial revolution. At the same time, it demistifies the idea by wich ancient civilization, hunter gathers, indigenous people were societies more respectful of the nature, living in armony with it without alterating the environment they lived in.

The origin of environmental alteration is embedded in human origin since humans started to control fire but, with the advent of the industrial revolution, humans have become for the first time in history a telluric force, able to compromise dramatically the equilibrium of the whole planet. The power of the technology developed since the industrial revolution and the dependence of the industrialized economies on fossil fuels, amplified exponentially the alteration of the natural environment produced by human societies. The alteration has reached the point in which humans can produce change in climate and destruction of entire ecosystems with drastic consequences in terms of resource depletion and biodiversity loss.

On the other side it is fundamental to notice how the environment have been altered in some parts of the world by hunter gatherers groups and compare the alteration of the hunter gathers to the first agricultural society of the Fertile Crescent, in order to define the link between complex society, population growth and environmental degradation.

[8] L. Thommen, *An Environmental History of Ancient Greece and Rome,* Oxford University Press, 2012, p.11.

The relation between these three elements defines a trend that can be synthesized in these terms: the more a society becomes complex and sedentary- hence dependent on agricultural production- the more the population grows and, consequently, the higher is the rate of environmental degradation and resource exploitation. Such a trend can be observed since the first agricultural complex society of the Fertile Crescent until now. The passage from hunters gatherers to agricultural complex societies is a fundamental step in human evolution concerning the vision of the natural world. Since the first civilizations left hints of their believes with written sources, it is possible to analize how the conception of nature has changed with the advent of agriculture, paving the way for what will be subsequently defined as the judeo-christian vision of nature, the mother of the capitalist's one which is the cause of the actual climate crisis.

Environmental history and sustainable development have many aspects in common. The first is that they both arose from the ecological awareness of the '60s, one in the sense of better understanding the interaction of humans and environment in the past, the second aimed at finding an alternative model of development to reduce the impact of ecological issues in the future." Environmental research is altogether a relatively young field of science which emerged as a significant force only as a result of the ecological crisis of the 1960s." [9] The second aspect shared by these two fields of study is the necessity of a multidisciplinary approach to enrich the knowledge of the past for environmental history and to strengthen perspectives towards the future concerning sustainable development. Both disciplines require the coordination of different branches of study, which makes the research in this direction far more complex and less sectorized than others, but also more interesting and focused on a cooperation and multidisciplinary based approach. "Environmental history properly requires knowledge in such fields as agriculture, archeology, botany, climatology, economics, geography, geology, philosophy, technology, zoology, and the like, in addition to the search for useful synthesis." [10]

Authors such as J.Blewit underline the necessity of conceiving sustainable development as a dialogue of values, a non-static concept that to be effective has to include different dimensions and approaches, such as scientific, economic, historical, cultural and philosophical. In this frame, the choice of the present work to focus on an historical reconstruction of the interaction between human being and natural environment is oriented to give a wider contribution to those studies that now are facing the problem and the necessity to find effective policies and strategies to face climate change, converting the economy, reducing the GHG emissions and trying to mitigate a future scenario of climate disasters all over the world. The risk consists in the fact that the consequences of climate change will increase in frequency and intensity. This emergency scenario will stimulate the adoption of policies and intervention focused on repairing the damage of the calamities where possible, rather than

[9] L. Thommen, *An Environmental History of Ancient Greece and Rome,* Oxford University Press, 2012, p.10.

[10] J. D. Hughes, *Environmental Problems of the Ancient Greeks and Romans*, Johns Hopkins University Press, Baltimore, 2014, p.23.

concentrating the efforts in understanding the causes and put in place long term policies to avoid the inauspicious consequences. "Global warming, estimated at between 1.8 to 6.4 degrees Celsius by the end of the twenty-first century, will result in a whole range of 'natural disasters' that include desertification, droughts, species extinctions, sea-level rises and a destructive change in weather patterns." [11]

Time is a crucial factor in facing the current climate crisis and the questions are: "Is there enough time to act in the direction of changing the causes of the processes that generate climate change? Have we already passed the Rubicon of climate change?

Historical approach is mainly oriented to set basis for acting against climate change in the direction of understanding the phenomena that are causing it, contextualize them, underline the connection to the present situation and, most of all, enlarge the contribution to those studies aimed at rethinking the economic model in order to reduce the impact that capitalist global economy has on natural environment.

The link between environmental history and sustainable development- between past and future- is the core of the present thesis, focused on demonstrating the historical roots of the conception standing at the base of the capitalist view of nature and its consequent uncontrollable exploitation and destruction of natural resources. The aim is to discredit the idea- which consitutes also the main contradition of the concept of sustainable development- by which the economic system, amputable as the main cause of the climate crisis, can constitute at the same time the solution to it. Finding alternatives to capitalist neoliberal economy, based on infinite growth model, is the first step towards the resolution to the climate crisis. Without a deep questioning of the capitalist economy and its impact on natural environment there will not be any effective solution to the climate crisis and, unfortunately, all the efforts of the next decades profused by societies will be focused in facing the consequences- generated in a sort of stress multiplier chain- caused by climate change.

[11] S. Mosley, *The Environment in World History*, Routledge, 2008, p.9.

1. Deforestation, population and technology

1.1 The world forests: composition and scientific methods to recontruct past variation in climate patterns.

Deforestation is probably one of the most ancient practices in human history. Since the first human groups started to control fire, the clearing of trees assumed a crucial importance for the survival of the hunter gatherer tribes. Forests provided food and timber, necessary for construction, building tools, weapons and fuel to burn for cooking and warming.
" The thinning, changing, and elimination of forests—deforestation, no less—is not a recent phenomenon; it is as old as the human occupation of the earth and one of the key processes in the history of our transformation of its surface." [12]

To understand the impact of human development on world forests through millenia, it is necessary to study the history of the forests in parallel with human history. Concerning past ages, any attempt to quantify the process of deforestation is quite difficult and misleading, because of the lack of clear datas about the past of the forests, the numbers of variables involved and the fact that forests can regenerate fast after human impact. Leaving aside the quantification of deforestation in past ages, we will consider the main processes in human history that surely had a significant impact on the world forest.

The analisis will reconstruct the impact of human civilization on the environment, starting from the prehistoric hunter gatherers groups to the origin of agriculture, from the first agricultural villages to the ancient civilizations in the classic age, from the decline of the Roman Empire to the interconnected world of the early modern age. These passage in human history have settled the basis for future industrialization and globalization in the modern world, giving birth to the geological era of the Anthropocene at the beginning of the 19th century. The aim of this chapter is to identify the most relevant steps in human socio-cultural evolution and their related impact on the environment, to understand the background of the present situation of natural resources exploitation and environmental degradation. The converging point of all this historical analysis is the definition of a general trend, that connects population growth and resource depletion, in particular case the most important resource humanity depended on until the use of oil and natural gas for industrial and civil use: the world's forests.

The relation between population growth and deforestation, is derived from the malthusian law on population growth and resources depletion. Malthus wisely observed the critical point of the relation between population growth and food production, the first growing exponentially and the second following a linear trend. This inevitably leads to a point in which, in the mathematical model, the population outgrows the food supply. " Population,

[12] M.Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.15.

when unchecked, increased in a geometrical ratio, and subsistence for man in an arithmetical ratio." [13] Many considerations can be developed starting from the malthusian low on the population growth, but, concerning this chapter, it is relevant to define the relation between population growth and deforestation and to see how this is a constant trend in human history since the first hunter gatherers group.

The relation can be simplified by the statement: the more a population grows the more resources are needed and the more deforestation is produced, as wood is the primary resource for human sustain and agricultural land is gained by forest clearing. Human development has depended, and still depends on deforestation. Assumed this rule, in part derived from the malthusian's considerations on population growth, we will develop a further analysis in the last chapter, considering different variables like standard of living of a population, technological development, forest protection legislation and the natural capacity of forest to regenerate as its characteristic of a natural renewable resource.

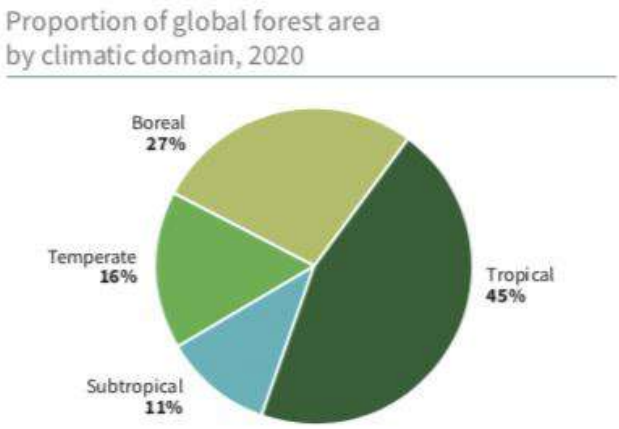
The modern aspect of the world forest started to assume the shape it has nowaday, gradually since the end of the last glaciation, around 11000 B.C. The glaciations had a huge impact on forests as it produced the most significant change in climate in the past geological eras. Before the actual anthropogenic climate change, glaciations were the main drivers of the past climate change on earth as consequences of the earth's orbit variations known as Milanković' s cycles, from his father Milutin Milanković. Although the causes of the cyclical glaciation in earth history is still an object of study, the Milankovic explanation is the most reliable theory regarding the origins of glaciations.

The combination between scientific methods, historical and archeological knowledge, mainly from the classical age onwards, together with literature and written sources can give us a picture of the world forest, their history, and the impact that civilizations succeed in time and space had on them. Before introducing a brief synthesis on the scientific methods used to gather information concerning the past climate and the history of the world's forests, it is necessary a brief consideration of the composition and classification of the main type of the world's forest.

Scientific literature considers fundamentally three major forest types: boreal, temperate and tropical forest. The great boreal forests are circumpolar, primarily composed of evergreen conifers such as pine, spruce and fir, diffused in the northern regions of Alaska, Canada, Scandinavia and Russia, the wide Siberian regions has the world largest boreal forest. Lowing in latitude, the moderate temperature gives way to the deciduous temperate forests. Populated by species such as oak, beech, elm, maple and willow, these forests were originally widespread through North America, Europe and north-east Asia.

Tropical forests are the world's most extended. Mainly distributed in South America, south-east Asia, Australia, West and Central Africa, they are the world's richest source of biodiversity. Composed by over 100 tree species per hectare, tropical forest has seen an increasing trend of deforestation in the past decades, due to intensive agriculture and the high commercial value of woods such as ebony, mahogany teak and sandalwood.

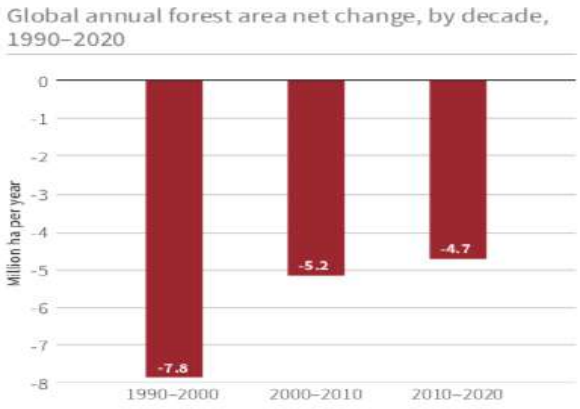
[13] C. H. Parker, *Global interactions in Early Modern Ag*e, Cambiridge, 2010, p. 146.



Global proportion of different forests, source: FAO, Global Forest Resources Assessments 2020.

" Until recently, deforestation had been most intensive in the temperate world. Europe, for example, has virtually no primary (naturally regenerated) forest cover remaining. Since 1950, however, the focus has shifted to tropical forests, which are now being lost at a rate of over 10 million hectares – an area larger than Greece – per annum. " [14]

Although the rate of forest loss every year seems to be reducing, as the Fao 2020's Global Resources Assessments states, with a very unrealistic explanation, such as "the rate of decline of net forest loss slowed in the most recent decade due to a reduction in the rate of forest expansion". [15] Despite the contradictory explanation of the reason why the rate of deforestation has slowed in the last two decades, it doesn't mean that the problem of deforestation is under control and will have no longer impact on climate alteration as the actual rate of forest clearing is still relevant and a lot has to be done to stop deforestation and protect the existing forests.



[16]

[14] S. Mosley, *The Environment in World History*, Routledge, 2008, p.32.

[15] *FAO, Global Forest Resources Assessments 2020*

[16] *FAO, Global Forest Resources Assessments 2020*

There are four principal scientific methods that allow a reconstruction of the past climate and environmental composition: palynology, radiocarbon C14, dendrochronology and ice core analysis. The first, also known as pollen analysis, consists in the analysis of multilayer sediments extracted mainly from the lake and swamp depths, where pollen has deposited and stratified in layers. The analysis of the pollen composition and percentage in each layer of the sediment collected reveals important information about the composition of the surrounding environment in a certain period of time and, in addition, the modification induced by the interaction of humans can be detected. Palynology gives information on the type of trees and plants present in the area studied and its variation through centuries. It gives an important contribution to reconstruct the history and the past composition of the world's forests.

" The quantities (of pollen) are indicative of past vegetation communities and, by implication, of past human disturbances of the environment." [17]

A second technique is very common and transversally used to date samples of organic and also some non organic objects, due to the study of the radioactive decay of the isotope of carbon 14. This process is widely used in archeology, to date human settlements and gave also a significant contribution and accrued precision to palynology. However, the decay of radiocarbon still has some criticalities, the most problematic of them for archeologists is the fact that for a dating analysis of radiocarbon a specific quantity of material is required and(concerning very ancient archeological remains analized) often the quantity is not enough. This problem leads to the association with those rests with others considered to be related in order to gather enough material to analyze, with a higher margin of error and uncertainty.

Normally the radiocarbon analisis has a margin of error between 50 to 100 years, with the association of different materials the margin increases. Another problem is related to the settlements studied. The material taken for the radiocarbon analysis is not always in a pure environment, which means that has been subjected to atmospheric and natural agents and with high probability has mixed with other material of different periods compromising an accurate dating process. However, radiocarbon analysis has contributed significantly to the actual development in archeological, historical and environmental knowledge.

"A second problem in radiocarbon dating is that the carbon 14/carbon 12 ratio of the atmosphere is in fact not rigidly constant but fluctuates slightly with time, so calculations of radiocarbon dates based on the assumption of a constant ratio are subject to small systematic errors. The magnitude of this error for each past date can in principle be determined with the help of long-lived trees laying down annual growth rings, since the rings can be counted up to obtain an absolute calendar date in the past for each ring, and a carbon sample of wood dated in this manner can then be analyzed for its carbon 14 / carbon 12 ratio." [18]

Dendrochronology is the study of past climate starting from the analysis of the rings of a tree trunk. From the Greek *Dendros* and *Chronos,* respectively tree and time, dendrochronology is a

[17] S. Mosley, *The Environment in World History,* Routledge, 2008, p.5.
[18] J. Diamond, , *Guns Germs and Steel*, Norton, 1999, p.97.

fundamental method to deduce information about past climate, environmental conditions and, overall, the variations of it during the lifetime of the tree analyzed. Tree rings are like a biography of the tree's life and the past climate. The sequence of rings indicates the quantity of rain and drought season each year, as each ring corresponds to one year time. The wider a ring has grown, the more precipitation and humidity in the atmosphere in that year; the narrower, the less precipitation and the more intensity of drought's period. By comparing different tree sections in different areas it is possible to gather information on climate variations starting from the present year, which is represented in the most external ring , or starting from the year in which the tree was cut. Dendrochronology applied to archeology gives a margin of uncertainty as the trees analyzed were cut way back in the past and the exact year of cutting is unknown and can only be supposed with a margin of error.

The ice core analysis consists in a scientific methods of reconstruction of the past climate condition revealed by detection of past atmospheric composition contained in samples of ice core collected from the glaciers. Palynology, radiocarbon, dendrochonolgy and ice core analisis are the main techniques which allow the reconstruction of past climate, detecting its variations. These methods have criticalities as we have seen for the radiocarbon dating and for the dendrochronology applied to trees cut at unknown date. However, the combination of these techniques is fundamental to reduce uncertainty, minimizing the margin of error. Radiocarbon gives a significant contribution to paleontology and dendrochronology helps to minimize the margin of error in radiocarbon dating. With respect to the present analysis, the history of the world's forests and environmental variations caused both by human interaction and natural phenomena can be detected with the application of these four techniques. The modern aspect of the world forests started around 10000 years ago, in concomitance with the end of the last Ice Age and the beginning of the Neolithic Age. As glaciers gradually retreated the forests started to expand towards the land once occupied by ice, following the gradual mitigation of the temperatures. Therefore, the retreat of the ice was a long process, it is estimated that temperatures rising until pre industrial average temperature took around 8000 years since the end of the Ice Age, the deciduous forest started to move from southern Europe to the north, slowly substituting the tundra and the birch-conifer boreal pushing them to higher latitude where the temperature was colder. The mediterranean areas started to be populated by its typical vegetation, olive trees, pistachio and evergreen oaks to cite a few of the characteristic plants of the mediterranean scrub. In North America the forest evolution followed a similar pattern of Europe at the same latitude, although the expansion of the temperate forests seems to have happened earlier than in Europe. In the tropical latitudes the forest began to expand widely as temperatures were more temperate, generating a huge source of biodiversity that has been isolated from the glaciation for millenia. Despite the fact that for the tropical areas there is less data available compared to Europe and North America, it is sure that the biological heritage enclosed in the tropical forest of South America contains a lot of information on the past of the Earth Climate and a lot has to be studied and discovered still. The gradual expansion of the forests since the end of the Ice Age is approximately concomitant with the development of the first agricultural experiments and the domestication of plants and animals.

" A suitable starting point from which to compare historical developments on the different continents is around 11,000 B.C.(*) This date corresponds approximately to the beginnings of village life in a few parts of the world, the first undisputed peopling of the Americas, the end of the Pleistocene Era and last Ice Age, and the start of what geologists term the Recent Era." [19]

[19] J. Diamond, Collapse, *How Societies Choose to Fail or Succee*, Penguin, New York, 2011, p. 532.

1.2 The passage from hunters gatherers to agricultural society: the impact on the environment and the conception of nature.

The rising of the first human villages and the domestication of plants and animals marked irreversibly the history of mankind. The intensification of the exploitation of the world's forests increased as the human population grew. Agriculture is one of the most important drivers of deforestation and desertifications, as it was at the beginning so is still today. It is estimated that agriculture and land use today impact of 23% of the global emission of GHG, while the impact of agricultural practice on deforestation is around 80% .

" Some 80% of global deforestation is a result of agricultural production, which is also the leading cause of habitat destruction. Animal agriculture — livestock and animal feed is a significant driver of deforestation, and is also responsible for approximately 60% of direct global greenhouse gas (GHG) emissions. Overall, emissions from the food system as a whole, including production and consumption, represent up to 37% of total global human-induced GHG emissions." [20]

Agriculture, food production and distribution related sectors have a massive impact on the world environment today. The origin of Agriculture is dated around 10000 B.C , when the first villages started to rise in the Fertile Crescent, the first known area of domestication of wild plants and animals in the world.
The regions of the world in which, with a high grade of certainty, agricultural practices arose independently are five: Southwest Asia or Fertile Crescent, China, Central America, South America and the East region of North America.
Other four regions started to domesticate plants and animals, Africa Sahel's region, West Tropical Africa, Ethiopia and New Guinea, but in these regions it is not clear if the rising of domestication practices were independent or imported from other regions of previous domestication.
Agriculture is certainly a fundamental step in human social and cultural evolution for many reasons that will be analysed in the following pages. With respect to the framework of this thesis, it is interesting to underline how the independent domestication of plants and animals, which is the basic starting point of agriculture, has nothing to do with the European continent.
Considering the agricultural revolution the base for complex and structured civilization, an ancestor of the modern organization of society, it is clear that agriculture was imported in Europe and the future rising of complex societies in the Classical age , like the Greek Polis and the Roman Empire is the result of the importation of agricultural practices and domesticated species developed elsewhere, mainly in the Middle East.
If we consider the period of the early modern age, in which europeans, through the expansion of the maritime trade, consolidated their dominion over the world, setting the basis for a future development of imperialism, colonialism and the globalized world, it is possible to trace what I will be calling the non european roots of the european worldwide supremacy.

[20] https://www.greenpeace.org/usa/forests/issues/agribusiness/

In this regard, agriculture can be considered the first non-European contribution in this direction. The consolidation of the European hegemony with the expansion of the overseas empires in the early modern age and the following imperialism, colonialism and globalization of the world economy and trade is undoubtedly a constant trend of the European model of society applied, imposed and absorbed in the rest of the world.
The conquer of the new world is the starting point of this process and the wealth extracted and imported from the new world gave a relevant contribution to economic and population growth in Europe, setting the basis of a consolidated economic and financial system, which can be considered an embrional prototype of modern capitalism. However, most of the elements necessary to consolidate this situation originated in Europe, most inventions, technologies and practices were imported from elsewhere, like China and the Middle East.
The map shows the five centers of domestication and the four regions with uncertainty about the independent or imported domestication, followed by a question mark.

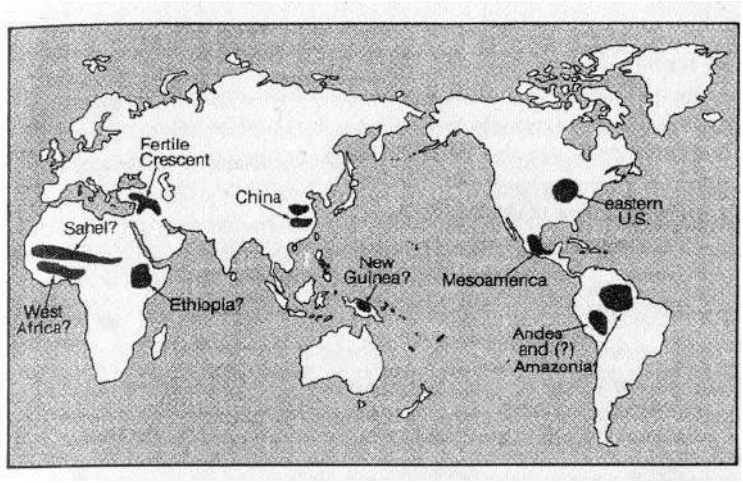


Figure above reppresent the world's indipendent centers of domestication of plants and animals. The four areas with a question mark are the ones where there is no certanty if the domestication was indipendent or influenced by other regions. The first was the Fertile crescent around 8500 B.C. [21]

The agricultural revolution had a large impact on the way humans interact with the natural environment and increased the demand and the consequent exploitation of natural resources, as the agricultural surplus was progressively allowing the growth of the population and the diversification of the labour. In other words, agricultural surpluses produced by the first agricultural societies gave way to the stratification of complex and organized societies. This process increased the impact of the societies on the natural environment with particular regard to forests, the more a society became complex and structured the more natural resources were needed to feed the demand of a growing population.

[21] J. Diamond, , *Guns Germs and Steel*, Norton,1999, p. 99.

Moreover, the division of labour, sustained by the agricultural surplus, generated a complexification of the technological development , as more and more people were freed from agricultural labour and could dedicate their time and efforts in other fields. Technological development permitted to improve agricultural practices, with the result of more agricultural surplus with minimize effort, defining an increasing trend of stratification of the social structure in complexity and organization. On the other side technological development such as the sofistication of the ceramic production techniques as well as the metals smelting and glass production, house and shipbuilding, require a crescent ammount of timber, in other words increased the deforestation process. Despite the transition from the hunters gatherer society to the agricultural settled villages is a fundamental passage in human history, the transformation of the means by which humans sustained their lives is not a defined process that could be identified completely with an historical date nor decribed as a linear process. It is variable in time and space and it has to be contextualized. The identification of a date in which we suppose that the transition to agricultural villages took place in some areas of the world is a reference, it is indicative of the period and the meanings that those transformations had in the history.

While some areas were developing in the first complex civilizations at a certain date, in other parts of the planet humans continued to live in hunters gatherer groups, and a few of them still maintain that lifestyle nowaday even though the contamination of these groups with the outer world is, at this time, inevitable. The transition from nomadic groups of humans to settled agriculture and farming based villages was a long and very differentiated process depending on geographical, anthropological, environmental and historical aspects.

Scientific evidence based on the radiocarbon 14 dating methods, can give us a temporality by which some process are expected to happen, but the reason why and, most of all, the way in which things happened at certain point in human history can only be supposed with high rate of uncertainty. It is highly possible that the domestication of certain plants and animals was a long process made by experimentation and errors. It is also highly probable that the hunters gatherer groups, started the domestication while continuing to survive on their classical means, and the transition to settled agricultural villages took place when domestication gave enough supplies of food to make hunting gathering no more necessary. Some groups became semi-nomadic, combining settled agriculture means of sustain during the vegetative period of the year and back to nomadism hunter gathering during the rest of the year , like the Native Apache in North America.

