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CLIMATE CHANGE AND MOTIVATION: VALUES, KNOWLEDGE, EDUCATION

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- Pennacchioni G. (2023) Navigating the Epistemic Responsibilities of Individuals and Institutions for Sustainability. *Filosofia Morale/Moral Philosophy, 2,* 129-145. https://doi.org/10.7413/fmmp0041.

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Dedication

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Abstract

This dissertation investigates the intersection between the challenges posed by climate change, climate actions, sustainability, and sustainability education. It also proposes a specific reading of sustainability – environmental sustainability – presented as the most compelling interpretation of this notion. In addition, it reports the results of a study conducted in several secondary schools in Milan as part of a sustainability education project organized by Istituto Oikos, with the aim of examining how students perceive climate change and possible sustainable solutions.

In the first chapter, I explain what climate change is, the moral and material difficulties it generates, what climate actions are, and which obstacles hinder their coordinated and shared implementation between countries in the Global North and Global South. Building on these challenges, I show why the concept of sustainability emerged, what should be understood by this notion, how it differs from sustainable development. I then introduce environmental sustainability, proposing this interpretation of sustainability as the sub-thesis of this research work.

In the second chapter, after clarifying why I focus exclusively on the epistemic and practical responsibilities of collective entities – rather than individuals – involved in the challenge of climate change and sustainability, I explain how they differ from groups of individuals and what their collective duties consist of. I then introduce the concept of agency, understood here as an activity of practical and epistemic facilitation, and clarify how states and supranational institutions should act as facilitators for other collective entities, according to their respective functions and capacities. Finally, I show why the full fulfillment of their collective duties and the complete exercise of their agency toward other collective entities coincide with achieving an effective, shared, and binding climate agreement by states and supranational institutions.

In the third chapter, after reconstructing the connection between sustainability education and environmental education, I explain why the exercise of the former, – understood as institutionally framed and policy-oriented, rather than limited to classroom practices or individual learning experiences – coincides, both practically and epistemically, with that orienting action in which states and supranational institutions fully discharge their responsibility. I then illustrate how the exercise of agency through sustainability education operates on other collective entities through various examples. I further show how environmental sustainability education would strengthen this orienting action. Finally, I examine how, at present, sustainability

has largely been reduced either to a vague concept or, conversely, to a set of technical geoengineering solutions, and how this reduction has hindered the development of education to the concept itself – a recovery of which, especially in its environmental interpretation, is the only way to restore the authentic meaning of sustainability.

In the fourth chapter, I provide a critical overview of the Italian legislative framework concerning sustainability education and describe my experience in sustainability education during my internship at Istituto Oikos with the *Power Up!* project, which focused on raising awareness of climate change and sustainability among a sample of 121 students in the Milan area. This focus on the Italian legislative framework is motivated by the fact that my research at Istituto Oikos was centered on clarifying the Italian normative and institutional framework for environmental education and relating it to empirical evidence gathered from schools in the Milan area. At the same time, the emphasis on the Italian regulatory context is emblematic of a broader issue: in the absence of a shared and binding collective agreement, ESD—and thus the dissemination of sustainability principles in schools—is often implemented in a fragmented and ineffective manner. I supplement these observations with a further analysis of both the national and global situation regarding the dissemination of sustainability education, to highlight how this field is still scarcely implemented and undervalued, which explains the ongoing confusion and skepticism surrounding the concept of sustainability.

The central contribution of the dissertation lies in highlighting the role that sustainability education, promoted by those collective actors with the greatest capacity to implement it on a large scale – namely states and supranational institutions – can play in climate action. The original contribution emphasized here is that it is not correct to claim that sustainability lacks a clear and univocal meaning: although this may be true in practice – and it is in this respect that its problematic nature lies – it does not imply that the concept has not been defined. Sustainability education can make a decisive contribution both by clarifying the epistemic content of the notion and by explaining how it should be concretely implemented. This would make it possible to address the climate problem not only through technical measures such as mitigation, adaptation, and climate finance, but also by confronting the moral paradoxes posed by climate change – paradoxes that sustainability, particularly in its ecological interpretation developed here and still underexplored in the literature, aims to clarify and resolve. The analysis of the Italian case and the global state of sustainability education show how far we still are from achieving this goal.

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Introduction

And it's a hard, and it's a hard,
It's a hard, it's a hard,
And it's a hard rain's a-gonna fall.
– Bob Dylan

La terre, elle ne ment pas. – Gustave Thibon

In 1972, the crew of NASA's Apollo 17 mission captured the now-iconic photograph "*Blue Marble,"* the first complete and sharply detailed image of planet Earth from space. For the first time, humankind could observe our world in its entirety—a luminous and fragile globe, suspended in the dark void of space. The vivid colors, the brightness of the clouds and oceans, and the contrast with the cosmic darkness conveyed to all humanity a universal message: there is no life beyond Earth—do not destroy it! This image, which soon became a symbol of unity and an icon for environmental movements around the world, helped spread a new ecological awareness: Earth is a living, interconnected, and vulnerable system that we must care for and protect, since each part participates in a single network of vital relationships. Today, more than fifty years after the photograph, the meaning of "*Blue Marble"* is even more significant. We live in an age in which anthropogenic climate change increasingly reveals its effects and in which the global average temperature rises year after year. Despite this alarming situation, the central theme of the opening of COP 30 in Belém, Brazil, once again, called governments' attention to the climate crisis—one still marked by inaction and indifference (Corrêa do Lago, 2025).