“Apache Indians of the southwestern United States settled down to farm in the summer at higher elevations and toward the north, then withdrew to the south and to lower elevations to wander in search of wild foods during the winter.” [22]

The studies concerning these semi-nomadic groups practicing both agricultural practices and more ancient hunter gatherer means of survival, is an evidence that the passage to agricultural societies was not clearly defined and well marked in a certain date, nor a linear

[22] J. Diamond, *Guns Germs and Steel*, Norton, 1999, p.106.

procees in history. In some places agricultural villages started to develop, abandoning hunting and gathering lifestyle in case of abundant harvest, in other places groups assumed both techniques; in others humans never assumed agricultural practices and kept maintaining their hunter gatherer life. What is clear is that from the main centers of domestication of plants and animals, the agricultural practices and the species domesticated spread widely, were imported in other areas and domesticated in new environments. The expansion of agriculture started with the exportation of some domesticated plants to other regions. In Europe the arrival of crops from the Fertile Crescent is estimated around 6500B.C- 3500B.C, in the meanwhile other wild plants of the region were domesticated locally.

" From those nuclear areas, hunter-gatherers of some neighboring areas learned food production, and peoples of other neighboring areas were replaced by invading food producers from the nuclear areas again at widely differing times. Finally, peoples of some areas ecologically suitable for food production neither evolved nor acquired agriculture in prehistoric times at all; they persisted as hunter-gatherers until the modern world finally swept upon them." [23]

The passage from hunter gatherers societies to agricultural complex societies also represents an increasing trend of deforestation caused by human activities. Agricultural societies' need for timber was increasing as the population expanded due to agricultural surplus. Population growth meant more houses to build, more land to cultivate, more wood to burn for cooking and heating. As explained before, the more a society becomes stratified and complex, the more resources are needed to its sustain, the higher impact on forest is produced.

However, the history of deforestation seems to be starting way before the foundation of the first agricultural complex societies in the Fertile Crescent around 8500 B.C. The main drivers of deforestation in a chronological succession were: Fire, Agriculture and Industrialization. Before the impact caused by timber and land demand of the agricultural societies, hunter gatherers groups used to have impacted on the deforestation process setting entire hectares of forests on fire. The burning of parts of wild forest is probably the most ancient practice by which humans have changed the natural environment, since the control of fire. The advantages of doing so were remarkable and clearly a step forward in human socio-cultural evolution. Burning parts of forest allowed to clear lands surfaces, fertilize it with ash of the burning and replace plants more convenient to humans like fruit trees, tubers and hutzelnut. This aspect can be considered an ancestor prototype of agricultural practice, despite the process can not be considered a domestication of plants. Fires helped the success of hunting because animals were forced to escape from fires , and the strategic localizations of fires could help to canalize the direction of the escape, increasing significantly the success of the capture of wild animals with traps, arrows, spears and stones. At the same time the fires left potentially many carcasses of animals increasing the source of food available for humans.

[23] J. Diamond, *Guns Germs and Steel*, Norton,1999, p.103.

The second aspect consists in the fact that replacing the cleared land with commestible vegetables attracted animals, reducing the efforts dedicated in hunting. The land was also cleared from snakes, spiders, scorpions and other inconvenient wild animals, making the settlement a definitely safer place." Not only were large mammals "flushed out" by fire, so too were nutritious insects, lizards, and rodents from trunks, holes, caves, and burrows, and even honey could be safely collected from combs. Night fishing by torch was very productive. The opposite was also true of fire: it had a purgative effect, ridding the ground of poisonous snakes, scorpions, and spiders and a host of ticks and bugs, while many peoples in the Americas learned to live in perpetual smoke to ward off flies and mosquitoes." [24]

Fires allowed to clear the forest from the dense bush and small trees cover, which was an obstacle for deplacements and also a clear environment where surprise attacks from wild animals and other humans could take place easily. The clearing of forest by fire has considerably contributed to improve the chance of survival of the human species. The clearing of forest by fire in the deep past is the significant evidence that humans have altered the environment they lived in since they developed the capacity of controlling and reproducing fire. Analyzed the impact produced by hunter gathers groups in the deep past with fire, and gave evidence of the existence of a remarkable impact on the environment of different civilizations before europeans, it is time to see how the passage to agriculture, and agricultural based complex society of the ancient and the classical world impacted on the environment and contributed to define the modern cultural and religious conception of the natural world.

"The domestication of animals and plants caused such a radical change in humankind's relationship to the natural environment that it is justifiably called the "Agricultural Revolution," even though the process took thousands of years during the Neolithic period." [25]

The passage from agricultural settlements in the neolithic to the first civilization of the Bronze Age (3000 -1000 B.C), marks also an important step towards the organization of the population in urban spaces. The cities of Mesopotamia between Tigris and Euphrates rivers were affected by different environmental problems such as the flooding of the rivers and the salinization of the soil. Intensive deforestation and agricultural practices in the area, once covered with high fertility soils, produced the collapse of the Mesopotamian civilizations of the Bronze Age. "Mesopotamia's clear relationship between man-made environmental degradation and cultural decline represents an ecological disaster caused by human actions." [26]

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[24] M. Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.14.

[25] J. D.Hughes. "Environmental Problems of the Greeks and Romans", John Hopkins University Press, 2014, p.67

[26] Ibid. p.80

1.3 The Epic of Gilgamesh: nature between veneration and domination in the Fertile Crescent.

One of the most emblematic archeological find are some tablets describing the Epic of Gilgamesh. The story of Gilgamesh is one of the most ancient litterary source, embedding the conception of the natural world expressed by Mesopotania civilization, where is possible to identify two elements, nature and civilization. On one side nature is venerated and natural forces are enclose with mystery and sacrality, on the other side the epic describes the domination of the wild nature by the king Gilgamesh. The story begins with the character of Enkidu, the wild hairy man, protector of the animals, who released the animals trapped in the hunters snares, and once captured entered the city of Uruk and met the king Gilgamesh. The two became friends and started a journey in the mountains to defeat the animal god Humbaba, protector of the cedar forest. Once defeated the god of the wilderness, they cut cedar trees.

Archeological rests of the Gilgamesh Epic with a written tablet

The epic interpretation can give us a lot of information on the cultural relationship to the environment of the Mesopotamian civilization. First of all the contrapposition between nature and culture, between the animal god Humbaba and the king Gilgamesh. Some elements of sacrality and mysticism of nature are present, reflecting the hunter gatherers heritage, but at the end nature is defeated by the king and its allied Enkidu.The alliance between the wild hairy man and the king probably represent the passage from hunter gatherers tribe to settled society, this can be seen as a sort of historical reconnaissance of the king with respect of the origins of humans as hunter gathers. The fact that Enkidu protects and release animals represent the man veneration and protection of nature. So the passage from a more spiritual and respectful vision of the wild man to the first domination of nature produced by the king of the city. “The forest was a sacred grove protected by the wild giant Humbaba, and his defeat and death at the hands of the two heroes was a symbol for the subjugation of the wilderness

by the city." [27] The two elements of veneration and domination of the natural world can be traced also in Egyptian, Greek and Roman civilizations. It is not intention of this analisis to go deep in ancient time, just some interesting reference of the passage from a vision of veneration embedded of spirituality to the complete affirmation of the human domination paradigm with Christianity, which is the root of the capitalist vision of a natural world, conceived as a source of wealth to be exploited, producing the actual state of thing regarding the climate crisis.

[27] J. Donald Hughes. "Environmental Problems of the Greeks and Romans", John Hopkins University Press, 2014, p.76

1.4 The environment in the Classical Age and the raise of the Christian conception of the natural world.

Concerning the Classical Age the existence of a variety of sources offers a more accurate idea of the conception of nature by the Greeks and the Romans. The literature, in which the relationship between human and environment and its impact is well described and detailed, enrich the knowledge of environmental history in the Classic Age. We can consider the Classical Age as a period illustrative of the process already described, by which - through millenias of domestication and development of agricultural practice - societies increased in dimension and complexity and doing so the impact on the environment increased as well. The impact of the classical civilizations on forests was considerable, even though it is difficult and most of the time misleading any attempt of quantifying the rate of deforestation. We can assume it was relevant from literature references as well from historical knowledge. During the classical period the consumption was relatively high as the urbanization and expansion of the Greek civilization followed by the Romans was an ongoing process. The expansion of the population in urban areas required more resources of wood and land for agriculture, in other words, what we have seen to be a constant trend in human history, the relation between population growth and deforestation, is particularly relevant for the classical civilization and gained its apex with the expansion and consolidation of the Roman Empire.

In addition to the general trend of population growth–deforestation, the Greek and the Roman societies reached significant wisdom on architecture, agriculture, metallurgy and shipbuilding. As temples and palaces were erected as symbols of the magnificence and social status of the aristocrats, poor ghettos developed at the suburbs of the cities, both requiring an increasing quantity of timber. During the second century B.C, Athens and the other Hellenistic cities were eclipsed by Rome, which became the largest city in the world (until London reached a similar size in 1801). Its population was about 463,000 in 86 B.C, 1 million by 5 B.C, and possibly between 1.2 million and 1.6 million by the fourth century A.D, with decreases from frequent epidemics being compensated for by massive rural in-migration. [28]

The wars made by sea or land had a massive impact on Mediterranean forests, most of all the wars made by sea as they required more shipbuilding activity. Territorial expansion increased trade and connections between territories, which also meant more merchant ships and warships for protection. " Athenian fleets may have reached 200–300 triremes during the Persian War of 480 B.C. Moreover, Rome lost 700 quinqueremes during the 24 years of the First Punic War; and in response, crash programs of building were undertaken, as when Rome built 120 ships in 60 days during the first war against Carthage and, a year later, 220 ships in 45 days. And timber was available for their construction." [29]

[28] M.Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p. 75.

[29] Ibid, p. 72.

The considerable impact of the classic civilization on the environment is related to the fact that the improvement of agricultural practices and the use of slave labor for agriculture and constructions allowed part of the population to increase their standard of living and related resource consumption. For example roman baths required a huge ammount of wood to heat the water, this habit was widely diffused in the roman culture and practiced by all social extraction. With the expansion of the empire, baths were built all over the conquered territories main administrative centers. This is an example of a qualitative standard of living improvement that increases the impact of the population on the environment.

Not only the expansion of the population in terms of growth increases the impact on the forest's resources, but also its qualitative standard of living. The sum of the two variables can multiply the effect of the population on deforestation. Even Though the trend of increasing deforestation can be applied to all agricultural based societies there is a cultural distinction to be made in the way the natural world is conceived. As we have seen for the Mesopotamian societies, the element of veneration of the natural world is present as it was for the Egyptians, who believed that humans and natural forces should live in harmony balancing each other. The element of domination and subjugation can be traced in ancient civilization, such in the Gilgamesh epic, which is a consequence of millenia of domestication of plants and animals and agricultural development started with the Neolithic in the Middle East. Agriculture changed the relationship between man and nature, and this can be traced in the first expression of the civilized man dominating the natural world. Nevertheless, the sacredness of nature is still an important element attribuable also to Greek and Roman culture.

The Greek most ancient tradition of the presocratic philosophers attributed great value to nature, as the main purpose of their inquiry was to explain the origin of all living and nonliving things. Thales of Miletus, Anaximander, Pythagoras, Heraclitus and Parmenides to mention some of the main representatives, started to research the explanation of all things, focusing on the natural world and its main elements.
In ancient Greece the veneration and the sacrality of the natural world can be found in the myth and in the representation of the Olympo's gods, that even though they were represented as humans with all their human emotional dimension, they were also associated with natural events to prove their power. Despite the venaration and the sacrality enclose in the natural world, a new approach of rationalism and scientific enquiry arose with Plato and Aristoteles. The phylosophycal system conceived by Plato started to attribute imperfection to the natural world, as natural things were mainly the copy of the rational and perfect world of the ideas.
Beyond the philosophical implication he reconized the importance of the natural world for human sustain when he descibed the deturpated territory around Athens, "what remains of her substance is like the skeleton of a body emaciated by disease. . . . All the rich, soft soil has moulted away, leaving a country of skin and bones. . . . The annual supply of rainfall was not lost, as it is at present, through being allowed to flow over the denuded surface into the sea." [30]

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[30] M.Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.81.

The Roman culture inherited much of the Greek vision of the world, and the presence of similar elements of venerations and sacrality of nature is a demontration of the connection between Athens and Rome. Pliny the elder gave a consistent contribution in the study of the natural world, with his famous *Naturalis Historia,* based on a systematic knowledge inherited by Theophrastus, a disciple of Aristotle.
Beyond any consideration on the conception of the natural world of the Greek and the Roman civilizations, their development, as we have seen, had a consistent impact on the environment. The spiritual a sacral value attributed to nature did not mitigate the process of deforestation and environmental degradation, even if some cases of environmental and forest protection can be found in the Roman time, as a consequence of the awareness of the natural resources' importance." Some Romans explained their rule over other peoples by appealing to Rome's superior environmental situation. If environments shape nations, then the nation with the best environment must inevitably prevail, possessing a natural right to rule." [31]

The classical world is made of two souls concerning the vision of nature, the first incentrated in veneration and the second more orientated in domination. Litterary sources shows that there is not a unitary vision, concerning both the Greeks and the Romans, mainly because a lot of thinkers disagreed and developed different explanations. What is sure is that the classical world conceived the unity of human and natural world. The dicotomy between human beings and natural world conceived as inferior and the right of man to dominate and subjugate nature arose as an egemonic vision with the advent of Christiany, as a product of the judeo-christian tradition.
" In ancient Greece and Rome an ambiguous relationship developed between man and nature, and this decisively determined the manner in which they treated the environment. On the one hand, nature was conceived as a space characterised and inhabited by divine powers, which deserved appropriate respect. On the other, a rationalist view emerged, according to which humans were to subdue nature using their technologies and to dispose of its resources." [32]
The dualism between human beeing and natural environment arose with the judeo-christian tradition and expanded in Europe trough the cristianization of the Roman empire, setting the basis of a future dominant conception by wich man's domination over natural environment is a divine right and nature is seen in contrapposition from man as a source of the original sin.

Despite some elements of domination arose within the Bronze Age and classical civilizations, as a consequence of the radical transformation led by the agricultural revolution, the definitive shift in the paradigm appears with the judeo-christian tradition and its vision of the world. For istance, the natural world seen as inferior and imperfect has his roots in Plato's philosophical system.It is not coincidentally that many philosopher, considered as the fathers of the church, were neoplatonics and set the basis for the passage from the classic world to the christian world.

[31] J. Donald Hughes. "Environmental Problems of the Greeks and Romans", John Hopkins University Press, 2014, p.148
[32] L. Thommen, *An Environmental History of Ancient Greece and Rome*, Cambridge University Press 2012, p.1.

1.5 The Middle Age Great Clearings

Christian conception of the natural world is the fundamental transition towards the contemporary vision nature embedded in the capitalistic system. The concept of domination and subjugation of the natural world as a fundamental rights of human being is expressed clearily in the Genesis. Hughes in his *What is Environmental History* defines Environmental History as "the history of human thought about the environment and the ways in which patterns of human attitudes have motivated actions that affect the environment" [33]. In other words the definition expressed by Huges is related to the concept of intellectual environment developed by V.Winiwarter and M.Knoll [34]. Moving from the theorical bases of these two principle it is undeniable that the advent of christianity mark an irreversible shift in the way the nature is conceived, and many phenomena, actions and historical events can be reconducted to this culturl shift.

Conceiving the right of mankind to subjugate the earth and all its species, christianity prepared the grounds in wich early modern european expansion and contemporary capitalist economy seeds will grow. This conception spread trough the expansion of the Roman Empire with the christianization of Europe, and consolidated during the Middle Age, where entire "army" of monks and comunities related to the ecclesiastical power produced massive deforestation, clearing lands and building monasteries, abbeyes and villages all over Europe. Such massive deforestation and land clearing produced in Europe was motiveted by the idea of ruling and putting order the wilderness, fact that was seen as a fundamental contribution to the redemption of the original sin enclose in nature. In this aspect we can see the connection with the Greek late philosophy, in particular, the heritage of Plato's conception by which nature is defective and misleading.

At the time Romans were expanding and conquering the European continent, the state of the forests was already compromized by the development of locals population and the Roman occupation added more stress on the environment.

" But Romano-British and Romano-Gallic clearing, cultivation, and grazing in Britain and France was more widespread than thought, although Germanic lands still contained large tracts of untouched forest. It was a landscape already in the process of considerable transformation at the time of the Roman occupation." [35]

However, the pattern followed for clearing forests and setting villages in Europe - by opening up wild environment- is similar to Native Americans clearing and rural village settlement expansion in North America before the contact with Europeans.

Waldhufendorf, from the german litteral meaning of forest raw village, similar examples of

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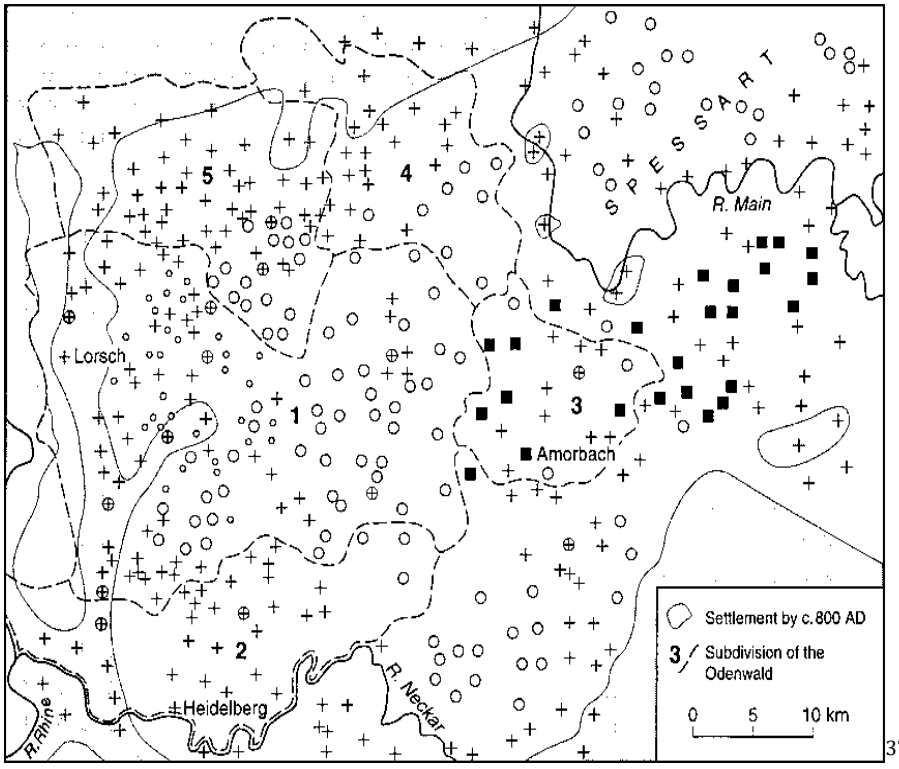
[33] J. D. Hughes, *What Is Environmental History?* Cambridge and Malden, 2006, p.3.

[34] L. Thommen, *An Environmental History of Ancient Greece and Rome*, Cambridge University Press 2012, p.10.

[35] M.Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p. 70.

forest clearing by expansion of rural settlements can be found in England, France and gradually expanding all over Europe following the increasing of the population until the 14th century. The *Waldhufendorf* settlement probably originated in the upper Rhine, expanding to formal Odenwald, Spessart in the east, the Black Forest, and the southern Augsburg plains.

" Eventually, with variations, it was adopted even farther afield in the massive forests of the Frankenwald, Thuringia, and Lower Saxony before becoming such a distinctive feature of the trans-Elbian colonization and forest clearing." [36]



[37]

The map above is an example of medieval clearing of forests by settlement of rural villages related to different Abbeys such as Lorsh, Amorbach and Fulda in the Odenwald area of Germany. The abbeys functioned as administrative centers and also as promoters of forest clearing and village foundation in the area. The persistent effort of the monks during the

[36] M.Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.99.

[37] Forest clearing and village foundation in the Odenwald, eighth to eleventh centuries ad. The subdivisions of the royal forest of Odenwald are as follows: (1) Abbey of Lorsch, (2) Bishop of Worms, (3) Abbey of Amorbach, (4) Abbey of Fulda, and (5) Nobility. The sub- divisions of the Odenwald settlement types are coded as follows: □ □ irregular (mainly early); □ □ *Waldhufen*—short, small "*hufen*" (eighth to ninth centuries); □ □ *Waldhufen*—long, large "*hufen*" (tenth century); □ □ *Waldhufen*—large, disconnected "*hufen*" (eleventh century); □ □ administrative centers. (Source: after H.-J. Nitz, "The Church as Colonist: The Benedictine Abbey of Lorsch and Planned Waldhufen Colonization in the Oldenwald," *Journal of Historical Geography* 9 , 1983.

Middle Age, contributed intensively to the process of deforestation in Europe, as their mission was a sort of redemption from the original sin, contained in nature and represented by it. The clearing forest and the settlement of villages was a way to control environment, a fight between human will of redemption and original sin contained in nature. Probably a similar pattern of deforestation and village expansion would have happened aside from the Christian conception of Nature, as the population growth was increasing between the 9th untill the advent of the plague in the mid 14th century. The disintegration of the Roman Empire opened new opportunities for populating and opening up new settlements and this, combining the political situation in Europe with a favorable climate warm period- Medieval Warm Period-, set the material bases for a considerable population growth.

Beyond the material favorable conditions for demographic expansion and the its effects on European forests, the religious background played a leading role in the process. The fact that there was a religious legitimation of the clearing of wilderness probably contributed to an intensification of the work and motivated these groups of monks and farmers to realize their mission.“ Thus the religious orders were the shock troops of clearing. Between 1098 and 1675 the Cistercians founded 742 centers, of which over 95 percent were in existence already by 1351, and these constituted about half of all religious houses. Each was a nucleus of intensive forest clearing and farming.” [38]

As feudal landlords' power starts to consolidate in the Middle Age, the revendication of forests and forest’s usage right bagan to be the fulcrum of a social conflict. Forest was a primary resource for poor people, who obtained food, some pieces of land, wood and timber from it. As the feudal aristocracy grew its power and influence, forests were revendicated as their exclusive property for hunting. In this we can see a prototype of a future legislation on forest protection, in the sense of privatization to legitimate aristocratic possession over forest mainly for hunting activity. The ritual of the king or the feudal lord hunting in the forest represented a return of the sovrain into the wilderness, to dominate it with the capture of wild preyes as a symbol of the victory of civilization over wilderness, but also a return to ancestral hunting and contact with the non civilized landscape.

From the 11th century to the advent of the plague, Middle Age Europe has known a period of intensive deforestation, defined in historiography as *l’Âge des Grands Défrichements*, the Age of Great Clearing, which interested mainly Northern and Central Europe, in particular France, Germany and England. As we have seen the favorable climate condition of what has been defined as Medieval Warm Period allowed a consistent demographic expansion.The growth of the popyulation required more food production and stimulated technological innovation in agricultural practices: the agricultural revolution and the utilization of heavy metal plows. “ The solution lay in the invention of the wheeled heavy plow that appeared in parts of

[38] M.Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.97.

Germany, the Low Countries, and northern France in the country between the Loire and the Rhine sometime during the seventh century." [39]

The heavy plow innovation apported relevant improvement in agricultural practice and considerably increased food production. Combined with the collapse of the Roman Empire, the revolution of the heavy plow shifted the balance of power and development from the Mediterranean Europe to the Central part of the continent. The Age of Great Clearings, *l'Âge des Grands Défrichements,* is indeed the period standing at the apex of the demographic expansion begun with the introduction of the heavy plow, wich to be sustained required and increasing number of forestal resources and cleared lands. For example, after the diffusion of the heavy plow, carried by axes or horses when available, produced at the beginning of the 9thcentury, a harness with a rigid collar that rested on the shoulders of the animals and not the neck, empowering the pulling force of horses between four to five time, avoiding the strangulation of the animal during the plowing. This is a typical implication of a technological invention, the heavy plow, that produced other related improvements to solve some criticalities connected with the introduction of the new technology. The number of people in Europe by the 7th century is estimated to be around 18 million, 38 million around 1000 and 75 million at the beginning of the 13th century. Increasing trend of population growth was sustained by a technological development in agricultural practice, but also viceversa, population needs incentivated technological innovation and of course a crescent rate of land clearing and deforestation.