Climate change is neither *only* a matter of climate science, which explains its causes and warns us of its consequences, nor reducible to political or economic management. Rather, it calls for reflecting on our relationship with the natural world and on how we might live authentically given this relationship. A "thought of nature," after all, has always existed for obvious reasons; the foremost being humankind's survival on Earth. Nature can indeed be a source of resources, well-being, and progress, but it is also a source of danger and calamity. Different civilizations have developed distinct views of nature that are often intertwined with religious or spiritual interpretations of nature (Diamond, 1999; Harari, 2015). However, during modernity—at least in the Western

world—we replaced these interpretations with scientific and rational understandings of nature. While this shift enabled enormous progress, most people came to understand Earth as nothing more than a resource to be exploited.

> This conception is objectively attested in modern philosophy, beginning with Bacon's ideal of knowledge as the power to intervene in nature, passing through Descartes's explicit reduction of animals to mere mechanical entities and through Kant's rigid separation between persons and things, and culminating in the idealist reduction of nature to spirit—a reduction that persists into the twentieth century through Marxian ideal of the realm of freedom as the full naturalisation of humanity and the complete humanisation of nature. (Reichlin, 2008, p. 52; my translation).

This way of thinking about nature has resulted in a series of activities—including burning fossil fuels, deforestation, land exploitation, intensive agriculture and livestock farming, industrial development, and urban expansion—that lie at the root of the climate problem. This dissertation neither reconstructs the conception of nature that underlies the current crisis nor, more broadly, retraces the various understandings of nature in the West or elsewhere. Indeed, others have already provided a scientific history of climate change (e.g., Spencer, 2013) as well as philosophical one (e.g., Clark, 2010). Rather, the dissertation investigates—once I have clarified what climate change is and the multiple material and immaterial challenges it entails—the solutions that nations and supranational institutions have developed to counter climate change or mitigate its effects. Given the moral implications of this phenomenon, an effective response can neither be limited to merely mitigating its causes or containing its consequences nor be reduced to a set of technical fixes. The concept of *sustainability* emerged to overcome these reductive approaches, as sustainability requires an integrated framework for transforming society. The dissertation's second area of inquiry examines this concept and the main actors involved in its implementation. The centrality of sustainability in addressing the climate challenge has led institutions to create a field that is devoted to communication pertaining to and education about sustainability; this field is active in formal contexts (e.g., at all levels of education) and within civil society. The dissertation's third objective, then, involves analyzing this field, who and what institutions promote or ought to promote it, and how global and national institutions implement it. A fourth—more forward-looking—goal is to introduce the concepts of *environmental sustainability* and *education*

for environmental sustainability, which—compared to sustainability in the strict sense—are more useful and effective for reinterpreting the human–nature relationship more ecologically.

i. Research Questions

Four main reasons led me to dedicate my doctoral dissertation to these topics. The first is the deep economic, social, and environmental instabilities that the climate crisis has caused; these instabilities are bound to worsen. I am convinced that, despite climate scientists' efforts to describe the extent of the crisis and politicians and economists' efforts to propose solutions that are compatible with certain notions of development, climate change is a philosophical and ethical problem (Pongiglione, 2025). The first set of questions, then, are: *Who bears the greatest moral responsibility for creating the crisis and who bears responsibility for responding to it*? The climate crisis requires that we rethink our values and how we relate to nature before we can reasonably develop technological, social, or economic solutions—that is, before we introduce compensatory or mitigative measures that address the effects of climate change.

The second reason that guides my research is the persistent confusion—present in academic literature, civil society, and institutional contexts—about the concept of *sustainability* and how we educate others about it. Since the 1990s the climate has been a central issue, one from which the idea of *sustainable development* emerged, yet the concept is profoundly ambiguous, which has undermined its application and effectiveness. Moreover, this ambiguity has prevented our developing a systematic approach to the crisis, which has ultimately exacerbated it (Kminek, 2020). Thus, the second question the dissertation raises is: *What is sustainability?* I demonstrate that, while the concept has undergone transformations and adaptations, it nevertheless retains a stable conceptual core that defines its essence.

My third motivation is connected to our contemporary challenges: political and institutional crises, rising economic and social inequalities, mistrust in science and critical knowledge, the spread of disinformation, identity-based conflicts, the decline of collective meaning in favor of individualism, geopolitical fragility, and, finally, a technological and anthropological crisis linked to artificial intelligence, social networks, and privacy (Harari, 2019; Pinker, 2019). Hence, the third question that guides my research is: *What do climate change and sustainability imply about all of this?* This question ultimately points to the destiny of humanity as a whole.