" The attack (to forests) intensified during the energetic and ebullient High Middle Ages, after 1000 to circa 1300. This was a period of purposeful change, the heroic age *des grands défrichements* (of the great clearings), which lasted until the end of the thirteenth century when activity began to wane, and ended abruptly with the Black Death of circa 1350." [40]

L'Âge des Grands Défrichements, the Age of Great Clearing, also saw the raising of a legislation on forest protection and rights of use. The massive clearing produced in those centuries contributed to raise the awareness of the necessity to legislate and protect the forests, most of this embrional protection, as we have seen, was implemented by the aristocratic class for hunting and property purposes. In 1217 England, Henry III emanated the Forest Charter, on the wider context of civil and political rights included in the *Magna Carta Libertatis.* The charter defined the rights of forest use and protection. In France a series of edicts on forestal rights, culminated in the emanation in 1291 of the ordinance of the masters of *Eaux et Forêts*, instituting a body of agents which had the role of supervise and control the state of the forests, sanctioning illicit uses and regulating rights of use during different seasons. Similar laws were produced in Bavaria and in the area around Nuremberg. The necessity of a political regulation over forest use represents in part an attempt to solve the social conflict that in many parts of Europe regarded the access to forest as a primary source of sustenance.

[39]M.Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.94.

[40]Ibid, p.91.

The conflict arose between the rural poor class, mainly depended on forestal resource exploitation, and the aristocracy more orientated to protect forest as their property for hunting. On the other hand the previous centuries of massive clearings, contributed to raise the awareness that much of the forest landscape had been lost, increasing the fundamental value of the forest as a primary source of human development that now needs to be protected and its use ruled.

The Age of Great Clearing culminated with the advent of the plague around the middle of the 14th century, which decimated the European population breaking the growing trend of the past centuries. European forests started to recover during the plague, as a demonstartion of the pressure that economic and population expansion put on forests in human history. The same dynamic is produced troughout the Atropocene until today, with a difference, the impact of economic and population growth of industrialized petrol based economy on forest is exponential and globally spread.

" The spread of bubonic plague from Constantinople and across Europe between 1347 and 1353 wiped out at least one-third of the population in most of the West, and maybe one half in some places. Over 20 million people died, and the total population fell from 73.5 million in 1340 to about 50 million in 1450." [41]

Eventhough the plague pandemic reduced drastically the popultion and the impact of human caused deforestation, the Middle Age is the age in wich most of the European forests were cleared, and the process of social, political, economic, technological and demographic expansion was slowed and weackened by the Black Death, but the technological improvement in agriculture set the basis for a future expansion and population growth in Europe." Pre-1650, the three oldest-settled continents (Europe, Asia and Africa) show the highest rates of deforestation." [42]

[41] M.Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.117.

[42] S.Mosley, *The Environment in World History*, Routledge, 2008, p.36.

1.6 *The Christian vision of nature through the Early Modern Period: the basis of the capitalist attitude towards nature.*

The discovery of the American continent by Colombo in 1492, marks irreversibly the beginning of a new era, the Early Modern Age, caracterised by European expansion and the fundation of the overseas domination of the most powerfull countries such as Spain, Portugal, the Low Countries, England and France. The beginning of naval expeditions to conquer new lands was possible due to a technological development in agriculture and shipbuilding. Once most of the European forests were cleared to sustain the demographic growth in the Middle Age, a great ammount of timber was used as soon as the European powers started to invert consistent capitals in naval expeditions, territorial expansion and intercontinental trade towards the new continent. Shipbuilding technology guaranteed a clear adfirmation of the growing market of international goods; the movement of goods and people between continents started to assume an increasing importance as new products such as cocoa, coffe, sugar, silk and cotton entered the European market. The Early Modern Age is a crucial momentum in this framework of research, for the main reason that it can be considered the period in which socio-political transformations, imperial expansion, technological development, economic and population growth set the basis for the contemporary globalized system, mainly driven by European overseas expansion. The interaction between society and environment started to assume similar patterns worldwide since the creation of the interconnection between continents and the exchange of technology made possible by European empire building in the Early Modern Age.

After the 1492 Columbus discovery of the American continent, European states started to invest large amounts of capital in the intercontinental trade, building vessels with an ongoing improved technology and financing new discovery missions around the globe. The development of naval technology in Europe is crucial to understand the rising of the Europeans' overseas empires starting from the 16th century. What is relevant to the present analysis is to underline how the parallelism between European expansion and environmental change in the natural landscape took place during the formation of the new overseas empires. The main purpose of the intercontinental naval expeditions was to find new resources to exploit in order to satisfy a growing demand of goods in the european market, and to redefine a european balance of power between state, who increased their power and political influence from the new land discovered and conquered and from the wealth incomes related to it.

" European expansion overseas brought about a fundamental reorganisation of the world's ecology, an Environmental Revolution, which affected the everyday lives of most of its inhabitants." [43]European settlers in the new world exported the knowledge and the technologies resulting from a plural millenial social evolution in the Euroasiatic continent, deforestation wild forests to create new land for agriculture and to make coal for melting the metals extracted in the mines. The world slowly started to assume an European shape as fast as the conquest of wild regions advanced, and the european technological advanced societies allowed the imposition of the European culture as a new world wide hegemonic system.

[43] S. Mosely, *The Environment in World History*, Routledge, New york, 2010, p.15

Starting from the early 16th century intercontinental voyages, Europeans fastly improved naval technology. The taxonomy of new environments and wildlife began to assume a systematic complexity as far as the world wild regions were explored. A sophistication of the navigation techniques and the increasingly detailed mapping system, was consolidated throughout the 17th and 18th century.

" Europeans engaged in a new global cartographic effort to lay out the surface of the entire world and to develop a system of universal coding by which every point on the globe was assigned a unique location according to determined latitude and longitude." [44] During the early modern period, new disciplines of sciences such as botany, zoology, and geology were implemented in order to meet the necessities of the new world economy and trade. The disciplines of history and geography became important tools towards the discovery of new remote regions. Methods of navigation on rivers and sea and cartography systems turned out to be much more precise and reliable. Taxonomies of plants and animals of the new regions discovered broadened the content of the emergent botany and zoology, and increased the attention of scientist towards new species originate from America such as Mais, Potato, Tomate, Cacao for their economic potential, as will be discussed more detailed in the following chapters. The effort to transform the new world environment to satisfy europeans purpose of producing goods for the old continent market, was not a linear process and took the form of an adaptation of exported agricultural practices and species cultivated in new environments, with not few ecological disaster and the consequent necessity of finding hybrid techniques and agricultural system adapted to the new environmental conditions.

Territorial expansion was motivated mainly by political and economical reasons, as the new world resources could drastically improve the European standard of living and consumption. The aim of economic profit that stood behind the European expansion constitutes, for many scholars, the prototype of the modern capitalist economy. Marx in his analisis of the capitalist economy also noticed that a prototype of capitalism could be found in Italy at the beginning of the 15th century, when merchant and corporations started to organize work and production in a profit orienteted system.

" He does indicate, however, that there are two contrasting historical modes of progression into capitalist production. The first is where a segment of the merchant class moves over from purely trading operations to take a direct hand in production. This occurred in the early development of capitalism in Italy, and is the main source of recruitment of capitalists in England in the late fifteenth and early sixteenth centuries."[45] The first naval expedition produced a radical transformation of the world economy harldy immaginable at the beginning of the 16th century. The process innescated in Europe during the Middle Age set the basis for the overseas expansion, and the first discoveries gave a wide impulse to the development of naval technology, mapping systems and cartography, which gradually intesified intercontinental voyages, territorial expansion and trade. European overseas expansion

[44] J. F. Richards, *The Unending Frontier, An Environmental History of the Early Modern World*, University of California Press, Los Angeles, 2003, p.19.

[45] A.Giddens, *Capitalism and Modern Social Theory , an analisis of the writings of Marx, Durkheim and Max Weber*, Cambridge University Press 1971, p.329

started a trasformation of the world economy with drastic effects on the ecosystems of the planet. For the first time in history people, goods, plants, animals and pathogens began to move from one continent to another; the world territories and resources were more and more conceived for the purpose of satisfying an interconnected market. Diamond acutelly analised the historical process leading to the adfirmation of the European dominion over native cultures, in his *Germs, Steel and Weapons* [46]. The batteriological weapons, unconsciusly used by Europeans against a population lacking of any immunological defense against the old continent pathogens, played a decisive role in the European worldwide adfirmation.

Once local population were submitted and land conquered, territorial expansion in the new world started to assume the shape of the European farming organization. Forests were cleared massivly to gain land for agricolture and timber to meet the increasing demand of the European market. The impact on the environment of the European wordwide expansion in the Early Modern Age was huge. As most of the old world resources were already exploited, the conquest of new territories supplied the crescent demand of natural resources in Europe, as the population was growing cosiderably due to the introduction of new coltures from America and the general trend of economic growth." The distribution of new American crops – potatoes, maize, cassava, and peanuts – around the world, along with the introduction of Eurasian livestock to Central and South America, contributed to an unprecedented population growth, doubling by the end of the early modern period." [47]

Beyond the economic and political puroses of the expansion and with its destructive impact on the world forests, ecosystems and biodiversity, a cultural element have contributed to the massive clearing of the overseas forests. The Judeo-Christian tradition that through the Genesis adfirm the right of man to dominate over nature, contributed sostantialy to the mission of christianization of the world. Missioners started to undertake intercontinental voyages to christianize the rest of the world, while in Europe arose the philosophical debate concerning the christianization of native people, wheather they have the right to be christianized or not,wheather they have to be cosidered human beings or beasts. Sepulveda-Las Casas debate in Spain about the right of native people is a clear example in this direction." The forest was a dark and sinister symbol of man's evil where the Indians "were transformed into beasts" and where even a civilized man could revert to savagery because he was beyond the reach of redemption." [48] As we have seen for the Middle Age Great Clearings in Europe, the spirit of christianization reinforced and motivated the efforts of the settlers towards deforestation expeditions worldwide. The commodification of the environment in the new world assumed a sort of moral connotation of redemption representing the eternal fight between wilderness and civilization, between good embleded by civilization, religion and social morality and evil represented by wilderness of nature and native cultures. Once again,

[46] J. Diamond, *Guns Germs and Steel*, Norton,1999.

[47] C.H.Parker, *Global interactions in Early Modern Ag*e, Cambiridge, 2010, p.179.

[48] J. Winthrop, *Winthrop's Journal: "History of New England"* (1630–49), ed. J. H. Hosmer, 2 vols. (New York: Barnes & Noble, 1966), 2:83; and I. Mather *A Brief History of the War with the Indians in New England* (Boston: John Foster, 1676), 5.

the wild nature is seen as an enemy of the civilization, as a nature to conquer and dominate in the name of the morality embleeded in religion and European civilization, as a source of original sin and savageness.

" Lastly, as we have seen, cultural values were a powerful driver in changing the world's forest cover. And when European settlers arrived in their new lands from the 1500s, many believed that it was their Christian duty to clear forests and convert them into fruitful farms as quickly as possible. The Judaeo-Christian tradition, which stressed humankind's right to dominate and subdue the natural world (Genesis 1:26–9), made transforming forest 'wilderness' into an earthly Eden a 'divinely ordained task'. "[49]

The Genesis explicitly uses the term *subjugation* to identify the relationship between human and nature. Humanity, within the Christian vision of nature, has the right to dominate and subjugate the natural world that surrounds it. On the other hand, concerning other religions, most of all from the orient tradition such as Buddhism, Confucianism and Shintoism, scholars have suggested that the vision of nature embedded in these traditions reflects a deeper sense of respect for the natural world. Man and nature are considered in a dualistic vision in the western tradition, which is the base to legitimize man's dominion over nature. Dualism is probably one of the most important characteristics of the philosophical and theological tradition of the western culture, while oriental religions are more orientated to a unitary vision of existence, man and nature are not divided, but part of an entire complex unity. The animist vision of the Native American and Australian Aboriginals, their conception and spiritual value portrayed in the natural world doesn't necessarily mean a pure ecological behavior towards nature. Scientific evidence has shown that the impact on deforestation and commodification of wild forest into secondary regenerated forest actuated by burnings and clearing was a common phenomenon both in pre-columbian America and Australia. However, it is clear that, seeing the demographic composition of these human groups, their impact is nothing compared to the Middle Age clearings in Europe and later the deforestation produced by the European overseas expansion in the Early Modern Age. " China and Japan have shown, Buddhist, Confucian and Shinto 'reverence for nature' was not strongly reflected in their forest policies. Such religious values did not save forests, except for a few isolated stands of trees left untouched near shrines or other sacred places." [50]

Experience of Chinese and Japanese history shows that, despite the value of nature ingrained in the spiritual tradition, deforestation in those regions was massive as the necessity to support the population growth required huge amounts of timber and land. Concerning the relation between the conception of nature rooted in cultural, philosophical and religious tradition, and the way in which different cultures and societies have exploited the environment, it is necessary to consider also this qualitative aspect and its consequences on the impact of human actions on nature. However, through an historical analysis based on scientific data about commodification of past environments, it results that all societies and

[49] S.Mosley, The Environment in World History, Routledge, 2008, p.41.
[50] Ibidem.

human groups have produced deforestation and have impacted the natural environment they lived in, regardless of what beliefs and values their tradition embedded. The dependence of human existence on natural resources is a primary aspect that no religion can avoid, buti t can definitelly control the process and set limits to it. In this respect, it is possible to explain the western vision of nature as a contribution to deforestation and transformation of the world environment, because it goes in the same direction as human expansion needs, and legitimate the domination and the exploitation. The vision of nature as separated, wild, evil, something to be dominated and transformed to meet human needs, helped and enhanced a process that probably would have happened without any consideration on the religiuos and philosophic conception of nature, because of the contingency of its material necessity. This imperative of necessity can also explain why culture with a tradition attributing a sacred value to nature has also contributed to deforestation and impacted on the environment. Beyond Native American and Australian Aborigenal, China and Japan- two great developed agricultural based complex societies- with spiritual traditions very different from the western, have impacted hugely on their environment.

The Early Modern Age is the period in which European overseas expansion and the rising of a global interconnected economy produced a significant environmental transformation around the world. The environmental change produced in this age gave way to the following Anthropocene alteration, which have followed the same patterns, empowered by the industrial revolution, technological development and the related population and economic boom. The transformations of the world environment to satisfy an increasing global economy can be considered a continuum process that started in the Early Modern Period until the present days globalized economy.“ The most striking topographical effect of early modern frontier expansion was the severe depletion of forests especially, though not exclusively, in Brazil, the Caribbean, North America, Siberia, and China.” [51] European settlers started to alter the new world environment to produce goods required in the European market. The sugar industry, produced massive deforestation in the Caribbean island and in Brazil, that after a century of colonization became the world first producer of sugar. “ During the 1500s, Portuguese merchants imported eight thousand metric tons of Brazilwood every year, which was equivalent to two million trees in the century. This volume of wood translated into the loss of six thousand square kilometers of forest.” [52]

Despite the massive size of the Brazilian tropical forest, it is estimated that nowaday the loss of forest has overwhelmed one quarter of the original size before 1492. By the end of the Portuguese colonization of Brazil it is estimated that around 200,000 square kilometers of forest had been cleared to give space to agriculture and settlements.[53] The reduction of forest had an immense impact on the local diversity of flora and fauna. Moreover, the impact of the settlers on the environment consisted in the extreme amount of huntings of wild animals, which in many cases led to the extinction of entire species.

[51] C.H.Parker, *Global interactions in Early Modern Age*, Cambiridge, 2010, p.162.

[52] Ibid, p.163.

" The world's forests and woodlands have always provided – and continue to provide – 'ecological services' that are fundamental to the maintenance of a habitable planet. They are an important storehouse of biodiversity, contain- ing at least two-thirds of the earth's terrestrial species (with the greatest biotic diversity occurring in tropical forests). But the International Union for the Conservation of Nature and Natural Resources estimates that 87 per cent of the world's reptiles, 75 percent of its mammals, 57 percent of its amphibians, 44 per cent of its birds and 12 percent of its plants are now threatened by forest decline. Some 8,000 tree species (around 10 percent of the total known to science) are currently facing extinction." [54]

During the 16th,17th and 18th century deforestation for economic and human purposes advanced drastically all over the world. European forests were already well cleared at the beginning of the Early Modern Age, but the intensification of clearing due to economic and demographic expansion led to the development and amplification of protection laws, already emanated, as we have seen, at the end of the Middle Age. Concerning forest protection was a mere European social conflict that needed to be resolved through detailed classification of rights of forest use. " By the early modern period, laws regulating forest use had become com- monplace throughout Britain, France and Germany (especially in woodland reserved for royal hunting)."[55] In France in 1669 was issued *l'Ordonnance des Eaux et Forêts,* a law containing over 500 articles on ferestal protection and regulation, while by the end of the 18th century in Germany started the scientific study and classification of the forest. The concerns about protection that arose in Europe after centuries of clearings never touched the rest of the world in the Early Modern Period, where deforestation and wood extraction continued at an intensive rate.

The period between 1400 and 1700 is known for the great development of large centralized political authority. In Europe the rising of the national state from the feudal heritage of the Middle Age was the starting point for the consolidation of the empires overseas. In Asia the Ming and the Quing dinasty ruled over a developed, burocratic and centralized political system, while Muslim empires spread from the Middle East to India, Ottoman, Safavid and Mughal rispectively from West to East. The American empires of Inca and Aztec civilization wouldn't resist long the European invasion, while the African continent knew different agglomerations of territories under emergent political authority. The fenomenon of territorial expansion and growing centralization under political authority opened the way to international trade. Dealing with one political authority ruling over a vast area made commerce safer and increased the merchantil connections, as the commercial relations between large stable empires was much more reliable that negotiating with different small and instable political leaders. The fundation of large empires around the globe enhaced connections and economic exchange, promoting the rising of a new era of intercontinental trade.

[54] S. Mosley, *The Environment in World History*, Routledge, 2008, p.34.
[55] Ibid, p.42.

" In every world region, centralizing states building their military strength attained new territorial extent and new capabilities. They of- fered new levels of protection and reduced protection costs for merchants and traders in deepening and widening markets. Early modern states in- creased industrial production directly in state-owned enterprises. They of- fered subsidies and encouragement to preferred private industrial and trad- ing enterprises. They created more reliable and useful monetary systems based on coinage minted with New World silver and gold."[56]

The Protestant reformation had a huge political and social influence in Europe, its impacts were so radical in European society that it was a crucial event of tranformation of the political power in Europe. Conflict and war for power and religion spread all over Europe for almost one centuries, from 1560 to 1640 reshaping the traditional organization of the political power and redifining the equilibrium between emergent national states." The leading European states – England, the Netherlands, France, Prussia, Spain, and Austria – underwent a transformation in military capacity, referred to by many scholars as the "military revolution." [57] The religious wars that affected Europe at that time were also fought for economic purposes. As national states were rising and consolidating their power, their burocratic centralized apparatus, their militar technology and their cultural identity, an increasing rivalry and competition for commercial routes arose in the European political scenario. In particoular, such elelement of rivalry and competition between states in Europe, will translate into the aggressiveness of the process of transforming the world environment in the new territories and, somehow, is recognizable in the brutality of the slave trade. Different scholars underline, in more recent time, how the increasing rivalry and competition between states in Europe at the time was the final ingredient to the powerful mix of elements that aloowed the Europeans to rule the world, setting the base for a capitalist intensive explotation based on the world economy in the Early Modern Age." Thus, war for the sake of commerce had a long history among the constellation of competing states in Europe. As Europeans ventured overseas in search of trade and land, this warrior ethos made it natural for merchants and mariners to wage war against one another and indigenous peoples. Competition among European states made them effective and aggressive at empire building overseas." [58]

The situation in Europe during the 16th and the 17th century forged all the elements necessary to consolidate the European dominion all over the globe. Improvments of military and shipbuilding techonologies, improvement of the agricolutral production, reinforcement of the burocratic and administrative body of the state, adfirmation of a structured financial system (that could support wars and commercial expeditions over continents) are the main elements that constituted the adfirmation of the European overseas expansion . Diamond explains how and why Europeans gained their superiority trough the reconstruction of the main steps of human history which interested the development of technology and civilization across the euroasiatic continent. The horizontal territorial axe, characterizing the Euroasiatic continent,

[56] J. F. Richards, *The Unending Frontier, An Environmental History of the Early Modern World*, University of California Press, Los Angeles, 2003, p.24.
[57] C.H.Parker, *Global interactions in Early Modern Ag*e, Cambiridge, 2010, p.16.
[58]Ibid, p.17.

facilitated the interconnection between civilization and the exchange of germs, species and technology. In the other continents, like America and Africa, the north-south territorial extension didn't produce the same exchange, and the geographical characteristic of these continets kept their civilizations more isolated.

Moreover, the increasing interest in financing merchantil expeditions towards new territories caused a social and political transformation in the European society between 16th and 18th century. The merchantil class was gaining power and influence and the financial and administrative structure consolitated to sustain the empire expansion and the new global economy created a complex bond between buisness class, political authority and financial power. The transformations inaugurated with the European overseas expansion saw the emergence of a new social class, the bourgeoisie, mainly connected with trade and industry. The arising social class, consolidating its power thought the fiorent centuries of economic expansion, will soon define its role of political actor leading Europe and the the rest of the world into political modernity trought the English, French and American Revolutions." Third, and most important of all, the social sectors involved with capitalism took political power on a wide scale in western Europe, something that had not happened elsewhere except on very small terrains. This, the bourgeois revolution, allowed the emerging capitalist class-community to mobilize state power toward its further rise." [59]

All social political and economic transformation in Early Modern Europe can be seen as a step towards the consolidation of the modern capitalist society. As Marx pointed out, when analizing the social and productive transformation in Italy during the 15th century, the organization of the economy and the consequent reshaping of the socio-political organization in order to adapt to the economic transformation, is a clear prototype of a capitalist society. It is not a coincidence that Marx identify the embrional capitalistic society in the organizations of the Italian Maritime trade based Repubblics in the 15th century. Nonetheless it is not a coincidence that the same political organizations such as the Venetians Republic controlled the trade with Asia and Africa in the mediterranean see, and the first expeditions towards America were originally an attempt to find alternative commercial routes to Asia in order to defeat the Venetian monopoly in the Mediterranean. The discoveries in the new continent and the opening of alternative commercial routes started to weaken the Venetian monopoly and the rising power of Portuguese, Spanish, French English and Ducth shifted the balance of power in the adfirmation of the modern maritime empires.

As we have seen, competition between states for maritime and territorial control forged the way for the overseas expansion. The characteristic that this expansion and dominion over foreign territories assumed was definitelly the result of a capitalist based economic model and a consequence of the christian vision of the natural world and its resources: source of unlimited exploitation for human purposes. Political organization became more and more

[59] James M. Blaut, *The Colonizer's Model of the World: Geographical Diffusionism and Eurocentric History,* New York: Guilford Press, 1993, p. 201.

centralized and sofisticated and the real economic actors were the trade companies, the military wings of the states for the adfirmation of the economic imperialism.

" Such were the English Muscovy Company (1550), the East India Company (1600), the Dutch East India Company (1602), the Dutch West India Company (1621), and later the Hudson Bay Company (1670) and the Royal Africa Company (1672), as well as many minor ones. The companies were the powerful and well-organized spearheads of long-distance trade and the precursors of colonial land empires." [60]

These companies were the main drivers of the transformation implemented by the Europeans in the Early Modern Period. The growing demand of exotic goods such as sugar, coffee, tobacco, tea, silk, cotton, and Chinese porcelain implemented the production of these goods in America and in the far east, with its related environmental and cultural transformations. Moreover, the natural resources of the conquered territories alimented the industrial development in Europe, with the importation of great quantities of raw materials. Setting their bases in the most strategic harbours of the world for commercial and geopolitical purposes, the European trading companies became the main actors towards the world transformation in its economic and environmental shape. Much of the European worldwide expansion depends on three main aspects. The development of naval technology which allowed long distance voyages, the political and financial organization standing behind the naval expedition and the creation of global trade companies and, last but not least, the biological and military superiority gained throught millenia of exchange in the Euroasiatic continent.

Concerning the development of naval technology and most of all, reliable navigation tools and system of cartography, a lot has been inherited by the Chinese culture which invented the astrolabe and the gyroscopic compass, two key elements which contributed considerably to European success. Moreover, the complexity and sophistication of the financial system in Europe, which allowed the allocation of the resources necessary to support the growing international trade, were inherited from the Arab culture. Other elements inherited by the European that allowed the configuration of the development and the transformations happened in the Early Modern Age, others non European contributions allowing the European domination and transformation of the world. To summarize the elements that arose in this analysis which can be considered *conditio sine qua non* of the early modern transformation of the world, the first non-European contribution, as we have seen, is the importation of domestication of plants and animals and agricultural techniques from the Middle East. Second, the Chinese knowledge in cartography, the astrolabe, gunpowder, the gyroscopic compass and the paper money, third financial systems and tools inherited, mainly by Venetians merchants from the arab culture and lately diffused across Europe.