A final motivation stems from my curiosity about the contemporary Italian

context—specifically, Italians' level of awareness about climate change and Italian measures to address it, both through education for sustainability and through concrete application of sustainability. Thus, my final question is: *What is Italy's position regarding sustainability policies and climate change education?* This part of the research integrated perfectly with an internship at the NGO Istituto Oikos, where I participated in the *Power Up!* project as part of my doctoral studies.[1] Through the internship, I conducted environmental education activities at schools in Milan and its province. Furthermore, throughout this period, I deepen my understanding of how sustainability is implemented at the national level, which also enriched my research.

ii. Preliminary Clarifications and General Summary

I should clarify two preliminary points. First, this thesis does not directly situate itself within the classical debate of environmental ethics, a field that emerged during the 1960s and 1970s and later developed deontological, consequentialist, and virtue ethics approaches (Brennan and Lo, 2024). The focus of that debate lies in defining the criterion by which non-humans have moral—and, in some cases, legal—status. While the climate crisis certainly influences the debate and is, in fact, a part of it, the crisis does not constitute its central focus.

Second, the concept of *sustainability* that guides this research should not be confused with reductionist interpretations that limit it to a set of technical practices—such as the use of renewable energy, recycling, or reducing consumption (Dryzek, 2013)—or to virtuous individual behaviors—such as avoiding plastic or choosing organic products (Maniates, 2001). Likewise, sustainability should not be conflated with ontological or spiritualist views that sacralize nature yet overlook historical, political, and social dimensions of the human–nature relationship (Soper, 1995; Latour, 2017) or with technocratic approaches that frame sustainability as a matter of management or engineering (Fulvi and Wodak, 2023). Instead, sustainability ought to be understood as a process of cultural and collective transformation.

This study is a moral inquiry into the problems that climate change has caused, the notion of sustainability, the education model of sustainable development, and the actors most responsible for implementing and disseminating education for sustainability. The dissertation consists of four chapters.

[1] The internship at the NGO Istituto Oikos was part of the PNRR doctoral program of the Vita-Salute San Raffaele University in Milan (CUP: D43C22001470004). During the internship, I participated in the Power Up! project, which the European Union funded and promoted. The Power Up! project fosters environmental education and sustainability in schools across Milan.

In Chapter 1, "Climate Change and Sustainability," I focus on what climate change and sustainability are and why the latter is necessary for resolving the climate crisis. I begin by illustrating why climate change is distinct from Earth's previous climatic variations and its anthropogenic origins (1.1). I then explain what greenhouse gases and the greenhouse effect are (1.1.1) and analyze the main effects of climate change on temperature (1.2), on terrestrial ecosystems, and on human life (1.2.1). In the third section, I introduce *climate actions*—mitigation, adaptation, and climate finance and discuss the differences in how countries in the Global North and Global South implement these strategies (1.3.1). In the final part, I introduce the concept of *sustainability*, explain the moral reasons for why it is a necessary response to the practical and moral limitations of climate actions (1.4.1); I then trace the evolution of the notion of *environmental sustainability* (1.4.2). I show how this perspective is more effective than is the narrower concept of sustainable development.

In Chapter 2, "The Actors of Sustainability," I analyze the main actors involved in realizing sustainability. I show how, given the difficulties individuals face in understanding and effectively responding to the climate crisis, this responsibility is largely ascribed to *collective entities* (2.1). I then distinguish between groups of people and genuine collective entities—those capable of expressing intentionality and who, therefore, bear the most significant duties for addressing climate change and implementing sustainability (2.1.1). Next, I examine the relevant types of collective entities: those with epistemic capacities; those with political, economic, and regulatory capacities; and, finally, those with communicative and educational capacities (2.1.2). In the second part, I show how, among all actors, *states* and *supranational institutions* are best suited to address the climate crisis (2.2). In the third part of the chapter, I present my conception of *collective agency* (2.3) and illustrate how states and institutions fulfill their guiding duties both epistemically (2.3.1) and practically (2.3.2). In the final part, I discuss the challenges of establishing of a global, shared, and effective Climate Agreement (2.4), which would represent the primary duty of states and institutions—one that, even in its absence, they pursue through their orienting function.

In Chapter 3, "On Ecological Sustainability: Towards a Recovery of Environmental Education," I consider the difficulties that states, and supranational institutions face in implementing effective climate and sustainability policies and introduce the field of *education for sustainable development* as a tool that supports their guiding role (3.1). After reconstructing the history of *environmental education* (3.1.1) and

the reasons that led to its evolution into *education for sustainability* (3.1.2), I analyze the meaning and development of the latter (3.1.3) by showing how it influences collective entities—both those endowed with the capacity for action (3.1.3.1) and those with educational functions (3.1.3.2). Consequently, education for sustainable development enables states and institutions to fulfill their moral responsibility (3.1.3.3). In the second part, I return to *environmental sustainability* and show how education from this perspective is more effective than is simple education for sustainability (3.2). I examine the presence and representation of this idea in contemporary society (3.2.1). Next, I turn to a critique: I argue that, on the one hand, sustainability has been reduced to a *business-as-usual* logic (3.3.1) and that, on the other, a technicist vision of sustainability lends itself to merely geoengineering interpretations (3.3.2), both of which cannot address the moral challenges of climate change (3.4).

In Chapter 4, "Education for Sustainable Development in Italy and Worldwide," I begin with an analysis of sustainability education in Italian legislation (4.1) and then discuss the main obstacles to its full implementation in Italy (4.1.1—4.1.2). I then turn to an *empirical study* that I conducted through the *Power Up!; the study* analyzes 121 student responses to a reflection exercise about climate change (4.2). In the final part of the chapter, I broaden the analysis to the global situation and highlight differences between countries in the Global North and South and the inequalities in their implementation of sustainability education programs (4.3). Ultimately, I argue that we need to strengthen implementation and expand their reach (4.3).

Chapter 1. Climate Change and Sustainability

1.1 What is Climate Change?

On planets similar to Earth, which is over 4.5 billion years old and has undergone major oscillations both in atmospheric composition and temperature, it seems strange to attribute current climate change to human activity. Throughout its history, in fact, natural factors, such as variations in solar luminosity, volcanic eruptions, or changes in Earth's orbit around the sun, have caused climatic changes. Using satellites, we can collect data on these activities and how they have influenced Earth's climate. However, studies based on such data also show that, since around 1600, these activities have not significantly varied. Instead, since 1880, Earth's temperature has continuously risen. Consequently, natural causes alone cannot explained this increase. Its cause must therefore be sought in human activities. The "Summary for Policymakers" in the IPCC's *Sixth Assessment Report* states: "It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere, and biosphere have occurred" (IPCC, 2021, p. 4).

In particular, certainty about the anthropogenic origin of current climate change comes from one discipline: paleoclimatology (Pongiglione, 2025, p. 22). As highlighted in the IPPC's (2007) *Fourth Assessment Report*, paleoclimatology studies show that, even when compared with other formidable climatic changes, current climate changes represent an unusual trend. Consider the following unequivocal data:

- The concentration of carbon dioxide (CO_2), a greenhouse gas, has reached, in an extremely short time, its highest levels in 500,000 years. Such a rapid increase is inexplicable for the period we are in—the Quaternary—which has lasted about two million years. During this period, we have no evidence of such large and rapid variations. Even considering earlier periods, peaks of this kind occurred only several million years ago, and still over much longer timescales (IPCC, 2007).
- Over the past 50 years, temperatures have risen sharply. Although local fluctuations in temperature have frequently occurred in the climatic history of our planet, these fluctuations were not indicative of any global change. Humans acquired the ability to record global average temperature during the 18th century. However, given evidence from other sources—mainly tree rings and ice cores from glaciers or polar ice caps, which allow us to go much further

back in time—temperature variations as significant as those observed in recent decades have never occurred. These data reveal that the Middle Ages were generally a warmer period, and the subsequent centuries were colder centuries, and that temperatures began to rise in the 19th century. Looking further back, within the past 2000 years, we find no indications of other significant oscillations or climatically unusual periods. Extending the time horizon further, to about three million years ago, while Earth's climate was generally warmer, glaciers were smaller and sea levels were higher. An oscillation like that in the past 50 years—or one even more intense—have occurred in geological periods prior to ours but then the Earth's tectonic activity was much higher than it is today (IPCC, 2007).

However, even if we discount the extraordinary nature of today's temperature fluctuations, the anthropogenic character of current climate change derives from the speed with which these changes have occurred. For pre-anthropogenic climate change periods, variations between 4 and 7°C are estimated to have occurred over 5000 years, whereas today the risk is an increase of +5°C by 2100—and in 2024 the threshold of +1.5°C above pre-industrial levels has already been surpassed (WMO, 2024a, p. 6 https://library.wmo.int/records/item/68835-state-of-the-global-climate-2023). This seemingly modest temperature rise arouses such deep concerns because of the rise in global average temperature (Pongiglione, 2025, p. 27). That is, we are not witnessing a uniform global temperature increase of just over 1°C. Although the global average is an increase of more than 1.5°C and some regions of the world experience temperatures roughly around the average—or slightly lower in some years—other regions have witnessed local rises of +2°C or +4°C. The expected and already ongoing consequences in these regions are alarming (IPCC, 2007, p. 465).

- The scientific community has reached a consensus on the anthropogenic origin of the problem. As early as 2013, more than 97% of scientists agreed that current climate changes were the result of human industrial activity (Cook et al., 2013). This consensus has continued to grow as the level of expertise in climate science has increased. In 2019, it reached 99% (Powell, 2019); in 2021, the IPCC Assessment Report stated that its anthropogenic origin is "unequivocal" (Lynas et al., 2021). Such unanimity must be taken into

account, as it represents not the work of a few individuals but of the entire global scientific community.

1.1.1 Greenhouse Gases and the Greenhouse Effect

The main cause of global warming is the alteration in the presence of greenhouse gases in the atmosphere: the layer of gases that surround planet Earth and are held together by gravity. Greenhouse gases allow sunlight to pass through the atmosphere and reach the Earth's surface, thereby warming the land and oceans. Subsequently, our planet re-emits this energy in the form of heat (infrared radiation), and greenhouse gases absorb part of this re-emitted heat energy. This absorption of heat slows down its dispersion into space and maintains temperatures compatible with life—hence the term "greenhouse gases." They function much like a greenhouse's glass panels: they let sunlight in but limit the flow of heat outward. Without the natural greenhouse effect of these gases—mainly carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (NH_4)—the average global temperature would be around -18°C. The presence of these gases, however, has raised the Earth's temperature by about 33°C (NASA, 2024 https://science.nasa.gov/climate-change/faq/what-is-the-greenhouse-effect/).