Europe's strength, from this perspective, depends mainly on the capacity of the European society to import technological and biological elements developed elsewhere, thanks to the

[60] M. Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.139.

strategic geographical position of Europe." None of these voyages would have been possible without the assimilation of Chinese knowledge of cartography and astronomy and without the use of the astrolabe and the compass, including the gyroscopic compass (all via the medium of the Arab world)." [61]

Compared with all the other continents, Eurasia is the continent in which a lot of exchange between human groups and civilizations has been possible through millenia due to its geographical configuration and its horizontal extension of the territory. The exchanges through the Euroasiatic axe, as Diamond acutely observed, allowed Europeans to absorb a lot from the civilizations developed all over the asiatic continent. These exchanges allowed European population developing immunity to the main pathogens related to the domestications of animals which, on the contrary, has almost extinct the native population in America and Oceania.

The creation of an interconnected world trade based on importation of raw materials and exotic substances in Europe, produced a massive environmental transformation and a huge rate of deforestation of the South American, Indian and Indonesian forests. Much of the forests in the new settlements were cleared to give way to sugar, coffee, tobacco and cotton plantation. All the overseas production was based on slave labour. Europeans have produced the most important in terms of numbers, and most dramatic from an ethical point of view, diaspora in history. The African diaspora is one of the most horrific results of European development in the Early Modern Age. It is estimated that around 12 million of slaves were deported from Africa to work in the plantations established to satisfy the European market demands of those goods.

The transformation of the world environment begun with the European overseas expansion combined with the African diaspora, set the basis for the contemporary globalized world. Despite the evolution of the human rights legislation and the consolidation of democracy, the exploitation of labour and resources is deeply embedded in our contemporary economic system and, as it was explicitly clear in the early modern age, capitalism bases its strength and its power as a hegemonic system on exploitation. Capitalism begins, as Marx indicates, in 14th century mercantile Italy and 16th century manufacturing England, as historical examples of the prototype of capitalistic organization of the production of goods.

The history of capitalism, as well as the history of the European expansion, the consolidation of the modern national states as well as the history of the western conception of the natural world can be seen as a fundamental history of exploitation. Environmental and human exploitation developed by the rising capitalistic system is rooted in the Christian vision of the natural world, legitimized by the right of man to dominate and subjugate the natural world resources and other men belonging to other cultures (slave trade). The transformation of the socio-political order from the 15th century onwards and the consequent environmental impact of such permutation had a wide repercussion in the direction the world development

[61] M. Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.131.

took. It is essential to focus on these stages from an environmental historical approach, to lead the reflection on the contemporary climate crisis, which has to consider historical and cultural aspects in order to develop aternative models able to substantially change the conception of the natural world as a mere object of domination and exploitation to satisfy human purposes.

1.7 China and Japan: environmental problems and protection in the Early Modern Age.

The state of forests in China during the Early Modern Age is considered by many scholars as a dark area, because of missing, unreliable information about forests and their use. Differently from the case of Japan where the forests were well monitored and different reliable sources of extension, the composition state exists , in China it does not. The information about forests and forestal uses can be deduced by information about rural life organization, and the demographic growth during the Ming and the Quing dynasty.

China is today the world's most populated country, but the population boom has its origin at least six centuries ago. At the beginning of the Ming dynasty in circa 1400 there were between 65 and 80 million people, and the area cultivated was about 24.7 million ha. By 1770 there were 270 million people and 63.3 million ha of cultivated land, and by 1893, 385 million people and 82.7 million ha of land in cultivation—a fourfold increase from 1400 to 1770, and a five- to sixfold increase by the end of the nineteenth century. [62] Assuming the datas about the population growth it is not difficult to imagine the impact on the Chinese forests of such an increasing number of inhabitants and their need of land for food production, clearing for shelter, fuel etcc. Moreover, as one of the first world centers of independent domestication of plant and animal, the history of deforestation in China is probably as old as the first agricultural settlements. Today China is facing every year environmental problems of different nature, some of them related to deforestation such as soil erosion, floods and droughts. The awareness of environmental problems and the necessity to act against climate change has become evident also for the world's most populated, first charcoal consumer and CO2 emitter country. The impact of the Chinese population on the environment is massive , but if we consider the CO2 emission per capita, China is still far from the USA or other developed countries, but the will of the Chinese to reach the standard of a first world economy puts China at the center of the climate challenge.

" In other words, China's achievement of First World standards will approximately double the entire world's human resource use and environmental impact. But it is doubtful whether even the world's current human resource use and impact can be sustained. Something has to give way. That is the strongest reason why China's problems automatically become the world's problems." [63]

Differently from the lack of information about forests in China during the early modern age, Japanese environmental history is abundant. The different attitude assumed by China and Japan towards forest during the early modern age, marks a significant difference in the status of the forest today, considering that Chinese territory is covered by only 16% of forest today, while Japan by 74%.

[62] M. Williams, *Deforesting the Earth: From Prehistory to Global Crisis*. Chicago: University of Chicago Press, 2003, p.216.

[63] J. Diamond, Collapse, *How Societies Choose to Fail or Succee*, Penguin, New York, 2011,p. 654.

From the collapse of the emperor's power Japanese society experienced a period of civil war and constant conflict between Daimyos, local landlords for power, which lasted almost 150 years beginning at the middle of the 15th century. When the civil war was finally over, and a daimyo assumed control over the entire nation, a period of peace and stability began. This period was accompanied by a massive demographic and urban expansion, characterized also by the monumental construction , such as castles and temples, which required an immense amount of timber.

The enhanced population and economic expansion increased the pressure on Japanese forests. Moreover the amount of timber required for urban construction, fuel, ceramic, metal smelting led to a crisis of wood resources by the end of the 17th century. The Tokugawa dynasty assumed rapid control of the situation and faced the wood crisis with different top down measures in order to limitate the human impact on forests and to allow forest regeneration. The Japanese case under the Tokugawa dynasty is a clear example of a ruling class that became immediately aware of the serious consequences of an environmental problem and started to act to contain it rapidly and with a long term perspective. The awareness of the ruling class was also due to a political decision to keep Japan isolated from the rest of the world, avoiding to solve the resource crisis exploiting resources elsewhere and obliging decision orientated to solve resource crisis locally. We will analyze more in detail this aspect in the last chapter, however, to anticipate, one of the most important problem of the environmental crisis in the globalized capitalist economy is the exact opposite of what has happened in Japan during the Tokugawa period.

Globalization allows multinationals corporations, stakeholders and decision makers to externalize environmental problem, to face resource depletion by exploiting resources elsewhere and most of all, to act in a completely opposite direction of a long term sustainable resources management, mainly because the lack of environmental legislation or control in most developing countries allow a short term exploitation to maximize profit and externalize damages in the future. Tokugawa's Shoguns, intensified controls over forest exploitation by instituting a magistrate in charge of controlling a preservate Japanese forests. Laws were enacted to stabilize the population growth and other to promote silviculture and forest regeneration. In this case religious background was used this time to legitimize the forest protection and to add spiritual value to the campaign undertaken by the Shogun.

" Japan gradually achieved a stable population and much more nearly sustainable resource consumption rates. The shift was led from the top by successive shoguns, who invoked Confucian principles to promulgate an official ideology that encouraged limiting consumption and accumulating reserve supplies in order to protect the country against disaster." [64]

A consistent swift in food supply was introduced by the intensification of the fishing activities, in particular a development in technology for whales fishing permitted to reduce the food dependence on agriculture, mitigating the impact on forests.

[64] J.Diamond, Collapse, *How Societies Choose to Fail or Succee*, Penguin, New York, 2011, p.529.

2. The Little Ice Age: climate change and resilience, 14th 18th century.

Variations in climate patterns affected Europe at the beginning of the 14th century, inaugurating a five century climatic change known as the Little Ice Age. This period was characterized by a decrease in average temperatures, basically the opposite of the actual trend in climate change where the problem is the rise of global temperatures. The reason for this shift in climate patterns is still not clear and defines a scientific object of study. Since the beginning of the 14th century the Little Ice Age caused extreme weather conditions.
Despite the uncertainty that surrounds the causes of this little glaciation, the effects and the change in climate patterns are well documented by different historical sources.

"What caused the Little Ice Age? Did small changes in the earth's axis affect global temperatures for five centuries? Or did cyclical fluctuations in solar radiation lead to greater cooling? The answer still eludes us, largely because we have barely begun to understand the global climatic system and the interactions between atmosphere and ocean that drive it." [65]

Scientific reconstructions of the past climate estimate that at the beginning of the 14th century the average temperature had dropped around one Celsius degree, while by the second half of the 16th century the cooling of the global temperature was even more drastic, around two Celsius degrees on average. Such a reduction in average temperature had a wide repercussion on the environment, causing extreme weather events, including the alteration of the deep-sea currents and an increasing trend in the earth's seismic activity.
Other peculiar events such as the freezing of the Thames river in London, are well documented in different historical sources of that period, describing the freezing city of London facing a period of extreme cold winter lasting until may. The freezing of the river became permanent during much of the year. Paintings and narrations of the epoch show the frozen rivers trannsforming into an open air market and spot for other activities.

The cooling of the global average temperature had important repercussions on agricultural production. It is estimated that a reduction of around two Celsius degrees is equivalent to a reduction of three weeks of the vegetative period of the crops. This consistent reduction in addition to the change in climate extreme events drop dramatically the agricultural production causing famine and social tensions. " A two-degree drop in annual mean temperature translates into almost three weeks of lost growing time, meaning that crops were very much slower to ripen, and sometimes failed to ripen at all ." [66]
The Little Ice Age has caused in Europe periodic agricultural crisis. Climate change reduced the crops harvest and consequently the prices of basic needs products such as bread and flour rose consistently. Historical evidences show the correlation of the most difficult years with the spreading of riots and social conflicts.

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[65] B. Fagan, *The Little Ice Age, How Climate Made History 1300-1850,* Basic Books, New York, 2001, p.93.
[66] P. Bloom, *Natures Mutiny, How the Little Ice Age of the Long Seventeenth Century Transformed the West and Shaped the Present, Liveright Publishing, New York, 2019,* p.24.

The evolution of the climate conditions in Europe and more in general in the Northern Hemisphere is something which has interested climatologists and scientific investigations for decades. The scientific knowledge about the climate is still not complete, there are fenomena whose causes are still not clear and require more research in the field.
What is known is the NAO, the North Atlantic Oscillation, a phenomenon of variation of atmospheric and sea currents caused by fluctuation of high and low pressure zones, which defines a complex interconnected climate system governing the climate variation in the North Atlantic area.
"The North Atlantic Oscillation (NAO) is a seesaw of atmospheric pressure between a persistent high over the Azores and an equally prevalent low over Iceland. This seems like an arcane piece of scientific information until you understand that the NAO governs the position and strength of the North Atlantic storm track and thus the rain that falls on Europe, especially during winter." [67]
The persistence of a low pressure zone, particularly over Island and Greenland, and the high pressure zone over the Azores, generate winds moving from the south west to north east, bringing warm currents to the north of Europe .
The NAO is also correlated to the EA (East Atlantic) pattern, an oscillation similar to the NAO and constituted of a north-south polarity which causes the shift of currents from east to west. These two phenomena are studied in combination by climatologists in order to understand the complex equilibrium defining the climate patterns and their periodic variations in the North Atlantic Area.
A high NAO index means a high pressure over the north area (Island and Greenland) and low pressure over the south area (Azores), which is related to an increased stream of currents bringing warm weather in Europe, while a low NAO index normally generates cold weather over the European Continent.
" The EA pattern is structurally similar to the NAO, and consists of a north-south dipole of anomaly centers spanning the North Atlantic from east to west. The anomaly centers of the EA pattern are displaced southeastward to the approximate nodal lines of the NAO pattern." [68]
A positive EA index is related to warm temperatures in Europe while a normally cold or below-average temperature is registered in the south of the United States and vice versa. The complexity of the climate pattern in the North Atlantic is a mix of these elements where each of them plays a fundamental role in defining the climate patterns over a chosen period and its variations.
The earth climatic equilibrium is a complex system and a lot of aspects are still object of scientific investigation, including the relation and the self influence of phenomena such as NAO, EA, Gulf Stream, Sea Temperatures and the distribution of the sea ice and icebergs, periodic variations of the rain. Since the scientific interest on the consequences of human development on the climate has increased in the last thirty years, many studies have been developed to better understand the complexity of the system that regulates the climate fluctuation in the North Atlantic and in the rest of the planet.

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[67] B. Fagan, *The Little Ice Age, How Climate Made History 1300-1850,* Basic Books, New York, 2001, P.52.
[68] https://www.cpc.ncep.noaa.gov/data/teledoc/ea.shtml

The study, conducted in 2011 by T. Woollings and M. Blackburn titled *The North Atlantic Jet Stream under Climate Change and Its Relation to the NAO and EA Patterns* [69].published by the American Meteorological Society, is based on an comparative analysis of different systems of climatic datas collection with the aim of investigating the consequences of the anthropogenic greenhouse effect and general warming of the earth temperatures within the complexity of the North Atlantic climate pattern. In other words the study conducted by the climatologist of the Reading University wanted to demonstrate how anthropogenic climate change is affecting the delicate dynamics of the North Atlantic climate pattern. The result was that, by comparison of different data systems and previous studies, the jet streams have moved poleward due to anthropogenic climate change. For more detailed information on the research see. The NAO has defined the climate pattern in Europe for thousands years, and combining modern research on meteorology with historical written sources, dendrochronology and Ice core analysis is able to gather climate datas back to the end of the 17th century. "We do not know what causes high and low indices, nor can we yet predict the sudden reversals that trigger traumatic extremes. But we can be certain that the NAO was a major player in the unpredictable, often extremely cold, highly varied weather that descended on Europe after 1300." [70]

The Gulf Stream and the NAO played an important role in the climatic shift especially during the Little Ice Age. Scientists and climatologists mainly agree on the period in which collocate the Little Ice Age. It began around 1300 and ended around 1850. The little Ice Age is a period related to a wider period of climatic shifts. Since the last Glaciation the word has known a periodical shift in climate patterns. It is estimated that around 6000 years ago, the average temperature of the earth's surface was similar to noaday's records, even a little warmer. During the last glaciation 18000-14000 years ago the glaciers levels in the most important mountain chains of the world had descended around 350 m. During the Little Ice Age it descended 100m compared with the levels of the Medieval Warm Period, to recede back again at the beginning of the 20th century due to the increase of the temperature.

The Little Ice Age was not a monolithic event. As a general trend in the change of climate patterns it represented an increasing frequency in climatic shifts, most of them unpredictable and unexpected. It was characterized by a long series of cold and long winters, which could continue for decades orbe just a sporadic cold winter. At the same time summers could be very hot and the variation in the precipitation patterns has caused several flooding and extreme weather events all over the European Continent."There was never a monolithic deep freeze, rather a climatic seesaw that swung constantly backwards and forwards, in volatile and sometimes disastrous shifts. There were arctic winters, blazing summers, serious droughts, torrential rain years, often bountiful harvests, and long periods of mild winters and warm summers. "[71]

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[69] T. Woollings and M. Blackburn, *The North Atlantic Jet Stream under Climate Change and Its Relation to the NAO and EA Patterns*, Journal of Climate , Vol. 25, No. 3 (1 February 2012), American Meteorological Society.

[70] B. Fagan, *The Little Ice Age, How Climate Made History 1300-1850,* Basic Books, New York, 2001,p. 58.

[71] Ibid, p.84.

2.1 The Norse settlement in Greenland

The importance of studying the variations in climate patterns in the recent past defines a scientific priority in order to foresee and prevent the consequences of imminent change in the future. Jared Diamond in his book *Collapse, How Societies Choose to Fail or Succeed* [72], accurately analyzes the delicate equilibrium between the prosperity of a social group and the environmental circumstances, describing how different behavior towards the natural environment became a fundamental matter of survival or failure of past societies around the world.

The book is structured in four parts, the most relevant to this analisis are the second and the fourth, respectively including case studies of the past societies and "lesson for the future", with suggestions and analisis on the present situation and the imminent future.

Concerning the Little Ice Age in its early beginning, the case study of the Norse Settlements in Greenland makes clear how a conjunction of social and environmental factors led to the decline of Norse outposts in the island around the beginnings of 1400, in conjunction with one of the coldest period of the Little Ice Age. The case of the Norse Settlement in Greenland is representative for two main reasons. On one hand, the case represents an historical evidence of a society who had to adapt to a new environment and, during the centuries, had to face different environmental problems, some of them caused by human action- like deforestation and erosion of soils-, others imputable to natural changes such as the drop of temperature at the beginning of the Little Ice Age.

On the other hand the case is emblematic because of the number of researches and means used to gain information about the past civilization and the change in climate patterns during that period. As we have seen in the first chapter four main scientific methods are used to gain accurate information about the past climate: palynology, dendrochronology, ice core analysis and radiocarbon dating.

All these methods are fundamental for scientific research in past climate variations when combined, underlining how often these kinds of research need to incorporate and compare information obtained from the use of different analysis in order to be more accurate in time dating and to discard false track of inquiry.

The study of the Norse settlement in Greenland has been made of polinology and ice core analysis, mainly because the dendrochronology was impossible to practice considering the relatively young vegetation that populates the island. The comparison of the results of the two types of analysis gave relevant information about the variation of the climate in Greenland, the modification caused by human settlement and the beginning of the Little Ice Age.

The pollen analysis of the sediments extracted in Greenland revealed that the vegetation had changed from spices that normally populate warm climates to spices more resistant to cold weather."As past climates became colder in Greenland, palynologists find pollen shifting from that of warmth-demanding trees to that of cold-tolerant grasses and sedges. But that same

[72] J.Diamond, Collapse, *How Societies Choose to Fail or Succee*, Penguin, New York, 2011.

shift in pollen may also mean that the Norse were cutting down trees, and palynologists have found other ways to distinguish those two interpretations of declining tree pollen." [73]

This should indicate a general trend of temperature cooling, but considering only this information it is not clear wheather the gradual shift in the vegetation was caused by climate change or by human deforestation. Some species of trees could have disappeared because of human over exploitation. The problem was solved by comparing the informations obtained from the ice core analysis. The snow that sedimented in the layers of ice year after year contains three types of oxigen isotope: oxigen-16, oxigen-17, and oxigen-18. These different isotopes differ from each other because of their atomic weight, and the presence of oxigen -16 is the most consistent, around 99.8%, while oxigen-18 and oxigen-17 are present in a very small portion, 0.2% and less then 0.2% for oxigen-17. The presence of these isotopes of the oxigen can change depending on the temperature at which snow forms. The atomic weight of the isotope can be detected by an instrument called mass spectrometre.

With the analysis of long core of ice in which snow has sedimented year after year it is possible to know the variation in climate from year to year, decades, centuries.
The comparison with the palynology analysis has proven that after the last glaciation the climate has been warming with the growth of small size tree forest in part of the island, and begin to cool again at the beginning of 1400, when most of the forest were cleared by the Norse and replaced with cold tolerant grasses and sedges.
This example shows how important is the combination of different scientific methods to reconstruct the variation in past climate in a given area, because , even though Europeans settlers in Greenland knew the writing, unfortunately we have no records about the climate during that period.

To what extent was the drop of temperature caused by the Little Ice Age the culprit of the decline of the Norse Settlements in Greenland? Was it the only cause? Why did the Inuit inhabitant of Greenland survived while the European perished?

Let's start a short reconstruction of the story of the Norse Settlements in Greenland to see how different aspects contributed to the decline of this North European medieval society.
In line with its heritage of a Medieval European society the Norse settlements depended on agriculture and livestock. The Norse arrived in Greenland around A.D 984 and started to settle in the most temperate and suitable area to sustain life, the South-West coast. Two main settlements were established, erroneously called the eastern and the western settlement, because both of them lay in the south west coast, with the western settlement located 500km north from the eastern. The mistake in the using of the adjective eastern misled many expeditions in search of the eastern settlement, wrongly searched in the eastern coast of Greenland without any success.
The fiords where the settlements were established were quite virgin at the arrival of the Europeans. The climate favorable period before the beginning of the Little Ice Age led the first

[73] J.Diamond, *Collapse*, *How Societies Choose to Fail or Succeed*, Penguin, 2005, p. 227.

explorers to call it Greenland, with good expectation for the future of the settlements and with the aim of attracting more people to live in such a remote area of the known world.
Deforestation was one of the first means by which Europeans started to modify the environment in Greenland. Timber was used for construction and fuel, while areas of forest were cleared to obtain fields for pasture and agriculture. As in many other parts of the world the process of clearing forest was connected to another phenomenon: the erosion of the soils caused by the effect of the winds. Trees and shrubs, which roots and presence help to keep the soil integrity avoiding the erosive effect of the wind, once cleared, opened the way for an intense process of erosion provoked by the strong winds in the fjords of Greenland. Even though the relative temperate climate characteristic of what is termed the Middle Age Warm Period, the winter months in Greenland were cold and the extreme weather made it impossible for cattle to survive outside. Norse were used to cold weather and their dependence on livestock for meat and milk products meant the construction of stables and the massive production of hay in the vegetative period of the year.
" The sequence of soil erosion in Greenland begins with cutting or burning the cover of trees and shrubs, which are more effective at holding soil than grass. With the trees and shrubs gone, livestock, especially sheep and goats, graze down the grass, which regenerates only slowly in Greenland's climate." [74]

The harsh climate combined with the intense rate of deforestation avoid forest regrowth, increasing the erosion of the soils. The necessity of timber for construction, heating and iron melting increased during the centuries, but timber was no more available, forcing the Norse to import timber for construction and iron ingots. Archeological researches with radiocarbon dating, show that iron tools slowly disappear during the last period of the settlements, and was substituted by recycled wood tools and tools made with bones.
The scarcity of iron, caused by the unavailability of enough quantity of wood to reach temperatures necessary to work and shape it, forced the Norses to find alternative materials to fabricate their tools. The necessity to adapt to the new environment became stronger with the cooling of the temperature at the end of the 14th century.

"Around 1300, though, the climate in the North Atlantic began to get cooler and more variable from year to year, ushering in a cold period termed the Little Ice Age that lasted into the1800s. By around 1420, the Little Ice Age was in full swing, and the in-reased summer drift ice between Greenland, Iceland, and Norway ended ship communication between the Greenland Norse and the outside world." [75]

Norse's economy depended on importation of timber, iron and tar while one of the most important item of exportation from Greenland to Europe was the walrus ivory, a prestigious good since the Muslims blocked the commerce of the elephant ivory in the Mediterranean. Other goods required in Europe were the walrus strong and resistant skin, used to produce sailing rope, the polar bear (skin or alive) and a peculiar specie of hawk, Falco Rusticolus.

[74] J.Diamond, *Collapse*, *How Societies Choose to Fail or Succeed*, Penguin, 2005, p.263.
[75] Ibid, p.229

With the cooling of the temperature and the interruption of the maritime trade from Europe to Greenland, the living conditions of the two settlements became gradually harder, pushing the population to struggle to survive during the long and cold winters. The source of food originally imported, such as agriculture and livestock was no more sufficient to feed the population , so the quantity of protein coming from local species hunted or fished increased considerably during the most difficult years.
Without the Caribou, the Polar Bear, the Seal, the Whale and the Walrus probably the European settlements in Greenland would not have last more than two or three generations. Other studies, analizing with radiocarbon the human skeleton found in the settlements, show how the diet of their inhabitants changed considerably during the last period. It is estimated that at the beginning of the eastern settlement the amount of fish protein in the diet was around 20% while it reached around 80% during the last decades before the collapse of the civilization. " Thus, the impact of the Norse on the natural vegetation left them short of lumber, fuel, and iron. Their other two main types of impact, on soil and on turf, left them short of useful land." [76]

The collapse of the Norse settlements in Greenland was fast and cruel, but was not inevitable, as Diamond suggest in his analisis, because the Inuit had survived the advent of the Little Ice Age in Greenland, despite of the climate harsh conditions , the interruption of the maritime trade with Europe.
The main consideration we can observe in the story of the Norse settlements in Greenland is focused on the concept of adaptation. As a European Medieval Christian society, the Norse in Greenland imported in the new environment their traditional lifestyle and means of survivor. After a relative prosper warm period, they had to adapt to new habits and find new source of proteins, in order to survive in the changing environment, and when the trade with Europe was interrupted by the Ice, the level of survival reached its apex.
Their cultural attitude towards the Inuit, who were able hunters and knew the environment better then the Norse, probably made the difference in the fate of that people, because their hostility and presumption of cultural superiority avoid them to learn the traditional means by which the Inuit survived in Greenland's harsh climate. When things were getting worse their imported traditional means were unable to guarantee their survival.
When at the end of 1300 the source of protein in the diet was mainly marine's origin it was not because the Norse started to prefer eating whales and seals, it is because the cattle was so wicked and scarce that it could no longer sustain the entire protein deman of the diet.
The history of the Norse Settlement in Greenland is a clear case in which a society remains conservative towards their traditional means and perish because of its incapacity to face the environmental changes (partly caused by its own impact on the environment) and to change their traditional lifestyle, absorbing new techniques and knowledge by a different culture, in the case considered as inferior.