The current concern about the rise in Earth's temperature lies in the progressive intensification of the greenhouse effect, which is caused by a high concentration of greenhouse gases that are the result of human activities and pollution, such as the combustion of fossil fuels, deforestation, and intensive agriculture, that began during the Industrial Revolution. According to 2022 data, since 1750, the amount of CO_2 in the atmosphere has increased by about 50%, while CH_4 has increased by 164% (WMO, 2024b, p. 2, https://wmo.int/publication-series/wmo-greenhouse-gas-bulletin-no-20). To conveniently measure greenhouse-gas emissions, scientists use a common unit: carbon dioxide equivalent (CO_2eq), which expresses other greenhouse gases in terms of their corresponding quantities of CO_2. Each year, almost 50–60 billion tons of CO_2eq are released into the atmosphere, 73% of which come from the energy sector—production, electricity consumption, heating, and transportation—while 18.4% derives from agriculture, livestock, and deforestation. A further 5.2% comes from direct industrial processes, such as the production of cement or chemical compounds; the remaining 3.2% originates from waste, which releases greenhouse gases through decomposition (Ritchie

et al., 2024 https://ourworldindata.org/emissions-by-sector).[2] An excessive accumulation of greenhouse gases in the atmosphere increases the amount of heat trapped within Earth's system and leads to abnormal and accelerated global warming. Initially, this rise corresponded to an increase in temperature ranging from +0.9°C to +1.2°C compared with temperatures in the pre-industrial era. Today, global temperatures appear to have surpassed a +1.5°C threshold and could easily exceed +3°C (IPCC, 2023a).

Figures 1 and 2 illustrate the extent of ongoing global warming, both in terms of our planet's climatic history and compared with the pre-industrial period.[3] Since 1850, progressive improvements in thermometric measurements (Pongiglione, 2025, p. 22), combined with the continuous analysis of average temperatures over 20-year periods, have led to ever greater precision in studying global warming and the temperatures that precede the recent trend.

[2] I provide these data as an indicative overview; the data may also be aggregated according to different classifications (Pongiglione, 2025, p. 25). However, such work is not relevant to this doctoral thesis or this section, which aims to explain what climate change is and why it constitutes a global challenge for humanity.

[3] I obtained the second graph during my internship at Istituto Oikos. Throughout this experience, I met Professor Andrea Turolla from the Politecnico di Milano, who kindly granted me permission to use the materials he presented in his Power Up! project lectures.

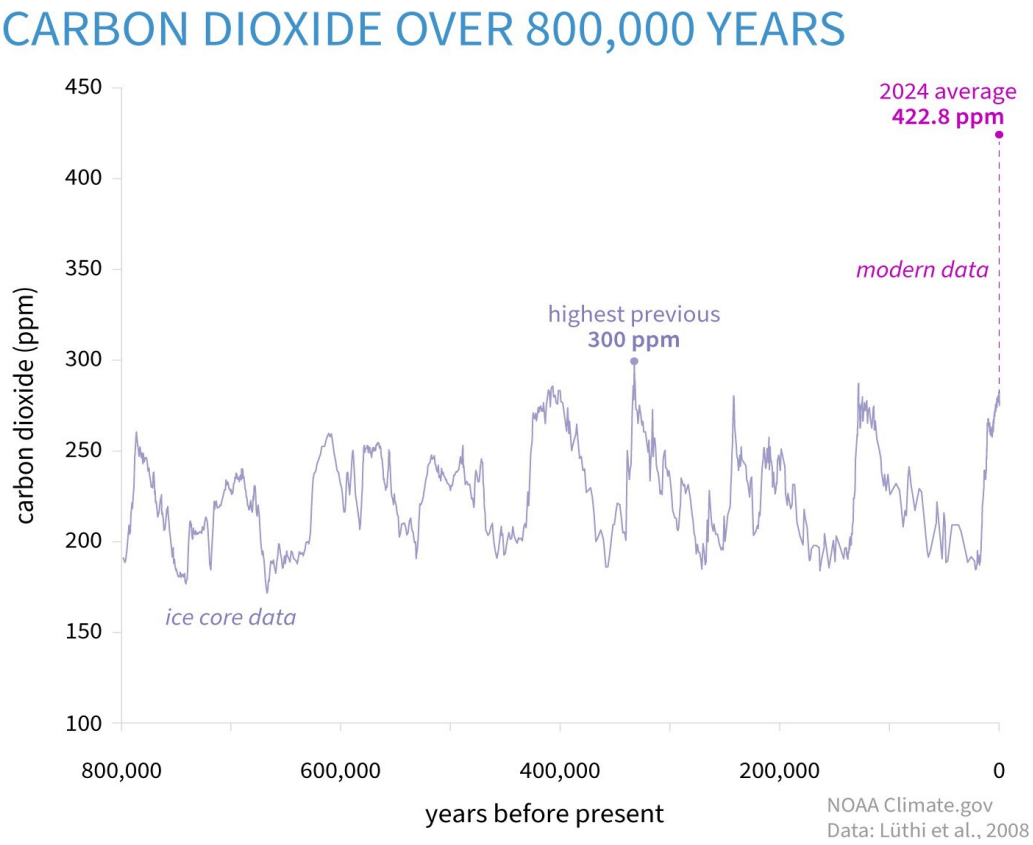

Figure 1. *Credit: Graph by NOAA Climate.gov based on data from Lüthi et al. 2008, via NOAA NCEI Paleoclimatology Program. https://www.nature.com/articles/nature06949.*

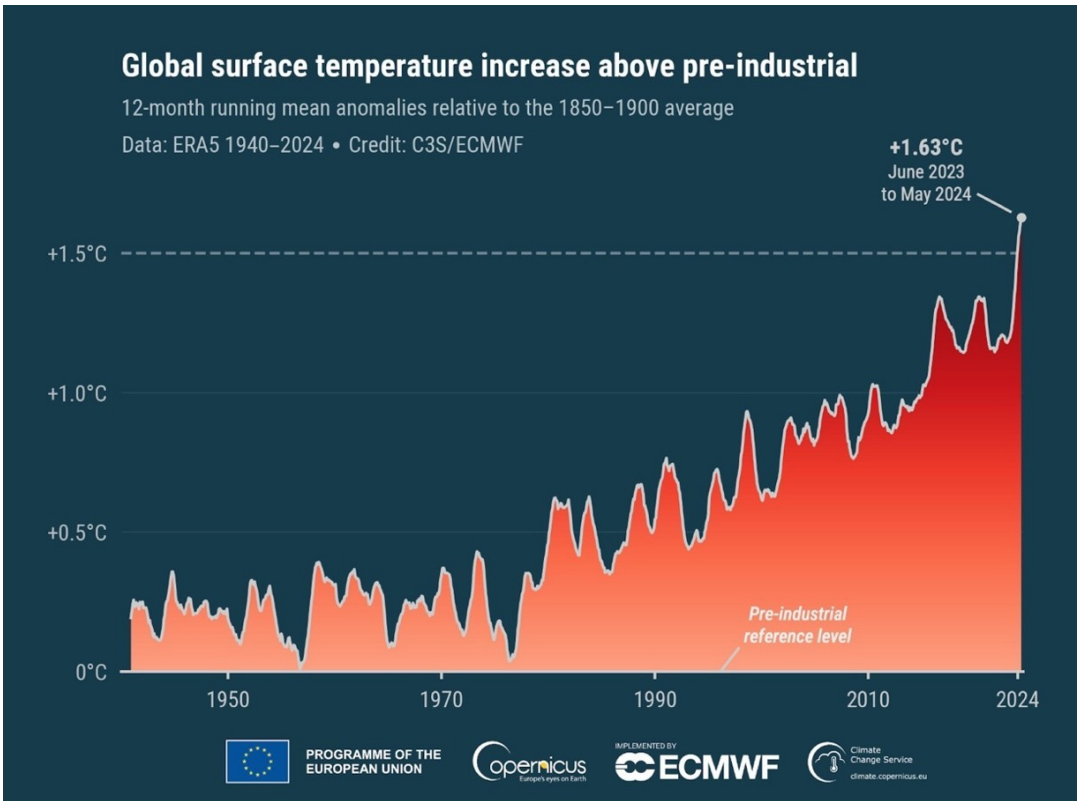

Figure 2. *Credit: C3S/ECMWF. Data source: ERA5.* https://climate.copernicus.eu/hottest-may-record-spurs-call-climate-action.

1.2 The Effects of Climate Change on Temperature

As global warming continues to increase, the average temperature draws ever closer to a critical threshold—the *tipping point*. The tipping point had been initially set at 1.2°C, then at 1.5°C, and has now reached 2°C, given that, in the two-year period 2023–2024, an increase of about 1.63°C was recorded (Copernicus Programme, 2024, https://climate.copernicus.eu/hottest-may-record-spurs-call-climate-action). The tipping point is a climatic threshold beyond which some impacts of climate change become irreversible, even if temperatures were to return to pre-industrial levels. A return to earlier levels, however, is practically impossible because CO_2 remains in the atmosphere for a long time and accumulates much faster than it disperses. Consequently, returning to pre-industrial age levels would take millennia (IPCC, 2022a, p. 160). In general, the higher the tipping point, the harsher the consequences of temperature rise will be.

The main effect of increases in global temperature and the progressive rise of the tipping point is that, in mid-latitudes, an increase of about 3°C is expected, while in northern regions global warming could reach as high as +4.5°C. Moreover, there is a concrete risk that the Greenland ice sheet will melt. The progressive retreat of the ice

cover in Greenland, together with that in Antarctica, will cause sea-level to rise between 0.26 and 0.77 meters by 2100 and several hundred meters in subsequent years, even if humans managed to bring the global average temperature below 1.5°C (IPCC, 2018b, p. 7). Additionally, especially in tropical areas, heatwaves will increase and already vulnerable regions, such as the Mediterranean area, particularly Southern European countries, North Africa, and the Middle East, will experience drought intensification. At the same time, extreme rainfall events are expected to increase in the northern United States, Central and Northern Europe, Russia, and Latin America (IPCC, 2018a, p. 201). Tropical cyclone activity is also expected to change. Currently, intense weather events in the North Atlantic and Indian Ocean basins have increased (p. 203). Although how the situation will evolve in response to future temperature rise is uncertain, most studies suggest that, given a global average temperature increase that has already exceeded 1.5°C, the overall number of cyclones may decrease but the number of the destructive ones will increase (p. 204).

For the purposes of this thesis, dwelling on the effects of rising temperatures makes little sense, as doing so is complex and requires considering too much detail. Instead, I briefly focus on the consequences of climate change on ecosystems and on global populations to explain why addressing the climate crisis and revising the concept of sustainability, themes that I cover in later parts of this chapter, are necessary.