[76] J.Diamond, *Collapse*, *How Societies Choose to Fail or Succeed*, Penguin, 2005, p.262.

2.2 The doomed adventure of the Spanish Armada.

Another emblematic event representing the dimension of the change in climate patterns at that time is the narrative of the Spanish Fleet, raised anchor from the Basque harbours of La Coruña in 1588, aimed to defeat the British Fleet, as a decisive attempt of submit the protestant kingdom to the catholic faith. King Phillipe II of Spain was in war against England for religious and political purposes. But, despite the magnificence and power of the Spanish fleet composed of a number of 130 vessels, the expedition culminated in a catastrophic disaster, not specifically for military reasons, but mainly for the effect of climate change.
Once crossed the English channel fighting against the british fleet to join another fleet sailing from the harbour of the spanish low countries, the huge spanish fleet got stuck in british water, pushed back by the English Cannons. The defeat was clear and to avoid the loss of other precious vessels in the attempt of crossing back the channel, the admiral Don Alonso Pérez de Guzmán decided to sail north, all the way through England and Ireland to avoid another British attack in the channel.
Sailing around the Orkney Island seas, the Armada was hit by a powerful Atlantic storm, which was unusual for the period of the year, the month of the storms was september. Scientific reconstructions have shown that the storm was a hurricane of intense magnitude that pushed the vessels towards the dangerous rocky Irish coast.
"The Spanish were excellent sailors, lords of a global empire and used to navigating in different conditions and climate zones. But even they could not have foreseen a storm of this size, completely atypical as it was in those latitudes. " [77]
The Spanish lost 24 vessels in the storm, around five thousand sailors and soldiers were killed and it is reported that only 67 vessels of the 130 returned to Spain (in seriously damaged conditions).
The case of the Spanish Armada is a well documented event of the epoch , which give us an idea of the change in climate patterns occurring at that time, such as a consequence of the cooling of the global temperature defining this phenomenon.

[77] P. Bloom, *Natures Mutiny, How the Little Ice Age of the Long Seventeenth Century Transformed the West and Shaped the Present, Liveright Publishing, New York, 2019,* p.48.

2.3 Volcan activity in the Little Ice Age

Another documented extreme climate event, with consequences in much of the northern hemisphere, is the eruption of the volcan Huaynaputina in Peru on February 19, 1600. A peruvian scholar, Felipe Guáman Poma de Ayala, documented what was happening in the town of Arequipa, describing the sky completely covered by ash and sand for 30 days.
The connection between the variation in climate patterns due to the little ice age and the intensification of volcanic and seismic activity in that period raised questions about the connection of these phenomena. One hypothesis explains such intensification of volcanic and seismic activity as a consequence of the alteration of the deep sea currents, wich altered also the pressure exerted on the continental shelves.
This could explain the intensification of these phenomena , but it is still not clear as the complexity of the earth climate does not allow us to assume conclusion and to move beyond past climate hypothetical research.
What is interesting to notice is how the eruption of the Huaynaputina volcano, had important repercussions even in Russia, where the following years caused a widespread famine due to poor harvests.
"It is estimated that between 1601 and 1603 some three million people in Russia and neighboring areas succumbed to famine and fatal illness." [78]
Scientific evidence based on ice core analysis demonstrate the correlation between the eruption in Peru and the following cooler years in the northern hemisphere.
During the famine provoked by the climate alterations at the beginning of the 17th century, riots and revolts spread all over Europe and Russia. Merchants were forced to find other routes to import grain and the price increased considerably.
The earth climate system, as we have seen so far, is very complex and is regulated by different phenomena such as NAO, EA, ENSO the oceanic streams which play an important role in defining the characteristics of the world climate, region by region, continent by continent. The Little Ice Age is an example of climate patterns, unexpected and irregular variations in the recent past, when the effect of the anthropogenic influence on climate due to the emission of GHG has not begun yet.
The interconnection and the interdependence of the earth climate is very delicate and the case of the Little Ice Age proves that a small variation of one of those fenomena which regulate the earth's climate can have wide repercussions both in space and time.
A single natural event such as a volcanic eruption can produce worldwide effects and alterations on climate. The case of Huaynaputina volcan eruption is just an example in the recent past of how those alterations can be produced, as far as we know from scientific datas and historical records.
" Volcanic dust is some thirty times more effective in shielding the earth from solar radiation than it is in preventing the earth's heat from escaping. During the three years it may take for

[78] P. Bloom, *Natures Mutiny, How the Little Ice Age of the Long Seventeenth Century Transformed the West and Shaped the Present, Liveright Publishing, New York, 2019,* p. 56.

the dust from a large eruption to settle out, the average temperature of much of the globe may drop as much as a degree, perhaps even more." [79]

The first decade of the 19th century was characterized by intense volcanic activity. Scientist have recorded three major eruptions. Soufriere on Saint Vincent in the Caribbean in 1812, Mayon in the Philippines in 1814 and Mount Tambora in 1815.

The Mount Tambora Eruption was the largest ever recorded in human history, the effect had worldwide repercussions and the intensity of the event provoked a significant cooling of the temperatures due to a reduction of the solar radiation activity, stuck in the layer of ash and smoke in the atmosphere. The year of 1816 is known as the year without a summer with a temperature drop in the summer month recorded between 2.3 to 4.6 below average.

In 1883 the Krakatau volcano brutally erupted in Indonesia causing a reduction of the solar radiation estimated between 20-22% below average. The Krakatau eruption is the first whose effects have been studied systematically by scientists.

[79] B. Fagan, *The Little Ice Age, How Climate Made History 1300-1850,* Basic Books, New York, 2001, p.92.

2.4 Social and political consequences of climate change during the Little Ice Age

As we have seen in the first chapter the Middle Age Warm Period was characterized by an increasing rate of population growth, which was arrested around 1350 with the advent of the plague. The European preindustrial society was a society in large scale based on subsistence and depended on agricultural production based on human and animal power. The capacity of European society to cope and be resilient towards sudden climatic shifts was very low. The cases of famines and social protests are well documented in those years sources.

The French Revolution is social and political event that recently, due to the increased interest in the environmental history studies, have been related to the climatic shifts in the decade of 1770 and 1780. Not only a series of bad harvests contributed to the spread of the social protest, but it is surely an element to take into consideration analyzing the context in which the Revolution arose. France's population was growing at that time, even though the living conditions of the majority of the population was very poor. Up to 75% of the population, depending on the region, was peasants and around 80% was not land owners. Compared with England, where agriculture was modernized and the revolution of agricultural production at that time was, to some extent, a response to the climate change of the Little Ice Age, French Agriculture was backward. The innovations introduced in England around the beginning of the 18th century, were stimulated by the necessity to cope with bad year's harvests, which became more frequent since the advent of the Little Ice Age. The revolution in agricultural techniques could solve only partially the problem of scarcity of food and bad harvest, England was hit by riots and uprising of violent demonstration in the most difficult years as France was.

"Eighteenth-century France was not on the verge of environmental collapse, but the links between land shortage, population growth, growing vulnerability to poor harvests, and sudden climatic shifts made for a volatile countryside that would have been unimaginable in earlier times." [80] Social riots caused by severe famine during the coldest years of the Little Ice Age were diffused in all the European continent. The demonstrations of the hungry people had similar patterns and most of the time ended with looting and riots in front of bakeries and city markets. It is not a case that in 1816, the year without a summer, caused by the violent eruption of Mount Tambora Volcan in Indonesia, the protests caused by the famine were particularly widespread and violent. The protests that arose during the 1816 and 1817 were particularly violent and the continent was already proved by the Napoleon's War. The spread of the violence and the miserable condition of the majority of the population worried most of the European governments who were aware of the risk of new revolutions.

The period concerning the Little Ice Age was very troubled and full of significant episodes in European History. Despite the difficulties worsened by climate change and periodic wars, the population followed a growing trend.The necessity to face the climatic unpredictable shifts pushed towards a more organized and modernized agriculture system, which revolution, for

[80]B. Fagan, *The Little Ice Age, How Climate Made History 1300-1850,* Basic Books, New York, 2001, p.226.

some scholars can be considered a precursor of the mechanization and capitalization of the productive system of the later industrial revolution.

"We would logically expect another such episode to descend on the earth in the natural, and cyclical, order of climate change, were it not for increasingly compelling evidence that humans have altered the climatic equation irrevocably through their promiscuous use of fossil fuels since the Industrial Revolution. We may be in the process of creating an entirely new era in global climate, which makes an understanding of the Little Ice Age a high scientific priority." [81]

In this direction the Little Ice Age, as a climatic event, can be studied not only from a scientific-climatological point of view, but also from the point of view of the social and cultural impact that climate change had, have and will have on the societies.The connection of climate change with historical processes such as the French Revolution prove show climate change plays a fundamental role in determining the course of history. This perspective could move towards a sort of Environmental Determinism, a conception by which historical and social events are related mainly to climate change.
Not everything in history was a response to climatic shifts or can be reconducted to climatic shifts, but the climate perspective has somehow been underestimated in historical research and this would explain the recent growing interest towards Environmental History and Environmental Determinism.

"One idea in particular, formulated for the first time in Europe around 1600, was to allow the continent to gain a position of spectacular global dominance: The medieval acceptance of human economic life as cyclical and stable was rejected in favor of the idea of continuing economic growth based on exploitation. This was to prove the generator of European wealth, built on relentless imperial and industrial expansion. It is this same idea of growth based on exploitation that now poses so clear a threat to the well-being of our species."[82]

The change in climate patterns from the 14th to the 18th century has defined the Little Ice Age. Wheather positive or not, the consequences on European society were remarkable and the Little Ice Age is surely a period of intense transformations in Europe. Even though the cause-effect relation between climate change and social change is not always easy to demonstrate, the cooling of avarage temperatures provoked by the Little Ice Age forced European society to cope with such a previously unknown phenomenon. Some scholars adfirm that the Little Ice Age was the main driver of the most important changes in Europe social and political scenario in the Early Modern Age. This vision, clearly framed in an environmental determinism perpective, defines the Little Ice Age as one of the causes of the European global dominance adfirmation. The poor harvest and consequent scarcity of food generated in the coldest years pushed European societies to find alternative commercial routes to replace the grain supplies. The necessity to open new commercial routes, challenging the mediterranean monopoly as

[81] B. Fagan, *The Little Ice Age, How Climate Made History 1300-1850,* Basic Books, New York, 2001, p. 96.
[82] P. Bloom, *Natures Mutiny, How the Little Ice Age of the Long Seventeenth Century Transformed the West and Shaped the Present, Liveright Publishing, New York, 2019,* p.31.

the only maritime connection with the Middle East, stimulate the competition between European State to reinforce their maritime markets in the search for new routes. Once the American continent was discovered, the maritime competition explosed between European states. As we have seen in the first chapter, the geopolitical situation in Europe during the 15th, 16th and 17th, was not stable and the difficoulties provoked by climate change were combined with war scenario for political and religious purposes. The combination of these elements forged the characteristic of competition, aggressivity and desperate search for wealth, resources and expansion, by wich European societies built in those centuries their global dominance.

The repercussion of this process increased the capacity of European society to cope with Climate hard conditions of the Little Ice Age. The introduction of American crops in Europe constituted a partial solution to failed harvest and famines. The consistent wealth and resources flowing into Europe from the new continent make europe richer that ever and constitute a very important mean to fight the effect of climate change in the old continent.
The cooling temperatures and the consequent reduction of the crops vegetative period stimulate new agricultural techniques, and the substitution of new types of crops more cold-resistent.

" The peak of the climate episode we know as the Little Ice Age coincides with massive changes in European societies. To some extent at least, improved agricultural techniques, stronger and more international markets, and an increasingly globalized system of economic domination (of growth based on exploitation) allowed Europeans to develop more successful responses to climate change and to the hardships it inflicted. These responses were answered in their turn by transformations in every aspect of culture and society." [83]

It is evident that climate change played a fundamental role in determining the process by wich Europe built its global dominance in the Erly Modern Age. Left aside a pure environmental deterministic perspective, the climate change produced in the Little Ice Age was not the only, nor the predominant element, wich have determine the historical process described. Most of the times historical facts are more complicated that the historioghraphy would like them to be and the causes are often an interrelation of different elements- some of them- not cleared still.
" But historical facts are never quite as smooth as grand narratives require them to be. The Little Ice Age is also a story of accidental adaptation, of coincidental circumstances allowing great transformations to take place." [84]
The conception by which history is a linear process and historical facts can be explained within a cause-effect perspective, constitute a clear attempt of historiography to simplify the state of things, attributing the narrative a sense of control over the explanation of historical events.

[83] P. Bloom, *Natures Mutiny, How the Little Ice Age of the Long Seventeenth Century Transformed the West and Shaped the Present, Liveright Publishing, New York, 2019,* p.282.
[84] Ibid, p. 283.

Assuming this perspective can be useful to find connections between historical events and between the concumitance of circumstances which have caused them, but it can also be misleading as the historical process is not linear and the connection between events is not always as evident as it seems to be. The Little Ice Age and the transformations produced in Europe during that period is an example of how the historical process is embeeded in a multilayered dimension, where the connections between things is not always clear and explainable within the cause- effect perspective. Assumning that the temporality is not linear and historical processes are encosed in a multilayered dimension, furnish a wider comprehension of history, with the awareness that not everything is connected and not every fact happens for a specific reason. This perspective helps also to understand the multitude of elements and the complexity of their interconnection in the definition of the historical process.

3. A philosophic perspective on climate change

In the first chapter we have seen the relation between humans and environment through the most important steps of human evolution until the edge of the European pre-industrial society of the 18th century. The analisis moves back so far in history, considering what are nowadays known as the major steps of human evolution as far as the historical, anthropological, archeological and scientific knowledge allow us to discover about humanity since the origin of its existence.
The reasons why the argumentation moves in the path of a wide historical and anthropological reconstruction belongs to two different orders. The first aims to analyze the interaction between human development and environmental degradation. The second is focused on the influence on the relation man-environment played in different historical context by the conception of the natural world. Unfortunately, this historical perspective proves that in the majority of the cases the evolution of complex societies had a negative impact on the environment, because of the overexploitation of the natural resources societies depended on. In some cases, as we have seen in Tokugawa Japan for example, the awareness raised towards environmental problems has led to positive solutions and implemented policies of protection allowing natural resources regenerations.
The conclusion in this sense is clear, humanity has always altered the natural environment and in the majority of the cases societies collapsed because of a conjunction of causes, one of the most important was the incapacity to face human-caused or natural environmental problems.
Our society, which is nowaday a global society, stands on the threshold of this dangerous line. The challenge established in the Paris Agreement to keep global warming not over 1,5 Celsius degrees, and way below 2 Celsius degrees compared with preindustrial levels, designs definitely a point of no return, a challenge that humanity has to face in order to guarantee the sustainability of the life on the planet for the future generations.

Some more radical activists and scholars are nowaday affirming that humanity is probably facing the sixth mass extinction on the planet. The scientific community defines clearly an imminent scenario of extreme weather events due to global warming. In particular the IPCC, the Intergovernmental Panel of Climate Change, the organism that provides the scientific datas based on model projections and helps to define the priority in the political agenda of the Conferences of Parties, published in 2018 the *Global Warming of 1,5 °C* [85] special report. The *Global Warming of 1,5* °C, is a scientific study based on model projections about future scenarios of climate change following the warming trends of the global temperature. Chapter 3.5 compares the consequences of a *1,5* °C to a 2 °C scenario. The consequences of this apparently low increase of 0,5 °C could have catastrophic consequences on the world's ecosystems and societies.

[85] https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter3_Low_Res.pdf

3.1 The failure of the international negotiation process on climate change and the contraddiction of sustainable development.

Whatever the future will bring, the scientific scenario, which is pushing the political agenda on climate, puts humanity at a crossroad. Or we change our economic system or the consequences will be irreversible and the future will be, with high probability, harder for humanity. The evolution of the approach towards climate change needs to shift from a soft approach of the first at least three decades of international summit on climate, to a hard approach in which the necessity to face the environmental problems and the human related causes is no longer postponable.

Why all the efforts taken until now can be seen as a soft approach to climate crisis?
The UNFCCC, The Earth Summit in Rio 1992, was not a binding agreement and left a wide range of flexibility for actions against climate change based on voluntary will of the parties involved. Since then the trend of the international summit on climate change and the related conferences of parties, initiatives , strategies and so on kept following the line of a non binding commitment based on voluntary will and good intentions of the parties.
The only exception was the Kyoto Protocol, which was the first binding agreement on climate.

" The Kyoto Protocol sets binding emission reduction targets for 37 industrialized countries and economies in transition and the European Union. Overall, add up to an average 5 per cent emission reduction compared to 1990 levels over the five year period 2008–2012 (the first commitment period)." [86]

Unfortunately, to confirm the thesis of a soft commitment of the parties with regards to Climate, the United States didn't ratify the protocol and countries like Russia and Canada ratified it only in 2005. It is important to underline that the United States at the time were the world largest producer of GHG, a quarter of the global emission of CO2 during the Kyoto period is estimated to be produced in the US. The negligence of the world's leading economy in the occasion of the kyoto protocol first, and the decision announced in 2017 and realized in 2020 of a US withdrawal from the Paris Agreement, must not be underestimated when at some point someone facing the gravity of the coming years will start to investigate the responsibilities of such scenario.
The Paris agreement set the targets of the limit temperature, but kept in the political ambiguity of a non binding agreement based on voluntarity. Most of the institutional actors celebrates the Paris agreement as a success for the (initial) total adhesion of the states, which could have been celebrated at the Rio Summit when the discourse on climate started to catch on, but definitely not in 2015 when the warning of the scientific community would have required more concrete actions and binding targets.
All this is to argue and justify the historical parallelism which has been developed in the previous chapters, because what is going on in the political agenda on climate is the clear sign that our society is entering a climate crisis whose impact will prove radically the resilience of

[86] https://unfccc.int/kyoto_protocol

the world's political and economical systems. In this sense, historical examples of past society's positive or negligent attitudes towards environmental problems are illuminating in considering the solutions that are proposed to solve the climate crisis today.
The fact that societies will be able to cope with the climate crisis depends on the capacity to change the real causes of the crisis, in other words the capacity to transform the way we live on the planet and the economic systems. There is no way to face the climate challenge without questioning the foundations of capitalism as the economic system has been leading to the present rate of resource exploitation and GHG emission.
This is a fundamental aspect, but it is also the most critical, explaining why the climate issue has been rejected for so long and why the approach undertaken by the major institutional and non institutional actors is, as we have defined, soft.
During the Covid 19 pandemic it has been evident how industrialized society can cope with a crisis and what use of all the means available has been set up to face the problem. Even Though the sanitary crisis should not be separated from the climate discourse, because the relation between climate change and arise of new pandemic is strictly interconnected, in the advent of a new virus humanity had to put in practice radical solutions as fast as possible, because the crisis was imminent and the danger was perceived as real.
Climate change is also real and it is causing more and more deaths as the extreme weather events such as floods, hurricanes are frequent and the long term consequences of it such as desertification, soil erosion, loss of biodiversity and contamination of the biota is having a great impact on the world population. The difference is that climate change is not perceived as an emergency yet, as something imminent which response has to be immediate. Most of the time the effects of it are described as isolated fenomena, not set in a more general frame of interconnected events and explained in their deep causes.

Why is it so difficult to face the climate challenge for our global society? Why hasn't the climate crisis been taken seriously (soft approach argumentation) and the process to cope the crisis takes so long in translating into concrete policies?

First of all, if we go deep in understanding the climate crisis, it is necessary to state what is so obvious and evident about the climate discourse. Facing the climate crisis means to change the way we have been living on this planet since the advent of the capitalistic economy.
A radical change in the economic dogmatic rhetoric of an infinite growth is the first step to exit the paradigm which has been leading humanity to the edge of ecological collapse.
Since the great economic boom following the Second World War, different eminent voices have warned about the limit of the infinite growth model and the capitalist economy.
In 1972 the famous report of the Club of Rome *The Limits To Growth*, states clearly the impossibility to conceive an economic system based on an infinite growth paradigm with the finite system in which we live in, the planet earth.
The civil society in the United States and Europe also contributed to raise the voice against the negative effects of the development in the industrialized society. Overexploitation, pollution, waste production and iperconsumism started to be questioned at the end of the sixties, giving birth to Environmentalism. Unfortunately, all these efforts and the evidence of their

argumentation has not been taken seriously and the process of questioning about development and infinite growth was only a superficial rhetoric.
The neoliberal assumption and its consequences on the world's population and ecosystems was not questioned and stood in its place of the hegemonic economic culture in opposition with communism within the Cold War scenario.
The result of the warnings of the Club of Rome reports and all the environmental discourses flowed into the concept of sustainable development which led to the evolution of the international discourse around climate change and the necessity to implement policies to face the climate challenge.
The Limits To Growth served as the basis for *Our Common Future*, the Brundtland Report in 1987, which also opened the way to the UNFCCC and the following steps of the international commitment of climate change.
The concept of Sustainable Development is a paradox, it embodies two concepts that are in a substantial ontological contradiction. Development can not be sustainable, and after 30 years of rethorics around sustainable development policies, thought with the aim of solving the climate crisis implementing sustainable policies, we have seen the complete failure of this philosophy and its incapacity to be effective in reducing the impact of human development on the world's ecosystems. In other words, the sustainable development theory is the way by which society has incorporated the criticism (which arose from the seventies onwards) of environmentalism around the negative effects of the infinite growth and development without renouncing the unlimited growth paradigm.
This simple fact explains the soft approach towards climatic issues in the international dimension. The necessity to question the cornerstones of the capitalist economies imposed by the discourse about climate, has been bypassed and avoided with all the useless and contraddictory rhetoric on sustainable development.
" Sustainable Development evoked in a magic way in all the political programs is needed only, as Hervé Kempf points out, «to keep the profits avoiding the change of habits, modifying only partially the route »." [87]

All the efforts undertaken to face the climate challenge until now go in the unrealistic direction of maintaining the actual economic system and rate of development (that means also all the nefast consequences on the environment), implementing, at the same time, sustainable development policies. The Agenda 2030 adopted by the United Nations in 2015 is the emblematic example on how the contemporary discourse about climate action has been confused, misled and mystified on purpose. The purpose is to keep intact the deeper core of the economic system, the concept of infinite growth the global society is based on.
The 17 Sustainable Development Goals, the pillars of the Agenda 2030 and the fundamental guidelines of all the policies and actions undertaken to guarantee the future sustainability on

[87] S. Latouche, "Breve trattato sulla decrescita serena", Bollati Boringhieri, Torino, 2008, p.17, translation from the italian edition.

the Planet, are representative of the mystification and the lack of a courageous and honest position around the challenges the world is facing. The SDG are:

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The problem of SDG consists in the fact that these goals are thought in an horizontal synergic line. There is no hierarchy between them and, the SDG 13 Climate Action, should be considered a priority over the rest. Without resolving the climate crisis it is inconceivable to realize the others, for example eradicating poverty and hunger is definitely impossible within a scenario of depauperation of the world's resources, worsened by extreme weather events , desertification, soil erosion and loss of biodiversity. The consequences of no climate action or unsufficient climate action (which is the case of the world today), makes it impossible to realize and, with high probability will worsen the present situation of SDG 1,2,3,4,6,10,14,15 and will surely affect and compromise the 16. On the other hand, the ontological contradiction of the Sustainable Development concept, becames evident in the incompatibility of SDG 8 and 9 with at least SDG 3,6,14 and 15. The philosophy of Sustainable Development expressed in the Sustainable Development Goals keeps moving in the direction of promoting climate actions and sustainability without questioning the main cause of climate change, the neoliberist capitalist economy and the idea of infinite growth based on infinite exploitation of natural resources.

Until the position of the world's governments will be protecting the actual economic system, we will continue to assist in the implementation of weak environmental actions while, the main problems caused by the global economy, will increase their impacts in the alteration and depauperation of the ecosystems. The inefficiency of the climate actions undertaken until now, is becoming more and more evident as the time passes by and the consequences of this soft, irresponsible and superficial approach to the problems are arising. The science on one hand and the civil society on the other are putting pressure on the climate agenda of the

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world's leaders, stating that it is definitely time to change attitude towards the problem before it is too late. Social movements like Fridays For Future and Extinction Rebellion are gaining consent and participation, most of all in the youngest generations who are expressing their worries for the future of the planet, convicting the inefficiency of the actions undertaken until now.

" Adfirming that an infinite growth is incompatible with a limited world and our productions and consumptions must not overwhelm the biosphere's capacity to regenerate are obviousness to which it is not difficult to find agreements. Difficult is to find consensus to indisputable facts that those productions and consumptions must be reduced and that the logic of a systematic 360 growth (which cornerstone is the coaction of the growth to the financial capital) must be questioned , together with our lifestyle. If then you point to the main responsible of the present situation, you suddenly fall into blasphemy." [89]

[89] S. Latouche, "Breve trattato sulla decrescita serena", Bollati Boringhieri, Torino, 2008, p.11, translation from the italian edition.