1.2.1 The Consequences of Climate Change on Ecosystems

Because of climate change, all ecosystems are—or will soon be—subject to transformations that we can no longer ignore. At present, about 4% of terrestrial biomes have undergone significant alteration and will continue to do so in the future; if the global average temperature does not fall below 1.5°C, 6.5% of biomes will experience serious alteration (IPCC, 2018a, p. 220).

The Arctic region, dominated by tundra, is among the areas most severely affected by global warming: increasingly short and mild winters are profoundly altering this biome, traditionally composed of mosses and lichens, while tree species are now expanding northward (p. 220). Beyond polar environments, climate change is reshaping ecosystems worldwide. Savannas are progressively replacing grasslands in some regions, while forest ecosystems—both tropical and temperate—are becoming increasingly vulnerable, as prolonged droughts heighten their susceptibility to wildfires and intensify physiological stress in plants (p. 220).

These transformations are not merely spatial or structural, but are fundamentally driven by changes in the composition, distribution, and functioning of plant life, which constitutes the primary ecological substrate through which climate change unfolds. Flora across different climatic zones is undergoing profound transformations. Rising atmospheric CO_2 concentrations have extended growing seasons and promoted widespread "greening" in boreal and temperate regions; however, long-term ecosystem productivity is expected to decline due to soil nutrient depletion, intensified interspecific competition, and reduced water availability. In subtropical and Mediterranean regions, climate change is instead accelerating aridification processes, prolonging drought periods, and contributing to the gradual loss of native vegetation.

Significant alterations are also evident across non-forested and marginal ecosystems: high-latitude ecosystems are experiencing extensive woody plant encroachment, mountainous environments are seeing plant species shift to higher elevations, and wetland and coastal ecosystems are contracting because of salinization and altered hydrological regimes (Pongiglione, 2025, p. 32). Oceans, which host an extraordinary diversity of ecosystems and provide essential resources for many human communities, are likewise undergoing profound changes, placing both ecological systems and livelihoods at increasing risk (IPCC, 2018a, p. 222).

These profound transformations of vegetation and habitats inevitably reverberate across faunal systems, reshaping species distribution, ecological interactions, and evolutionary trajectories. Across terrestrial, freshwater, and marine environments, many species are migrating poleward and toward higher elevations in search of cooler conditions. This large-scale redistribution of fauna increases the likelihood of biological invasions, introducing alien species that disrupt local ecosystems and generate substantial ecological damage. In the Mediterranean Sea, for instance, numerous fish species are shifting toward more northern basins, altering established ecological equilibria (p. 218). Similarly, the geographic ranges of hundreds of North American bird species have moved northward at an average rate of approximately 1.5 km per year over the past 55 years, signaling a persistent and directional response to climatic pressures (Martin et al., 2024). Taken together, these dynamics point to a broader and more systemic phenomenon: at the global scale, the planet is currently undergoing a sixth mass extinction event (Kolbert, 2014).

1.2.2 The Consequences of Climate Change on Human Life

Beyond the natural world, climatic upheavals produce profound repercussions for human life as well. Ecosystems deliver essential services that form the very foundation of societal survival — including carbon sequestration, nutrient cycling, water purification, soil stabilization, pollination, and climate regulation. The deterioration or collapse of these systems therefore threatens not only biodiversity but also the very conditions that make human life possible. This occurs both indirectly, through environmental degradation, and directly, by reshaping living conditions, livelihoods, and settlement patterns on a global scale, thereby highlighting how community resilience is tightly linked to the persistence of healthy and fully functioning ecosystems. From this perspective, the climate crisis cannot be understood solely as a human issue nor merely as an environmental one; rather, it constitutes an ecological crisis in which the fates of human and non-human life are deeply interconnected.

One of the most evident manifestations of these impacts is the rise in global sea levels. Coastal areas worldwide are increasingly exposed to flooding and erosion, while low-lying regions, including islands in the Maldives and the Pacific, are expected to become partially or entirely submerged. In other contexts, climate change has already led to severe damage to infrastructure and to the progressive salinization of groundwater, with direct consequences for agriculture and freshwater availability (IPCC, 2018a, p. 230).

Clearly, not all the consequences of climate change will affect every society in the same way. Thus, the notion of climate risk has emerged to assess different risks that societies in different geographic areas will face. A society's level of climate risk depends on the interaction of three factors: the climatic event, exposure, and vulnerability (IPCC, 2022a, p. 145). The first factor is fairly intuitive: for a climatic event to pose a real threat, people and communities must be exposed to it. A heatwave in the heart of the Outback— the inland desert region of Australia—will have a minimal impact. The second factor, exposure, concerns the level of risk populations face: a drought will have far more severe consequences in countries with scarce water resources than in those that have a humid climate or adequate infrastructure, such as advanced irrigation systems, storage basins, desalination plants, or efficient distribution networks. The same applies to economic and political conditions: in the absence of effective institutions, an entire population is more fragile than one that has adequate means and a government that can respond promptly to extreme events. A telling example is that of Indigenous peoples,

who are among the most exposed to climate impacts because their lives and livelihoods directly depend on the territories in which they live. Third, vulnerability varies considerably from region to region; vulnerability increases when a population, for geographical or socioeconomic reasons, is more fragile and less prepared to cope with climatic impacts. Poorer countries have fewer resources for adapting or responding to environmental disasters and therefore suffer their effects more directly and for longer durations. The consequences can be devastating, particularly in regions, such as Southeast Asia or Sub-Saharan Africa, where much of the population depends on natural resources and agriculture for survival. These resources are becoming increasingly unstable such that the regions experience mass malnutrition and forced migration. For years, the number of climate migrants has been rapidly growing, though such migrants still lack full legal recognition (IOM, 2024 https://publications.iom.int/books/world-migration-report-2024).