3.2 The incompatibility of an infinite growth with a finite system will determine the end of capitalism: from Latouche to Severino.

The assumption of the impossibility to conceive an infinite growth model within a finite system is the most evident and powerful criticism of the capitalist economy. The concept is clear and self evident and it shapes the theoretical base of the degrowth theory. The father of the degrowth theory is the french Serge Latouche, who has developed the theory through various publications. It is interesting to notice how the degrowth theory has been known and embraced in all the ambients which have a critical view of the capitalist economy.
One of the most important criticisms of the neoliberal capitalist economy is its metaphysical conception. The idea of the Market, which has in modern times substituted the idea of God, defines the dimension in which the economy is self ruled by the laws of the market and develops in separation with the rest of the world. In fact, in its theoretical foundation neoliberalism and capitalism are conceived as separated from their natural bases (the planet and its resources) and from the rest of the society.
This separated dimension serves as a perpetual self legitimation of the market and the capitalist economy, which couldn't be conceived as autonomous and self ruled if they would be recollocated within the natural and the social dimension.
The element of separation is the strength of capitalism in its theoretical assumption. But, at the same time, the separation is the base of the philosophical tradition of the western culture. So, in this sense, the capitalist economy is not something new in the western tradition because it is the result of the product of separation belonging to it.

" The unifying logic of the western tradition misleads in the attempt to unify what in the same logic is originally thought as separate. The logic of separation is the legitimate consequence of the way western tradition wants to unify the unjoinable. Things keep separated from each other. Science means first of all considering things in their separation from each other. Indeed this is the scientific specialization" [90]

Serverino in his majestic and illuminating book *Il Declino del Capitalismo,* argues very wisely the origin of the separation, which is defining nowaday the principles of the economic system, connecting it to the deeper philosophical origin of the western tradition. The concept of separation is fundamental in the Greek vision of the world as well. The existence is conceived as a separation from the non-existence and a return to it at the end of the cycle, so the act of separating is therefore the action who gives birth to the existence of all the things.
The concept of separation runs through all the western metaphysical tradition and is also used by modernity to what the scientific revolution has done to separate the things from their necessary nexus in order to reject the idea and the existence of an absolute. The modern Technic, based on science, arises from this cultural background and continues to prosper in this dimension in which the world is conceived as separated.
Therefore the market is separated from the world and this separation is the only conceptual action that allows the market to rule the world. Without this ontological separation the

[90] Traslation from the Italian edition of: E. Severino, Il Declino Del Capitalismo, bur, Rizzoli, Milano,1993, p. 193.

market will be vinculated to all things and could not rule over them. At the same time, the economy is separated from nature and in this separation it legitimizes the economic power to rule over the natural world and exploit its resources because nature is conceived as separated. The man is also separated from nature, as we have seen in the first chapter about the conception of the natural world embedded in The Genesis by which the man has the fundamental right to rule over nature because it is conceived as separated from it and not as a part of a totality.

"The idea of a "free market" is a tempting but mistaken conflation of economic ideas and Enlightenment rhetoric. Of course, no market could ever be free in any meaningful sense of the word. To be able to function at all, markets depend on regulation and oversight, on courts of law and legal frameworks to make contracts enforceable, on infrastructure and social priorities, on roads and ports and schools. Markets are an expression of social activity, not a self-contained realm existing apart from it. Belief in a "free market"—one somehow capable of not only regulating itself but also steering humanity toward a moral goal—is as deeply theological as the belief in divine providence." [91]

The faith on the capacity of the free market to regulate itself and on capitalism to reach social justice, peace and democracy is completely misleading. This faith is grounded in the religious background of the western culture , but it needs to be eradicated in order to rethink and reshape both philosophically and politically the way in which our culture conceives and therefore exploits the natural world. As Severino acutely observed, in their deep conceptions capitalism and democracy are antagonist and the coexistence of democratic political systems and capitalist economy is a superficial peaceful coexistence. If we consider their deep cornerstone, capitalism pursues the indefinite growth of private profit (producing the neoliberal infinite growth based economy), while democracy pursues freedom, justice, human rights etc. The pursuit of different and antithetical aims, defines the deep antagonism between democracy and capitalism.
It is not a case that in the development of the globalized economy the majority of the world industrial production has been delocated in non democratic states, where the cost of labour is incredibly low and the human and environmental rights nonexistent. The logic is obviously a consequence of the capitalist aim to increase the private profit and the human rights, translated for example in what are in the western countries the laws pledging the minimum salary, working conditions and working rights, becomes an evident obstacle in achieving the goal.
This argument explains also why industrialized countries' economies grow at a relatively low rate compared to the emerging economies like China and India. But the paradox of democratic states consists in the fact that they push the mechanism of delocalization and allow products made where human and environmental rights are violated, to enter and be sold in their market where human rights are protected and proudly defended as a western trophy.

[91] P. Bloom, *Natures Mutiny, How the Little Ice Age of the Long Seventeenth Century Transformed the West and Shaped the Present, Liveright Publishing, New York, 2019,* p.315.

However, if we look back in history, human rights are sons of the democratic revolutions and their implementation has passed through the atrocity of two world wars. No change in power, significant social and political achievement has been reached without conflict and violence. Hence it is difficult to think that the transition from a capitalist system to a more sustainable system, protecting human and environmental rights will be a peaceful process. As the climate change consequences will be harsher in the years to come, it is highly probable that the climate crisis will increase the social inequality already present in the global society. As we have seen in the chapter about the Little Ice Age, the climatic precarious condition in the decade before the French Revolution contributed to the determination of such a historical event.

"What changes in society when the climate changes? This book is a work of history, not prophesy, but it is possible, perhaps likely, that the current economic and political principles of highly developed societies—growth and exploitation—will result in their decline or even collapse. This would occur precisely because their basic assumptions are theological in nature, and they do not think it necessary to take human control of the situation they have—once unwittingly, now all too obviously—brought upon themselves." [92]

The theological and metaphysical assumptions standing at the core of the modern economic system are also the reasons why it is so difficult to change it and quit the logic of the infinite growth, despite the scientific evidence about climate change and all the negative impacts related to development are demonstrating the necessity to change direction. The faith in progress and development is the most difficult aspect to eradicate in our society, because of its theological nature, which has nothing to do with empirical evidence. On the other side there is of course the pressure and the power of the lobbies connected to the modern vision of development and progress, which have all the interest to maintain the status quo. The petrol lobbies and all the finance connected to the fossil fuel industry, are obstacles in the process of changing the direction of the global economy.

Fossil fuel companies have already mapped most of the world's petroleum, carbon and gas reserves. All this has already been quantified and transferred into finance, as a projection of future profits and investments. What is going on with these companies and the finance of fossil fuels is not exactly what the world needs, nor what the Paris agreement has established as targets of temperature rise to be respected. Therefore the call of more than 400 associations around the globe to the world's government to end as soon as possible the fossil fuel industry and accelerate the transitions towards renewable and safer sources of energy. The call, known as #Keepitintheground [93]has inspired demonstration, actions and activist summits around the world and refers to the necessity to not extract and burn the fossil fuel reserves already mapped by the companies in order not to exceed the Paris Climate Targets.

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[92] P. Bloom, *Natures Mutiny, How the Little Ice Age of the Long Seventeenth Century Transformed the West and Shaped the Present, Liveright Publishing, New York, 2019,* p.319.

[93] http://keepitintheground.org

The world's biggest company and the finance is implementing green policies and advertising them because the necessity to act against climate change became a market strategy and has been involved in the financial and economic policies of the multinational corporation, for the only economic reason that their image is, somehow improved, and the market value of showing to the public that the company is acting to face climate change is translated into an economic value. This phenomenon is known as Green Washing, and it is important to state that this approach is insufficient to face the gravity of the situation, the change must be more radical and go deep into the causes of the actual situation, not just green painting the background of the nefast consequences of this crisis.

The logic of the profit is so dominant and obstructing with regards to the effort towards a real climate transition that in 2006, the economist Nicholas Stern published a 700 pages review, in which all the consequences of climate change are quantified in terms of monetary damages produced to economic systems by climate change. The main idea of the Stern Review[94] is to demonstrate that it is economically worthwhile to take actions against climate change rather than not taking any commitments. The effort is remarkable and implies the hope that in a world where everything moves under the dominion of the economic low of profit, it is effective to demonstrate ,within the same logic, how much of this profit will be sacrificed if actions are not undertaken to mitigate the effects of climate change. However, for how effective this kind of works are and for how seriously they are translated into concrete actions, they still move within the capitalistic logic of the profit and it reveals all the weakness of trying to solve the problem moving within the logic which has created it.
It is necessary, as Latouche states in his *Breve Trattato sulla Decrescita Serena,* to deconstruct the capitalist logic of growth, profit, business as usual, in order to open the field to alternative models that can be then translated into effective actions against climate change, in the optic of facing the climate crisis, and to define a concrete model of sustainable future, social and economic justice for all humanity.
Unfortunately, the climate crisis incumbs and this shift is very far from being accepted because the world's governments and the majority of the public opinion, influenced by the mainstream media, is still reluctant to leave the logic of infinite growth.
" On the other hand, facing the attempt to join economy and environmentalism, modifying the measure of GDP, including the destructive consequences of the economic activity, the danger of fixing prices to environmental goods will remain somehow homogeneous to the dominant economic science, which considers everything measurable as money." [95]

As Latouch explains in different aspects of the degrowth and growth theory, much of the theoretical heritage of the theory comes from the necessity to be antithetical and challenge the dominant model of the infinite growth. The necessity to find a different model, able to

[94] N. Stern, Stern Review: Report on the economics of climate change, HM Treasury, London, 2005.

[95] Traslation from the Italian edition of: E. Severino, Il Declino Del Capitalismo, bur, Rizzoli, Milano,1993, p.193.

conceptualize the pillars of the new economic science, becomes evident in order to face the climate crisis capitalism has led the world into. The main challenge in this conceptualization is to rethink the concept of separation, in other words to replace the economy within the social dimension, which corresponds to replacing and rethinking the position of human beings within nature. The legitimization of the capitalistic free market based economies stands in the conceptualization of the separation of all things. Everything is materialized in the capitalistic view of the world, everything is filtered for its capacity to generate profit. The logic of the separation is the base principle by which all the things are conceived and the separation allows the confrontation of this multitude with the main value of the contemporary world: money.

In this perspective all the values are subordinated to, as Galimberti defines, the generator of all values, is saying money. Assuming this metaphysical collocation of a value generator, which is possible only if all the rest of the natural world is conceived as separated, money becomes for the contemporary world what God has been for the previous ages. The value that unificates the multitude of things by measuring their relation with their economic value.

The contemporary vision of the world gives value to the multitude of things by measuring their economic value where, for example, a tree is no longer a tree, an element part of a wider ecosystem (forest) who provides nutrients to a series of other organism, who enrich and fertilize the soils, avoiding erosion, desertification and the danger of landslides. A tree is seen as wood to burn or to enter an industrial chain and be processed and sold as wardrobes, chairs , timber, paper, etc etc. Unfortunately the way by which the dominant culture has approached the natural world is based on mere exploitation in order to satisfy human needs. The exploitation of the natural world with the only aim of profit forbids the deep comprehension of the natural cycles and therefore the alteration and destruction of ecosystems caused by human intervention.

The metaphysical heritage of all this structure of thinking and conceiving the world is the most important aspect to be rethought in order to replace the multitude of things within their natural cycles, implementing the vision of a holistic conception, by which all the things are conceived because of their role and their functionality within a wider natural cycle, not because of their translation into monetary value. This operation requires a complex knowledge of the natural cycles that rule the equilibrium of life on earth and also the necessity to recollocate and rethink the position and the role of our species within the natural cycles.

" The criticism of the separation and the concept of '' social totality" dates back to Marx and, from Marx to Hegel. With capitalism, Marx points out, the separation of economy from the social totality is combined with the separation of the individual from others individual and from nature, of the worker from the means of production and from the product of his work, of the quantity from the quality of work." [96]

[96] Traslation from the Italian edition of: E. Severino, Il Declino Del Capitalismo, bur, Rizzoli, Milano,1993, p. 193.

3.3 The necessity to develop alternative models to solve the climate crisis: Degrowth, Cradle- to- Cradle, integration of models and proposals for further investigation.

To rethink the role of human beings within the natural world and the role of economy within the social totality seems to be the philosophical priority in order to shape a system in which there is no disfunctional exploitation and distruction of the natural cycles and ecosystems.
As far as we can consider our developed and industrialized society highly intelligent because of the development of modern technique, the level of intelligence is still far from the intelligence of nature. Natural cycles are highly functional and perfectly designed in the logic of the cycle. In nature the concept of waste doesn't exist, every single element and every single phase of the cycle is functional to the cycle. The gap between natural intelligence and techno-human intelligence, where techno-human indicates the development reached through millennia of human evolution which have brought to the modern technique, is mainly caused by the different orientation that all the processes of technological development had until now.
The aim embedded in nature is the cyclical self regeneration. If we analyze the natural cycles with these eyes we can easily see how everything in nature is functional. A tree is an element part of an ecosystem (forest) where his life is an incessant exchange of material. In this highly functional exchange of material the tree is connected to the rest of the ecosystem and contributes to the well being of the totality. Where all the things, all the natural elements, all the organisms are conceived within the functionality of the cycle we automatically have the impossibility for each element to be separated from the rest. On the other hand, within the techno-economic, our tree is no longer part of the surrounding (forest), and of a wider biota's ecosystem, our tree is simply conceived because of its economic value. The tree is separated by all the rest and viewed as raw material to be processed and sold as a finite product.
Unfortunately the way by which the actual dominant system views the natural world is defined by the necessity to extrapolate each element from the natural cycle and, once separated from it, transforme it to enter the economic cycle. The problem is that the economic cycle is not as intelligently designed as the natural one, because not all the elements which constitute the economic cycle are functional and reenter the natural cycles once they finish their life in the economic cycle. Actually all the economy is not conceived as a cycle, so that the finality of all the processes is the consumption of a product, not the efficient functionality and reintegration of an element in the cycle. This is defined as the Cradle-to-Grave model of consumption, where all the elements in the economic system are conceived as functional as long as they contribute to any sort of human consumption and then literally abandoned in the grave of not being reintegrated in a cycle. The Cradle-to-Grave model is the main mechanism by which industrialized economies have asserved the natural world to the needs of a forced iper consumerism which is the direct consequence of the conception of a linear, infinite growth based economy rather than a cyclical model.

" Today our understanding of nature has dramatically changed. New studies indicate that oceans, the air, the mountains, and the plants and animals that inhabit them are more vulnerable than early innovators ever imagined. But modern industries still operate according to paradigms that developed when humans had a different sense of the world. Neither the

health of natural systems, nor an awareness of their delicacy, complexity, and interconnectedness, have been part of the industrial design agenda." [97]

Approaching studies which have developed alternative models to capitalism, and to the linear infinite growth economic model, we definitely underline the Cradle-to-Cradle model developed by William McDonough, in his famous book *Cradle to Cradle: Remaking the Way we Make Things*, where the necessity to end the linear infinite growth economy opens the way to circular models where industrial development is redesign to imitate the efficiency of natural cycles. The main idea of the Cradle-to.Cradle model is that the industrial system should be transformed in order to reach ideally the efficiency of a natural cycle, where all the materials involved in the industrial cycle are functional to the productive cycle, and once the cycle is closed, materials are regenerated and reenter the cycle or are recycled and enter another productive cycle. Imitating the efficiency of the natural cycle, the production in the industrial cycle does not produce any waste, because the materials used are thought and chosen in the perspective of being recycled. This model requires a deep conversion of the industrial system and massive investments in the research of the materials which better fit the purpose. The idea is the perfect integration of the industrial cycles with the natural ones, therefore, the industry does not contaminate and alter the ecosystems by producing materials which are not contemplated in the natural cycles because each cycle of production release only materials that can be absorbed and reintegrate in the natural cycles without compromising them.

"Design that deeply respect diversity at all the levels we have discussed brings about a process of industrial re-evolution. Our products and processes can be most deeply effective when they are resonant with information and responses- when they most resemble the living world." [98]

Rethink and redesign industrial models, is a fundamental step towards what we have being saying about taking actions to change the real causes of climate change, and the Cradle-to Cradle theory is an illuminating model that once applied would regenerate the industrial system (industrial re-evolution as the author defined the process) reducing the impact of industry on environment and ecosystems. The ecological transition on the source of energy should implement the industrial conversion in a Cradle-to-Cradle model.
Even Though the world's government respects the goals established on the energetic transition, to supply the industrial chains with renewable energy while the industrial process still produces waste like plastic and other toxic materials, contaminating the ecosystems and threatening life, it is definitely not the solution.

The industrial re-evolution needs to find renewable and safer sources of energy, which will automatically decrease the industrial amount of CO2 emission, but at the same time it must operate the conversion of the Cradle-to-Grave industrial model to a Cradle-to-Cradle cyclical

[97] W. McDonough, M.Braungart, *Cradle to Cradle - Remaking the Way We Make Things*, North Point Press, 2002, p.26.
[98] Ibid, p.154.

chain of production. The discourse about Climate Change is mainly orientated to the Paris Agreement goals, is saying reducing the emission of CO2 in order to keep the global warming between 1,5 and way below 2 °C. But the Cradle-to-Cradle theory shows that it is necessary to deeply transform the industrial processes and stop the contamination and ecosystemic alteration of the industry.

Another consideration, which goes in parallel with Severino's discourse about the relationship between Modern Technique, Capitalism and Democracy, is focused on the importance of the application of the Degrowth theory to the Cradle-to-Cradle industrial revolution.

The ecological transition is today a priority in the political agenda on climate, and gave birth to initiatives like the European Green Deal and other ambitious goals for the future of the energy, the reduce of the 45% of the CO2 emission by 2030 referred to 2010 levels and the 2050 net-zero target, to decarbonize the global economy with the aim derived from the Paris Agreement to stabilize the global warming. All the efforts are going in the direction of what is defined as the ecological transition of the economy, substituting the energy carbon sources with renewable and cleaner sources of energy. The problem of this kind of action is what we have observed in different cases, to focus on the consequences and not on the causes of the problem. Nobody, at least at an institutional level, is thinking of reducing the growth or reshaping the economy in order to eliminate useless products that nowaday populate our markets and become dangerous waste after a short use. Nobody is thinking that a fast and easy solution to reduce CO2 emission could be to produce less and to consume less, most of all in the developed countries which are responsible for the largest amount of CO2 emissions, to produce only essential goods possibly made with clean energy and Cradle-To-Cradle productive cycle.

Governments and the majority of the public opinion are so reluctant towards the idea of leaving the infinite growth model of capitalism, wich is, once again, the main cause of the problems connected with the climate crisis, and embracing an alternative model, wich have to be definitely based on the Degrowth principles and Cradle- to- Cradle model.

The world is putting so much effort into designing the ecological transition while keeping the levels of consumption and production within the same economic model and, on the other side, keep believing that the economy will follow the growing trend. To think that the substitution of the fossil fuel energy will be the solution to the climate crisis without questioning the economic model which have brought the planet into this crisis is still a superficial approach, and it requires even more energy and effort, because to maintain or even increase the levels of consumption and production reached with the fossil fuels energy with renewable energy is such an expensive and ambitious goal, which defines the deadline of 2050 for the net-zero goal.

With the the application of the Degrowth theory and the Cradle-to-Cradle model, the carbon neutral economy could be reached way before 2050 and with less efforts, but unfortunately, as Latouche point out, the faith of infinite growth is so difficult to eradicate simply because it has the nature of a faith, and in front of the evidences of the last decades we can add the adjective blind. Until the world won't be able to question and change this economic model and will continue with this self-destructive blind faith in infinite growth economy and progress,

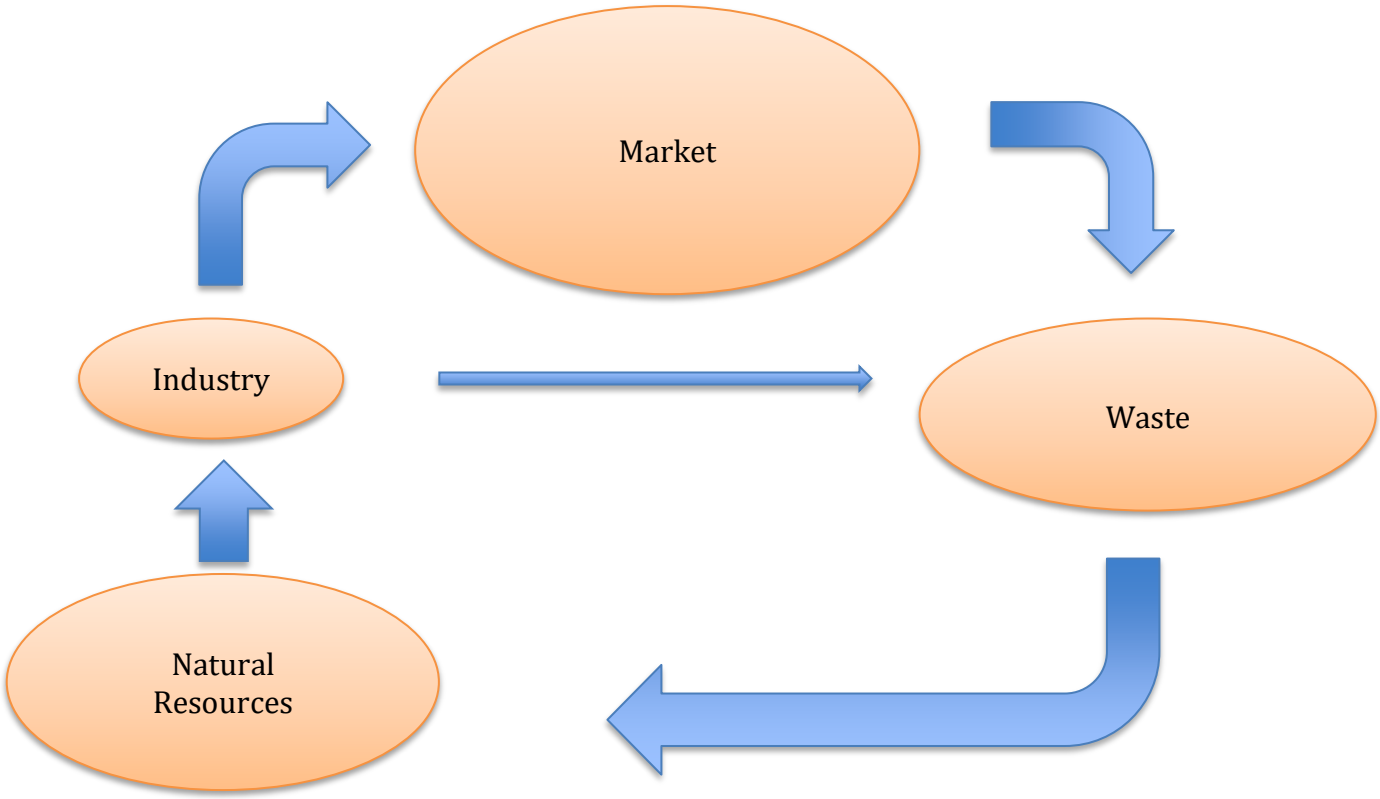
the climate targets will be more and more difficult to reach as time passes by without a radical change we are trying to argue and define.
Since the economic boom of the sixties the consumerist culture in western society has reached his apex, the concept is simple and has been forged by at least 60 years of intense mass brainwashing operated by the advertisement industry: the more you have, the wealthier you are, the better you feel and so on.
This incredible machine of the advertisement industry has been radicating the idea of iperconsumism in the western societies in the years in which the higher standards of living have been rich in the world and the combination of the two elements make the consumerist culture so eradicated and difficult to swich. Without the persuasive propaganda of the advertisement industry the consumption and related production and economic growth in the developed country wouldn't have the same intensity and consequent distructive effects on the environment.
" Allow the society of consumerism to prosper in her diabolic carousel, three elements are necessary: the advertisement, which creates the desire to consume, the credit, which gives the means, and the planned obsolescence of the products, which renew the necessity. " [99]
The means by which the society of consumerism empowers its self sustain and the necessity of increasing the consumption, have been well designed and developed at least in the last half century.
The fact that to be sustained in the growing trend the consumerist economy has to be constantly reinforced by massive advertising campaigns and through the planned obsolescence of the products, is in itself an aspect that reveals the weakness of this economic model.
The result is that the markets are literally invaded by a huge quantity of products whose utility is futile, but the impact of their production, transportation and deterioration as waste is considerably and definitely not futile, most of all because the main component of this kind of product is plastic.
We are compromising an essential resource, the planet and the well being of its ecosystems, to feed a chain of production which is not essential, it does not improve the life standards, it produces CO2 emissions, pollution and plastic waste. Is it necessary? Is it intelligent?
It seems that the contemporary hegemonic culture and humanity with it are stuck in the paradox of a blind faith in the free market and, despite science warning about the consequences of this destructive model, the eyes of the world keep closing in front of such evidence.
Humanity has reached a point in which it is necessary to assume a more responsible attitude towards the problem and, most of all, its causes. Part of the civil society, organizations and social movements are claiming the inefficiency of the climate actions undertaken until now, with the hope that more courageous actions and policies will be implemented as soon as possible.

[99] S. Latouche, "Breve trattato sulla decrescita serena", Bollati Boringhieri, Torino, 2008, p.23, translation from the italian edition.

"Gunnar Adler-Karlsson reports, for this purpose, a survey directed to the presidents of the big American corporations. 90% of them recognise that it would be impossible to sell a product without an advertisement campaign; 85% declare that advertisements persuade «often » the people to buy things they don't need; 51% affirm that advertisements persuade people to buy things they don't really desire." [100]

Another aspect to be integrated in the definition of a new model based on degrowth and Cradle-to-Cradle cycles, is what we will be calling the MSER (Market Selection and Economic Reformation) which consist basically in a classification and selection of all the products sold in the global market. All products present in the global market should be classified as primary essencial, secondary essential, and non essential. Primary essential goods categorization should include all type of food supply and water, secondary essencial are for examples the tools and the technology related to the food production, agriculture, water and sanitation systems , energy and all the industrial chain which is considered relevant connected to the first category and to the fundamental rights like healthcare, education and social welfare. All the rest, which constitute the third category of non essential goods, should be completely eliminated, the commercialization forbidden and the production chain closed. Of course this is a proposal that requires further studies and analysis in the field, but the main idea is that at the end of this categorization of the market, the third category will be completely eliminated, for what concerns the futile non essential production, and the first two categories industries are converted in the Cradle-to-Cradle model. Acting in this direction will definitely be a clever management of time and resources, because the ecological conversion will be faster and require less efforts and energy once a consistent part of the market and related industry, which is also the heaviest in terms of environmental impact and cost benefit balance, will be eliminated.
At this point normally the onjection comes spountaneously. What about the employment and the incomes derived from the third category market and industry?
The conversion in C2C models of the first two categories will necessarily create new employment and, with huge investments in the process, the ecological conversion will be safer and faster. The world will produce less in terms of quantity, so we have a first application of the Degrowth Theory, but more in terms of quality and sustainability.
The MSER is a fundamental step towards the economic transition and its realization will definitely accelerate the decarbonization of the economy while empowering a green and circular model, able to guarantee an increased quality of life with no environmental alteration. What scares the most about the Degrowth Theory is that the idea of producing and consuming less is associated with an inferior standard of living, but the point is that it is not the quantity of consumption that determines the quality of life. The quality of consumption and the ecological impact of the product consumed defines the quality of life. Therefore it is definitely better to consume less products of quality, with possibly zero or very low environmental impact rather than consume more quantities of products polluting the Earth and reducing the quality of life.

[100] André Gorz, *Capitalisme Socialisme Ecologie*, p.289.

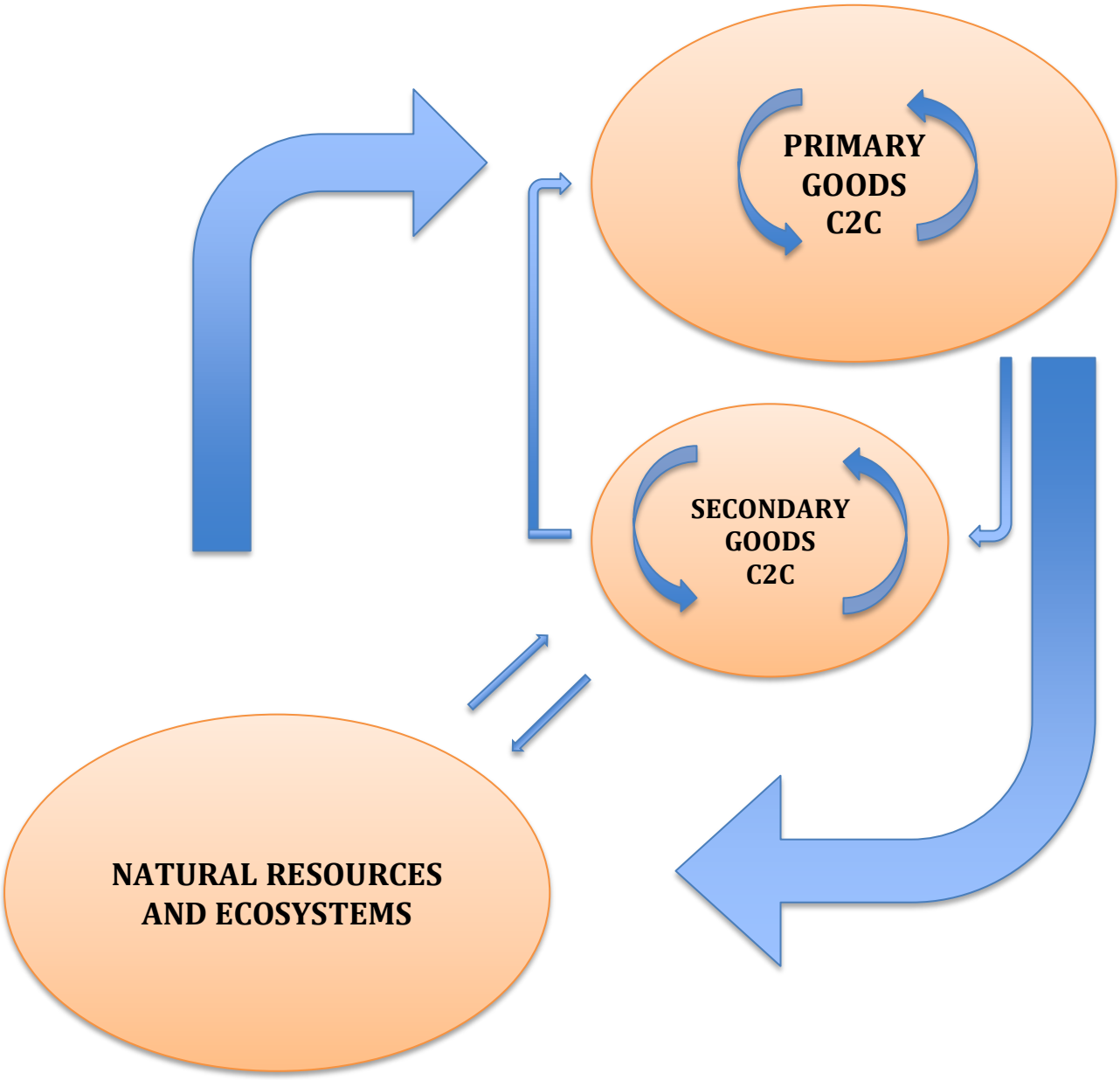


Model *1. How the actual economic system is interacting with natural cycles*

The model above, from now on Model1, represents the actual cycle of the productive system in the neoliberal capitalist economy. As we can observe, the model is cyclical, but the cyclic nature implied is dysfunctional and toxic because the quantity of waste produced by the model reenters the natural cycle and contributes to the contamination, alteration and pollution of the ecosystems and, therefore, to the depletion of the resources.
The capitalistic economies have been criticized mostly because of their linear conception of the growth, in particular, as we have seen for the degrowth principle, for the impossibility to conceive an infinite growth model within a finite world of resources. It is true that the neoliberalism conception of the economy is linear, and all the mathematical representation of it follows an arithmetical and geometrical function, but this is mainly because the economy in that conception is conceived as separated from the natural world.
The model above resettle the present economic model within the natural cycle, because whatever can be said about the economy and industrial system, all resources come from the earth, and, as far as evidences concern, every transformation and process operated by humans returns to nature.

Until recent times, no attention was given to the fact that all the waste produced by the system re-entered and compromised the natural cycles.
That's the reason why, for example, recent studies have proven the existence of microplastic almost everywhere in the world: from the highest glaciers to the human placenta.

The contamination by plastic and other dangerous waste is total, in the sense that these elements, which are not present in nature, have irremediably entered the biological chain. Nature's intrinsic intelligence can be able to dispose of these materials and the alteration provoked, but only if humans stop to insert such toxic waste in the natural cycles and help the regenerative process, that in other words means stop the actual economic system's negative consequences.



Model 2. The integration of the Degrowth Theory and the Cradle to Cradle approach.

While in Model 1 we observe an increasing trend of alteration of natural cycles and resource depletion, in Model 2 we design a new model on the base of the Cradle-to-Cradle, with the addition of the Degrowth Theory and the proposal of the MSER (Market Selection and Economic Reformation). The MSER is a fundamental operation in order to reduce the ecological impact of the global market and convert the agriculture and the industry in Cradle-to-Cradle systems. The 2050 net zero target was conceived calculating the actual rate of economic growth and combined with the development of clean energy production, so the date 2050 symbolically indicate the time by which the actual system should convert the energy sources from fossil fuels to renewable, in the hypothesis of maintaining the same trend of economic growth, or even increase it. The way the ecological transition has been conceived is not questioning at all the theoretical bases of the economic system, which, as we have augmented, are the main causes of the climatic crisis. The perspective of the net zero target doesn't mean the complete elimination of fossil fuels energy. Fossil fuels will remain part of the future economy in the perspective of a net zero balance, that means, the CO2 emitted is calculated in relation with the capacity of the ecosystems to absorb the carbon in the atmosphere plus the technologies of carbon captation, therefore the balance of the emission and the captation will be zero, net zero target. The future emission of CO2 by fossil fuels sources will not overwhelm the natural and artificial capacity of captation, in the zero target perspective. At the same time it is important to underline how this target is compromised by the actual rate of deforestation, and will be definitely improved if the process of deforestation stops its destructive development and massive projects of reforestation are implemented.

The lack of a structural questioning process of the bases of the neoliberal capitalist economy in conceiving the ecological transition and the attempt to face and solve the climate crisis is a huge responsibility of the world authority.

A structural revision of the theoretical bases of the economic system, and the implementation of the research in alternative and more sustainable systems, could lead the world in an ecological transition way before 2050. The ecological transition becomes necessary in the perspective of facing the climate crisis, but it definitely should be the occasion to think about solutions and alternatives to other social problems connected with the actual economic systems and to improve the quality of life.

The theoretical development of the model 2 is an attempt to create a model conciliating different philosophical perspectives involved in the climate issue. Questioning the base of the economic system , of the infinite growth faith, a new approach needs to be developed in order to give a better chance for humanity and the planet. Like all the transitions in the history of humanity, many problems arose in the implementation of this kind of project.

One of the first problems is definitely the difficulty of abandoning the infinite growth faith, and to eradicate the concept that we can live better with less. The quality of life could be better if everyone has access to the essencial and the essential is made without altering and destroying the ecosystems. The world will be less polluted and ideally in the Cradle-to-Cradle perspective the pollution will be eliminated, therefore the quality of life improved by cleaner air and water, safer food and a regenerated natural environment. The quality of work is also

improved because each work is done in a Cradle-to-Cradle model, so the workers participate and share the idealistic and ethical aim of the process.

Of course all this will challenge 60 years of consumerist culture in western societies and will also find disagreement in the ambition of developing countries to reach the standards of their developed partners. But it is necessary for developed countries to actuate this model shift and decrease the trends of production and consumption, while developing countries, most of all the poorest, should increase their life standards in an ideally global balance of life standards perspective , within the reformed economic model.
The necessity to change the economic system is not based on ideology. Someone could criticize all this, making the historical example of the rise and end of communist economies. Why implement an alternative model to capitalism, when the historical attempt to do so has failed and capitalism has become the international dominant system?
The question is leggittime but it leads nowhere because the difference is that the necessity of this kind of change is not ideological, but basically material. Therefore there is no way out of this, nobody is denying the necessity to act against climate change, the problem is more related to how effective are the actions undertaken which perspective it's embedded. Both Communism and Capitalism systems are based on the exploitation of natural resources and on the faith of an infinite growth system. The difference is that capitalism is based on the aim of indefinitelly increase the private profit, while communism on the principle of social justice, to equally share the wealth produced within a society.
The revolution the world is facing is different from the modern revolutions, because it is motivated by a global material necessity (GMN), the ideological background does not play any role in what is going on with the climate crisis. Moreover, if we consider the perspective of capitalism itself, as Severino states, it is capitalism the first force involved in this necessity. The fact that the natural resources will be depleted and, in any case, are limited as the earth is a materially limited system, is a problem that regards first of all the possibility for the capitalistic system to survive. It is no more an antagonism between two forces with different aims, it is a material necessity that will imply the end of the capitalistic system as we know it, defining a transition to a new system whose aim is primarily the safeguard of the Earth and its resources and ecosystems.
In this transition the modern technic plays a fundamental role, because the new system, as the old have done with the result of the actual dominance of the global capitalism, will implement and empower the Technic with the aim of safeguarding the Earth.
Many authors have pointed out how in the nature of capitalism it is embedded as an intrinsic contradiction, which is defined as a contradiction in terms of will. Capitalism is at the same time pursuing its perpetuation, by pursuing the aim to increase the private profit, but, doing so, is also contributing to his own self-destruction. The infinite growth of private profit also means infinite exploitation of the Earth, which is the natural base of capitalism, at one point the process will lead to the destruction of the natural base of capitalism, which is leading also to the destruction of capitalism itself, a self-destruction.
“ The contradiction indicated in these pages is the self-destruction of capitalism (self-

destruction, in the sense that capitalism and the western tradition lead to destruction and self-destruction." [101]

" Capitalism wants and doesn't want to prosper and realize its aim. Wants- which is the expected aspect of its acting. But doesn't want to, because its acting or finishes (or it is believed to finish) with the destruction of the Earth, its natural base, therefore the instrument itself – the technique – allowing the productivity of capitalism itself. Otherwise, on the other hand, pursuing as a primary aim the safeguard of the Earth and of the Technic, transforming the profit in a secondary aim, destroy itself as a capitalistic acting and leave space to the rationality of the technic, which does not contemplate the destruction and self destruction embedded in capitalism." [102]

Severino points out a fundamental aspect of capitalism's nature, which is directly connected to what we have been argumenting about the necessity to reform and change the economic system. What in the previous pages has been described as a global material necessity (GMN), is exactly the exploitation of the intrinsic contradiction of the capitalist system. The fact that to pursue indefinitely its aim of private profit the capitalism will lead to the collapse of the Earth, its natural base, and so the collapse of capitalism itself, is exactly the contradiction from which arose the GMN. The nature of the GMN, as we have explained, is no longer an ideological conflict or a conflict between forces with different aims (capitalism vs communism, capitalism vs democracy, capitalism vs cristianity). The nature of the GMN is embedded in the nature of capitalism and it is the result of its intrinsic contradiction, it is the starting point towards the end of capitalism- in the terms Severino has described- and towards the rising of a new economic model, which will be basically depending on the development of the technic (like others) but this time with the aim of safeguarding the Earth, as the natural base of everything. However this new model will be called, its philosophical bases, the future for humanity and the Earth, have already been traced by the analisis of Severino, and what is going on with the Climate Crisis can be reconducted to the self-distructive nature of capitalism, interpreted as the first hints of its decline.
Let's consider for a moment the scenario in which the climate actions conceived by political authorities today will manage to save the world by keeping the global temperature rise around 1,5 by the end of the century. Considering scientific projections, if the trend of CO2 emission will continue at the actual rate the temperature will rise around 3, therefore justifying the criticism of the social movements with regard to the inefficacy of the climate actions undertaken until now, even if the world manage to convert its energy sources and reach the net zero target by 2050 the problem of the depletion of the natural resources and destruction of the Earth will remain, because, as it has been augmented, it is part of the capitalist nature, and it will persist if the logic of infinite growth will be maintained.

[101] Traslation from the italian edition of: E. Severino, *Il Declino Del Capitalismo*, bur, Rizzoli, Milano,1993, p. 287.

[102] Traslation from the italian edition of: E. Severino, *Il Declino Del Capitalismo*, bur, Rizzoli, Milano,1993, p. 287.

4.2 Interview to Juan Pablo Gutierrez

The present interview was live-recorded the 2nd october 2021 in Milan, in occasion of the Milano Climate Camp, an initiative which have gathered social movements and associations for climate justice. The climate camp was organized by Exintion Rebellion Italia and Survival International in concomitance with the Milan Pre- Cop 26 meeting.
Many conferences and activities have taken place in the camp and in the city of Milan in those days. In such occasion, Survival International invited Juan Pablo Gutierrez, a Colombian activist for indigenous people's right, who held a conference on the impact of the forestal protection policies on indigenous communities.
The interview is relevant to this thesis for three orders of reasons. First, the description of indigenous community represents the mystification we have described in the first chapter of this book. The idea by which indigenous community live in total harmony with nature without causing any alteration, is the rethoric that has been constructed around indigenous communities and it is been proven to bea false myth. The second -and more important aspect- is the description of the indigenous conception of nature, the Pachamama, and the confrontation with the conception arose in Europe and spread all over with the conquest of the America. The description of the Pachamama is clear and it is relevant to describe how the European conception of nature is seen by an indigenous who now lives in Europe and knows very well the European cuture and history. Third aspect, is what Gutierrez means when he adfirms that the world is fighting against the consequences of climate change and not against its real cause: the capitalist industrialized economies. In this sense the direction of the present thesis and the analisis exponed by Gutierrez find a concrete point in common.

Juan Pablo Gutierrez, indigenous people's rights activist of Colombia, can you tell us what you do and why you participate in this international summit of social movements of climate change and climate justice?

My name is Juan Pablo Gutierrez, I was born 39 years ago in Colombia, I dedicate the majority of my work to the promotion and defense of the indigenous people's rights, especially from Colombia. Indigenous people are known mainly from the exotic point of view, at least in Colombia, but behind this image there is a humanitarian crisis which is affecting indigenous people and this is the reason why I decided to fight for this cause.
I belong to Yukpa indigenous people, of the Serrania del Perija, a mountain situated in the north east of Colombia, between the department of the north of Santander and El Cesar, a natural frontier between Colombia and Venezuela. Yukpa indigenous people are semi-nomadic warriors, which nowaday is facing an imminent risk of extinction due to the loss of its ancestral territory. 90% of our territory has been usurped, and has been stolen. Due to this work of reporting what is happening with indigenous people and reporting the actors producing it, both from left and right parties, both from armed legal and illegal groups, the

threats come automatically. In Colombia, unfortunately, it is something which has been naturalized, the work of human rights defensor, trade unionist, any type of job with this inclination comes with threats. The problem is real when threats become material, in my case, after a series of threats and after being targeted as a military objective by a paramilitary group called las Aguilas Negras, I was the victim of two attacks and I was almost killed by the second. When my daughter was born I decided to leave because the situation became intolerable. This is the reason why I am in Europe now, at the beginning it was hard, but I realized that from here a lot of things can be done more quietly and with more results than in Colombia. I was invited by Survival International, which is an allied to the indigenous cause, it is not an indigenous organization but an organization working for indigenous people's rights; I was invited here to make some order concerning the concept of Preservation and Conservation, this big lie that world's governments are orchestrating.

What is your vision of Climate change and how do you think this global phenomenon is affecting your people in Colombia?

The climate change we are experiencing is the result of a model of industrial society, capitalist, neoliberal which has been globalized through colonization at the end of 16th century, when Europe could exit the Middle Age's darkness to enter modernity through a series of social and political changes. From the feudal monarchy to the National States, the capitalist and industrialized society has developed through centuries.
The problem was that these changes were pertinent to the reality that Europe was living in at that moment, but it had been imposed on other world's reality, which didn't have any necessity to change the social, political, and economic model. This generated the chaos in which we find ourselves now, a model of society that from Europe presumed to be universal. They considered universalizable and extendable to the rest of the world a model created in Europe, and this was a serious historical mistake. The capitalist, neoliberal society, to work depends on the market, and the market, in turn, depends on consumption.
The transition from a subsistence agricultural society to a society based on consumption converted the wishes in necessity through market and advertising. People got stuck in the consumer society, where everything comes from a raw material (from a tree, from the soil, from water, it has to come from somewhere!)
This system was conceived to be infinite, but now with climate change, it is demonstrated that it could no longer be infinite and that it is time to slow it down. The climate crisis is the consequence of this model of society which, as I was saying at the beginning, was pertinent to the European reality at the end of the 16th century, it was globalized and now it caused problems that need to be solved starting from the different reality of each country.
The global crisis needs to be solved from a different perspective from the one which has created it. The solution to the crisis is not universal, the solution needs to be coherent with different realities' necessities. Everyone is affected by climate change , but if we assume the solution as the only one extendable worldwide, we will make the same mistake when the problem was universalized. The solution must not be universalized, solutions need to be found starting from different realities.

What is the 30% initiative, who is implementing it and with what aims?

The 30% initiative is a project of different governments, the majority of the world's governments in the United Nations, from the French government to Costa Rica if I remember right. The fact is they recognized that we are living in a global crisis and the necessity to undertake structural measures to face the crisis, so they proposed to protect 30% of the Earth surface to convert it in protected areas, to fight against climate change. At a first sight, this idea seems positive and has a good resonance in the public opinion. People think that for the first time in history governments are caring about the common good, they realized the problem and they are deciding to protect 30% of the earth surface.
I think that 95% of the population think like this, celebrating it, because finally a decision is taken. The problem is that when you realize deeply what is presented as a solution, you suddenly realize that it is not a solution, because they want to solve the problem, climate change, without fighting the causes that have generated it, in other words the system.
They want to protect the 30% of the richest biodiversity lands in the world, which actually don't need to be protected because indigenous people inhabit them and the fact that these lands are so well conserved and full of biodiversity is thanks to indigenous people.
Indigenous people' land contains the 80% of the biodiversity left in the world and governments will not protect deserts, will not protect the driest areas, they want to protect the most biodiverse areas, lands where idigenous people live.
If governments really want to protect the world society from global warming and climate change,the only solution must be to fight against the causes which are creating it, is the capitalist neoliberal model, based on a consumerist society which depends on markets to survive.
The 30% initiative, which is nowaday presented as the most important measure to protect the world and fight against climate change, constitutes the most important and magistral action of "green washing" of this century, because they achieved to shape public opinion. The solution they are proposing makes everyone talk about that solution, even the ones who are opposing it. People are stating that protection's models don't work, but they are still talking about them, in other words, they are dancing to the song that governments are playing. The problemi s not there, the problemi s in the system, but what are they doing to change the system? They desperately deal with consequences and not with the real causes of the whole problem.

You were saying that the land inhabited by indigenous people contains the highest percentage of biodiversity in the world, what is the difference between the indigenous culture and western culture with respect to the conception of nature?

Well, it is something concerning an ontological matter. Historically it can be explained through a change, an ontological transformation affecting the European individuum through the thought of one of the fathers of modern philosophy, Renes Descartes. Decartes in the 17th century rationalized a series of concepts, stating, for example, that man is master and possessor of nature. For the first time in human history a conception based on rationality justified the superiority of man over nature, there was a switch, an ontological

transformation separating man from nature. Man was separated from nature and nature started to be considered as an object, as a means, a resource, to be exploited in the name of progress and development.
The difference is that indigenous people don't have this separation between man and nature, indigenous people consider nature as the cosmos, as the totality , from which man fundamentally depends to survive.
It is an elementary law, so easy to understand, indigenous people consider the earth as the mother. My daughter is 5 years old says : " it is the Pachamama because it feeds us " ; It feeds us, gives us clean water and breathe pure air; we don't need science to understand this, it is so elementary. Indigenous people have this well clear in their mind, they didn't jump on this bus of modernity, they stood in a perspective more authentic, more compatible with the real essence of human being, is saying a human being aware of the role of nature for his own survival. The ones who have jumped on the bus of modernity consider that water comes from the sink , food from supermarkets and clothes from shops, they don't have a real consideration that everything comes from nature.
Everything we have comes from nature, therefore the ontological consideration of the difference. Nature as an object for western culture, nature as the mother for indigenous people, from which we all depend on to survive. The non indigenous world, from modernity onwards, thought that man could be master and possessor of nature and this is well documented.

Can you make some examples of biodiversity preservation practice, in the daily life of your people, of this harmony between human community and nature and how the way your people live is helping forests to preserve biodiversity?

The indigenous people Yukpa are semi nomadic, meaning that they are neither completely sedentary or nomadic. They move from a place to another, when they are in a place they start to exploit resources of the space, and when this resources are about to finish they move on to another place. When it comes back to the same place he had left, after a while, the resources had the time to regenerate and can be exploited once again. Yukpa people are aware of nature cycles which are not infinite.
You can not stay in a place thinking that natural resources are infinite, this is a belief of the Yukpa people, semi nomadic, are aware that nature needs to regenerate itself without human interaction, the belief that the territory is a fundamental axis for the survival of our culture. Yukpa indigenous people have an oral tradition, the elders, grandfathers, need that the territory is healthy in order to teach the younger generation, to walk with them and explain which plants are needed, in which areas some animals are hunted, and which woods are the best to make arrows. To keep culture alive, to keep educating younger generations, the territory needs to be healthy. It is a well connected cycle, the healthier the territory the better culture is transmitted and preserved, but unfortunately, in our territory there is a carbon mine 16 times bigger than the biggest carbon mine in Europe. Europe's biggest mine is in Germany and the mine in our territory is 16 times bigger!
This is the reason why we are facing the imminent risk of extinction, because the elders can not teach the younger generation which are the plants, so we lose natural medicine, they can

not teach which are the animals to be hunted , therefore there is an increasing desnutrition. In every aspect of life and culture there was a transformation and we are now facing a risk of extinction! Therefore it is vital that the territory is healed to keep our indigenous culture alive and to transmit it.
You were talking about the oral transmission of the cultural heritage, is it getting lost or is it protected and transmitted between generations?

Well, what I wanted to tell you is that the transmission of the knowledge is oral, we don't have books, all transmision is oral, from elders to the youth. About the language of the Yukpa people, we are the last people speaking the language of the Caribe civilization. The last indigenous people speaking Caribe civilization language is the Yukpa people. It is one tool of resistance for us, trying to preserve a very important aspect of our culture, because how Yukpa people define things is completely different from spanish. For example the word war or love are concepts that have a specific logic in the european culture, but for us the logic is completely different, it i snort a matter of words but wider concepts, something that allows us to preserve us as indigenous people.

The last question: Which future scenarios do you imagine for your people and more in general for indigenous people with respect to the climate change we are living?

If you speak on behalf of my people, rather than of all indigenous people, which in the second case would be a little pretentious, because indigenous people are many and with different realities, I would not represent them all. Many times the mistake of generalization has been made talking about indigenous people. Sometimes even indigenous people state we indigenous think, when they don't really know what all indigenous people think, the Africans, the Asians, they are different, therefore I can only speak for my People. At the same time, if I speak only about my people I would be a little selfish, because climate change is something which is affecting everyone.
I think that talking about possible solutions to climate change needs to be conceived in a common manner, from the indigenous to the non indigenous perspective, it is a matter concerning the entire humanity. There is no race, we have to leave in the past the racial categorization to understand that climate change is affecting the whole humanity so the solution has to be thought of starting from the whole humanity, I think the challenge consists in unifying the struggles because the problemi s common and does not have any borders.
The generations before us lived in a consumerist society, they consumed a huge quantity of useless things, but they didn't know there was a climate crisis.
We do know that the climate crisis exists, the scientific community keeps warning us with reports, we are conscious, therefore we have a tragic responsibility, it is something concerning the whole of humanity and I think we have to win this struggle because it is the last we have.

Conclusions

The Cop 26 held in Glasgow the last november was expected to be the point of no return concerning the fight against climate change. The possibility of a no deal outcome was high as the world political will is still dominated by division of interests between developed and developing country, mainly China and India, concerning the goal of eliminating carbon as a source of energy, which constitute today the 40% of the global GHG emission.
The difficaulties to reach a final agreement were increased by the economic division embedded in a world economy still coping with the Covid19 pandemic and with the raise of the energy prices. The result of the conference was the Glasgow Climate Pact [103], which can be considered the continuation of the main points included in the Paris Agreement.
The main results of the Glasgow conference can be summerize in 4 points:

1- To maintein the 1,5 °C temperature target introduced in Paris, with the awareness that at the present day the raise of global temperature is estimated around 1,1°C. A reduction of 45% (compared to 2010 levels) of CO2 emissions by 2030 and reach the net zero target by 2050.

2- The Glasgow Leaders' Declaration on Forests and Land Use [104], an agreement to stop deforestation and land degradation by 2030, subscribed by 141 countries included Brasil.

3- The end of fossil fuels subsides and the "phase down" of carbon.

4- The Climate Finance Delivery Plan [105], which was included in the Paris agreement and supposed to start by 2020. The document states that the trasference of the US $100 Billion per year from developed to developing countries should be activated in 2023.

Scientific projections presented to world's leaders assembly in Glasgow clearly demonstrate that the path we are following will lead to an increasing of temperature between 1.8 to 2.4 °C [106] by the end of the century. The warning is clear, meaning that there is no time left, it is time to take concrete actions. No excuses or further posticipation of commitments can be accepted anymore. The scientific pressure on the political agenda combined with the increasing pressure produced by social movements and non governamental organization for climate justice define the Cop 26 as an historical event, whose failure could have significated an irreversible defeat in the fight against climate change.

[103] https://unfccc.int/sites/default/files/resource/cma2021_L16_adv.pdf
[104] https://ukcop26.org/glasgow-leaders-declaration-on-forests-and-land-use/
[105] https://ukcop26.org/wp-content/uploads/2021/10/Climate-Finance-Delivery-Plan-1.pdf
[106] https://ec.europa.eu/commission/presscorner/detail/en/ip_21_6021

The price of a no deal outcome of the conference was too high and, as usually happens in this negotiation cases, the result is a non binding commitment based on voluntary will, which is also the case of the Paris Agreement. Therefore we see the world's leaders meeting each other 5 years after and basically readfirming the same targets of the Paris Agreement, with some new elements, because the main goals of the previous agreement have not been reached yet. The weackness of this type of negociation processes is emblematic and it is all a matter of trying to reach the most inclusive possible agreement, without compromising to much the different positions, therefore, the outcome is weack and based on voluntary will.
In the frame of the negotiation the agreement is not a failure, because it has been acheieved with a maximum scale of inclusion, but from a substantial and pragmatic point of view it is definitelly a failure because of the weackness of its real implementation based on hopes and good will. The same perspective is embraced by social movements and NGO activists who have hardly criticized the results of the Cop26 and the substantial inneficiency of the world's politics in tackling climate change.

One of the most expected goals to be established in the Cop26 was the end of carbon as source of energy. This was inicially achieved with the point in the draft of the agreement stating that carbon energy will start its "phase out", but at the last moment China and India raised the pressure and achieved to change the expression from "phase out" to "phase down", due, evidently, to the high level of dependece of these emerging economies from carbon sources. Another problem in these negotiation processes is the division between developed and developing countries.
Since the UNFCCC in 1992, the climate change assumed a political background in forging the division between the north and the south of the world. The division has been structured trough all the international process concerning the Cops about climate change, with the main argumentation, advanced by developing economies, that the developed countries are the most imputable for the consecuences of climate change meanwhile the mayority of the effects of this fenomenon are impacting developing country. The argumentation, which suppose an historical resposibility of developed countries in producing climate change, has been balanced with the goal of a transfer of financial resource, technologies and capacity building from developed to developing countries materialized in the article 9 of the Paris Agreement flowed in the The Climate Finance Delivery Plan at Glasgow, with the goal of a US$100billion per year transfer from developed to developing countries.

The position advanced by developing countries blaming their developed counterpart to be historically responsible for the mayor part of CO2 emission is definitelly legitime and undeniable both from a historical and scientific perspective, but the point is that this position can not be accepted as a legitimation for developing countries to continue emmitting CO2 indiscriminately and without implementing the transition of their economies towards renewable sources. The explanation of the reluctance of China and India to end carbon, is an example of how the emergent economies of the world are still far from sacrificing economic growthin the name of environmental protection. At the state of things nowaday, on behalf of the Glasgow conference, it is clear that no country in the world has accepted that to face the climate crisis a part of the economic growth has to be sacrificed. The lack of awareness in the

international political field about the necessity to change the bases of our economies in order to face and solve definitelly the climate crisis, is what brings the voices raised by activists and social movements to state that these Cops are a failure, and substantialy is what makes all these agreements so fiable and the implementation of their goals so slow and weack in practical terms.

What is emerging today with the Climate Crisis is the evidence that the capitalist system based on infinite growth economy is incompatible with the purpose of safeguarding the Earth and protecting humanity from the catastrophic consecuences of Climate Change. Unfortunatelly, the evidence is so inconvenient and the consecuences of assuming so will be revolutionary, because it will imply a radical change in the bases of the modern economy, that no political will at the moment have the courage to admit and to move steps in this direction.
The time to mitigate climate change effects is running out and the political process to convert the decision undertaken at an international level into concrete actions takes too long. Morover, the solutions designed at the international level are not efficient enough to reach the goals needed to keep global warming at 1,5 °C.
The idea standing at the base of the carbon credit market is the same that is structuring many reforestation project and the necessity of protecting forests worldwide. It is also the same logic standing behind the goal of the Net zero target to reach by 2050: compensate in order to reduce. Compensate in order to reduce is an hoximor, it is a green washing operation and a strategy that is not solving the problem at the root, but just postponing the consequences of it. Many companies are inverting in reforestation project, but this is not a sacrifice in the name of the environment, it is just a business as usual operation which guarantee them more carbon credits, therefore the more tree they plant the more CO2 the are allowed to emitt. The logic standing behind these solutions is still a capitalist logic, it is evident that it becomes useless to capitalize solutions when the core of the problem is the capitalism itself.

Historical disciplines can apport a wide contribution in the current debate on climate change for the fact that historical evidences prove how crucial is climate change in defining the course of social and political events. The historical reconstruction developed in this thesis underlines the connection between past and present and the most plausible scenarios for the future decades. Going back at the roots of a conception, in this case the capitalist conception of the natural world, is an essential intellectual operation in order to understand its development in history. To change, rethink, readapt a conception without deeply understanding its hystorical and philosophical root can easily become a misleading intellectual operation. The challenge that the climate crisis is opening to modern societies today is not only a clear motivation to act and find solution for the imminent future, but irremediabily an operation of questioning the past. How past societies have coped with unpredictable shift in climate conditions and which attitude towards climate change and environmental problems have caused the collapse or determined the survival of entire civilizations are questions that now more than ever are to be asked. The connection with the present situation is evident. The attitude of understimating the problems related to climate change and environmental degradation, which is exactly the attitude assumed by our society until now, have led to the collapse of past civilizations as Diamond demonstrate in *Collapse*.

As argumented in the first chapter of this thesis, the capitalist vision of nature is rooted with the Christian conception of the natural world expressed in the Genesis, wich gives man a position of superiority with regards to nature and legitimate its domination. Historically the adfirmation of this specific conception of the natural world can be reconduced to the evolution of the agricultural complex societies, a fundamental step in human evolution, defining the values of domination and subjugation of the natural world so well expressed in the Genesis. Despite the passage was not clear and it took millenia of evolution to be defined, considering different context around the world in which agriculture was indipendently practiced, the capitalist vision of the natural world, can follow the bloodline of the evolution from the ancient world to the contemporary. In other words the way our society conceive the natural world in the result of the passage from the first civilizations of the Fertile Crescent to the Classic World, and with the advent of Christianity, from the Classic world to the Middle Age, consolidated all the way throught the Early Modern Age until today.
The passage and the adfirmation of this conception was not clearily defined by an historical event and many examples can be made of society maintaining elements of veneration and more ancient spiritual conception of the mother earth, as we have seen is the case of the Epic of Gilgamesh, for the Greek and Roman culture. Anyway, the idea by which man has the right to dominate the natural world progressively taken hold and during the Middle Age it assumed a sort of conflictual connotation, a sense of redemption and estirpation of the original sin embedded in the darkness of wild nature.
The European Continent has been irrimediabily marked by conflicts in its history. Many scholars state that the concentration of conflictuality and competition between political authorities in Europe was the motor of the consolidation of the overseas expansion, in search for new trades, raw materials, wealth , prestige and power.

" Thus, war for the sake of commerce had a long history among the constellation of competing states in Europe. As Europeans ventured overseas in search of trade and land, this warrior ethos made it natural for merchants and mariners to wage war against one another and indigenous peoples. Competition among European states made them effective and aggressive at empire building overseas." [107]

The combination of different elements contributed to the adfirmation of the European espansion worldwide, starting from the 16th century the consolidation of the European economic model and its application to the rest of the world has led to the present day globalized capitalist economy. It is interesting to notice how the history of capitalism is daughter of the history of Europe, and how the most carachterisitic elements of capitalism are embeeded and recognizable in all phases of the historical process leading capitalism and European history to be the dominant model worldwide.
Greed, competition, aggression, domination, exploitation, conflict are all elements characterizing the European overseas expansion and flowed into capitalism through the industrialization and the technological development, wich have permitted to empower the productive system and therefore the rates of exploiation of natural resources.

[107] C. H. Parker, *Global interactions in Early Modern Ag*e, Cambiridge, 2010, p.17.

The 20th century was characterized by two World Wars, the greedy and identitarian conflicts between alliances of nation states, the conflict between Communism and Capitalism during the Cold war, which led humanity close to extintion due to the development of atomic weapons. The war for supremacy can be considered as the most important and characteristic element defining the last century, sentiments such as greed, aggression and thirst for power have moved events in the last century and are the same standing at the base of the capitalistic exploitation of the natural world, the same motivating and justifing the vision of nature as an object to be exploited for human puropses, for economic purposes.

Once in 1989 the Cold war was over, and at least at a global scale the peace of the capitalist global dominion was established, the greedy and the violence embeeded in the potential of the modern technique tools developed in the name of the 20th century's wars, was applied to the exploitation of the natural world to consolidate the capitalist dominion of the world and to reach its purpose of infinite growth and infinite accumulation of private profit.
The capitalist war against nature have reached its apex, in the sense that the climate crisis and what is going on about Climate Change is the clear evidence that the exploitation of the natural world can not continue at this rate and, most of all, if it does it will end with destroying the planet and the capitalism itself. As Severino acutely observed:

" Capitalism wants and doesn't want to prosper and realize its aim. It wants because is the expected aspect of its acting. But doesn't want to, because its acting or finishes (or it is believed to finish) with the destruction of the Earth, its natural base, therefore the instrument itself – the technique – allowing the productivity of capitalism itself. Otherwise, on the other hand, pursuing as a primary aim the safeguard of the Earth and of the Technic, transforming the profit in a secondary aim, destroy itself as a capitalistic acting and leave space to the rationality of the technic, which does not contemplate the destruction and self destruction embedded in capitalism." [108]
The elements of conflictuality, greed, competition agression and domination wich have led the process of adfirmation of capitalism worldwide are also the elements defining its nature of a self-distructive system, in the sense that the pursuing forward its aims capitalism will end with the distruction of its natural base- the planet earth- and therefore with its self distruction, wich is basically what is going on with the actual climate crisis.
Therefore the challenge of the 21th century is definitelly the Climate Change. It is a common goal and the hope is that no division can arise anymore towards the evidence of the necessity of gathering everyone's effort to win this challenge. To do so it is necessary at least to be honest in defining the structural causes of the actual situation and stop lieing about inefficient solutions.

[108] Traslation from the Italian edition of: E. Severino, *Il Declino Del Capitalismo*, bur, Rizzoli, Milano,1993, p. 288.

Postfazione

La scelta di sviluppare una tesi di laurea che affronti il problema del cambiamento climatico a partire da una considerazione storica e culturale può, a prima vista, sembrare poco coerente con un percorso di studi in relazioni internazionali comparate e, soprattutto, con la dimensione scientifica e di attualità che la questione climatica incorpora. Tale scelta muove da uno studio dettagliato del processo di politica internazionale che ha portato allo sviluppo delle conferenze internazionali delle Nazioni Unite sul clima. La UNFCCC, primo Summit sul clima tenutosi a Rio de Janeiro nel 1992, inaugura un trentennio di intensi impegni internazionali per la lotta ai cambiamenti climatici, di cui la Cop 26 di Glasgow ne costituisce il più recente esempio. È nel quadro istituzionale della UNFCCC che ogni anno si tiene una COP (Conference of Parties), la quale ha lo scopo di monitorare i progressi fatti dagli stati rispetto agli obiettivi climatici sanciti dalle precedenti conferenze e, in secondo luogo, di fissare nuovi obiettivi in base alle previsioni scientifiche. Da una prospettiva di politica internazionale, il sistema delle Nazioni Unite costituitosi intorno alla questione climatica è senza dubbio un sistema complesso, il cui funzionamento coinvolge numerosi attori (istituzionali e non) oltre ad una grande quantità di risorse impiegate per far fronte all'emergenza climatica. L'IPCC, Intergovernmental Panel on Climate Change, è l'organismo incaricato di fornire su base scientifica le linee guida per quella che è la politica internazionale sul clima. I risultati di questo processo internazionale cominciato a Rio de Janeiro nel 1992, sono sotto gli occhi di tutti e riempiono le pagine dei testi di politica internazionale degli ultimi 30 anni. Il Protocollo di Kyoto, gli Obiettivi di Sviluppo del Millennio, poi confluiti negli Obiettivi di Sviluppo Sostenibile contenuti nell'Agenda 2030, il trattato di Parigi e la recente conferenza di Glasgow, costituiscono i pilastri del processo di politica internazionale sul clima.

Un'analisi che muova nella dimensione internazionale, dei processi politici e di negoziazione che hanno portato a definire i risultati sopra elencati costituirebbe, senza ombra di dubbio, un lavoro cospicuo, ma rischierebbe di ricadere nella ridondanza di ciò che già è stato scritto, con la consolazione di poter aggiungere alla narrazione i risultati della più recente conferenza.

È proprio per questo motivo che ritengo e dimostro, attraverso il presente lavoro, che sulla questione climatica sia necessario cambiare prospettiva. Le ragioni sono molteplici, ma prima fra tutte l'evidenza che tutto il processo politico internazionale sul clima non sia stato in grado di raggiungere gli obiettivi prefissati. Nonostante a Parigi si sia stabilito che al più presto le emissioni di CO^2 dovessero raggiungere il picco massimo per poi diminuire, a distanza di 6 anni le emissioni continuano ad aumentare. Nonostante la necessità di mantenere il riscaldamento globale tra l'1,5 e i 2 gradi Celsius, stando alle proiezioni dell'IPCC ci sono alte probabilità che la soglia critica dei 2 gradi sarà superata entro la fine di questo secolo, aumentando l'incidenza di eventi climatici estremi con nefaste conseguenze sia sul piano ambientale che umano. Da un'analisi più approfondita sugli impatti reali delle politiche sul clima emergono molte contraddizioni, alcune di natura economica, altre di natura politica altre ancora di natura ontologica come vedremo, dalle quali sorgono inevitabilmente diverse questioni.

Perché dopo 30 anni di impegni internazionali sul clima, le politiche climatiche sono ancora distanti dal raggiungere gli obiettivi via via delineati dai trattati internazionali? Che cosa ostacola la lotta al riscaldamento globale e la decarbonizzazione dell'economia? Qual è il contributo che la ricerca accademica può dare alla questione climatica?

Le prime due domande spostano l'asse della questione climatica dalla politica internazionale all'economia, mentre la terza apre la strada alla ricerca verso nuovi modelli socio-economici. Il fallimento degli impegni internazionali sul clima sono imputabili al sistema economico, che, oltre ad essere la ragione sostanziale per cui il processo di risoluzione della crisi climatica fallisce, è la causa principale del riscaldamento globale e del cambiamento climatico che da esso deriva. La crisi climatica pone l'umanità di fronte ad un bivio: da un lato l'economia capitalista, la crescita infinita e la cultura del progresso come unico modello di sviluppo, dall'altro la protezione ambientale, la lotta al riscaldamento globale e al cambiamento climatico. La questione è semplice e deve essere posta in questi termini: o l'economia capitalista o la salvezza della terra. La ricerca di una terza via, che di fatto è ciò che il mondo ha fatto sinora attraverso il concetto di sviluppo sostenibile, è ontologicamente fallace. Lo sviluppo di una prospettiva ontologicamente fallace non può che portare a risultati altrettanto inconsistenti, non in grado di risolvere la crisi climatica nelle sue cause più profonde.
Fin dai suoi albori, la questione climatica si è costruita intorno alla retorica dello sviluppo sostenibile. Una delle prime definizioni del concetto si trova nel Brundtland Report – *Our Common Future* - del 1987, che di fatto aprì la strada alla conferenza di Rio. Lo sviluppo sostenibile costituisce l'asse su cui si è sviluppata la politica climatica internazionale, non solo strutturando e delineandone gli obiettivi, ma soprattutto costituendone la narrazione egemone. L'idea che la crisi climatica si possa risolvere attraverso lo sviluppo sostenibile, ossia una dimensione che incorpori allo stesso tempo la crescita economica di stampo cumulativo capitalista e la salvaguardia del pianeta, è una contraddizione ontologica. Molti autori, tra cui Nicholas Georgescu-Roegen e Serge Latouche, hanno espresso tesi critiche rispetto al concetto di sviluppo sostenibile, evidenziandone la natura contraddittoria in termini fisici, economici e logico-matematici. La contraddizione intrinseca contenuta nel concetto di sviluppo sostenibile è la ragione stessa a cui si può imputare il fallimento di tali politiche e il non raggiungimento di obiettivi climatici efficaci nel contrastare il riscaldamento globale.
La crisi climatica non è solo una crisi ambientale. È una crisi di natura sociale, culturale, economica e politica. La portata di questa crisi richiede una dimensione risolutiva che vada oltre la settorializzazione del sapere e sia in grado di mettere insieme strumenti concettuali e pratici pluridisciplinari. La politica fallisce perché oltre alla volontà, mancano gli strumenti concettuali per trasformare il capitalismo. Nonostante le evidenze scientifiche, la questione climatica è stata sottovalutata per tutto questo tempo perché essa implica inevitabilmente dei limiti alla crescita e una messa in discussione del modello economico. La legge economica capitalista è il motore del mondo contemporaneo, più forte della democrazia, della religione e di qualsiasi altra forza che voglia porre dei limiti alla crescita e all'incremento infinito del profitto privato. Al di là di una superficiale convivenza, il capitalismo e la democrazia sono due forze antitetiche, perché hanno fini diversi come spiega Severino in *Il Decino del Capitalismo.*

Severino dimostra come la fine del capitalismo sia scritta nella sua stessa natura, in base alla sua tendenza all'autodistruzione, il capitalismo perseguendo il proprio fine di aumentare indefinitamente il profitto privato finirà con il distruggere la base naturale da cui dipende e, di conseguenza con il distruggere se stesso. L'analisi di Severino indica come la crisi climatica non sia altro che un primo segno di crisi del capitalismo, come questa natura autodistruttiva si stia palesando nella crisi climatica come sua prima conseguenza. Non sarà l'antagonismo di una forza altra dal capitalismo a soppiantare il modello dominante, bensì una trasformazione intrinseca al capitalismo stesso a cui tale modello dovrà vertere per poter salvare se stesso ed il pianeta. Ciò che recentemente è stata definita come transizione ecologica, in realtà, non è altro che l'inizio della fine del capitalismo che lascerà spazio ad un modello dominato dalla razionalità della tecnica moderna che, armonizzandosi alla razionalità e all'efficienza dei cicli naturali senza alterarli, abbandonerà l'elemento auto-distruttivo proprio del capitalismo. Questa tesi vuole mettere in luce come ciò che viene definita come transizione ecologica, se sarà una semplice sostituzione delle fonti di energia del sistema economico, ovvero una decarbonizzazione dell'economia, non sarà in grado di risolvere né i problemi strutturali del capitalismo, né la crisi climatica. Ammesso che si riesca a decarbonizzare l'economia raggiungendo il Net Zero Target entro il 2050, non destrutturando un modello economico volto alla crescita infinita si raggiungerà sempre un punto in cui le risorse naturali si esauriranno, data l'incompatibilità logica e matematica di un modello di crescita infinita all'interno di un sistemo finito di risorse.

Ne deriva la necessità di indagare e sviluppare modelli economici che siano compatibili con i cicli naturali e con il ritmo naturale di rigenerazione delle risorse, sulla base di studi come il Cradle-to-Cradle e l'idea di economia circolare, per dare al mondo un sistema in grado di risolvere la crisi climatica aiutando la transizione del capitalismo verso un modello post-capitalista che, basato sulla razionalità e sulla potenza della tecnica moderna, sia in grado di garantire la sostenibilità della vita sul pianeta per le generazioni future in armonia con l'equilibrio dell'ecosistema Terra da cui tutti dipendiamo.

Una prospettiva storica apporta un contributo ingente alla questione climatica odierna. Da un lato la consapevolezza che il clima non può e non deve più essere sottovalutato, che in passato intere civiltà hanno contribuito a scrivere il proprio destino, a volte tragico, causando e poi ignorando i problemi ambientali che portarono alla loro autodistruzione. D'altro canto l'evidenza che i cambiamenti climatici siano un fattore chiave nel determinare lo sviluppo degli eventi oltre a costituire un elemento di trasformazione sociale, politico e culturale di primaria importanza. Come ogni crisi, quella climatica apre molte possibilità di trasformazione, sta alle società di cogliere questa sfida e mettere in atto le strategie perché tali trasformazioni avvengano nel segno della civiltà e non della catastrofe.

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