Peoples' climate risk therefore generates new inequalities or amplifies existing ones. In general, low-latitude areas and less developed, socio-economically more vulnerable countries—often referred to as the Global South—are thus less resilient and face the greatest difficulties.[4] Moreover, their vulnerability is all the more unjust given that they are also historically the least responsible for the ongoing climate emergency (Hallegatte et al., 2016, p. 12). As Stephen M. Gardiner (2006) writes,

> The climate change problem interacts in some unfortunate ways with the present global power structure. For one thing, the responsibility for historical and current emissions lies predominantly with the richer, more powerful nations, and the poor nations are badly situated to hold them accountable. For another, the limited evidence on regional impacts suggests that it is the poorer nations that are most vulnerable to the worst impacts of climate change. (p. 302)

However, inequalities do not manifest only between different regions of the world but also within individual countries. For instance, women, although not intrinsically more vulnerable to the effects of climate change, are often the most affected by climate change: their adaptive capacities are frequently hindered by pre-existing societal inequalities, such as reduced access to resources or unrecognized workloads. The same applies to economically poorer people within the same state (Di Chiro, 2017; Kingsolver, 2015).

[4] The term "Global South" denotes those regions of the world that have been historically disadvantaged and that are often marked by colonialism, resource exploitation, and economic inequality, while "Global North" refers to the economically more developed and politically stronger countries.

The effects of climate change are also unequal in terms of human health. Currently, about 30% of the global population—the poorest segment—lives in areas where extreme heat or humidity are associated with increased mortality; by the end of the century, 50% or 75% of the global population may live in such areas. Thus, the World Health Organization has defined climate change as one of the most severe threats to human health in the 21st century, and the scientific community has long warned of its often irreversible dangers (WHO, 2015 https://www.who.int/publications/m/item/strengthening-health-resilience-to-climate-change). According to the *World Economic Forum*, by 2050, the number of additional deaths attributable to climate change could reach 14.5 million (WEF, 2024 https://www.weforum.org/publications/quantifying-the-impact-of-climate-change-on-human-health/).

Thus, climate change causes not only injustice between individuals and societies but also intergenerational injustice (Gosseries, 2023). Since the consequences of climate change will long impact the future—and, unfortunately, do so in a compounding way—future generations will inevitably face a severely damaged environment and society, as well as significantly lower life prospects if climate change is not sufficiently counteracted. Thus, we should ask whether we have the tools either to mitigate and contain climate change or the tools to address its resulting or amplified inequalities.

1.3 The Fight against Climate Change

At the international and national levels, the main tools to counteract the effects of climate change and to prevent it are mitigation and adaptation.[5]

Mitigation involves all the policies, strategies, and measures that aim to reduce the causes of climate change. The goal of mitigation is therefore to reduce greenhouse gas emissions or remove them from the atmosphere. Mitigation emerged as a strategy following the signing of the 1992 United Nations Framework Convention on Climate Change and the 1997 Kyoto Protocol (Nespor, 2018). Reduction strategies are pursued in various ways, such as reducing energy consumption, promoting renewable sources, improving energy efficiency, and adopting low-impact technologies. Likewise, removal strategies come in several options, some natural and others technological. Examples of

[5] I obtained this information and examples about mitigation and adaptation strategies via my participation in the Power Up! Project with my internship at Istituto Oikos (see note 1). I prepared a lecture that explicitly addresses these issues and presented the lecture at various upper secondary schools. Slides from the lecture can be found at https://view.genially.com/6086d3df78c7db0da079e5c4/presentation-lez-14-12-14-anni-tra-mitigazione-e-adattamento.

the former include reforestation practices or the use of conservation agriculture techniques that favor absorbing CO_2 through photosynthesis and reducing the release of carbon from the soil. Such practices counteract the negative effects of intensive agriculture and wood combustion, both of which release large amounts of greenhouse gases into the atmosphere. Examples of the latter include direct air capture of CO_2, which is then stored in the ground, or artificial mineralization, a process that chemically converts CO_2 into stable solid compounds, which can then be stored or reused in industrial processes.

Adaptation, on the other hand, involves measures that aim to address the effects of climate change, both those already occurring (i.e., reactive adaptation) and those anticipated (i.e., preventive adaptation) to prevent or reduce damage. Additionally, transformative adaptation aims to modify the economic, social, and environmental structures of society significantly (Nespor, 2018). Adaptation strategies have two key objectives: reduce vulnerability and increase resilience of territories and communities who face the impacts of climate change. "Vulnerability" here refers to a territory's or community's propensity to be negatively affected by such impacts, while "resilience" refers to their ability to respond to a disturbance by finding a new equilibrium that adapts to the new conditions sufficiently. Applied to climate change, resilience is a person's, animal's, or plant's capacity to live normally in the presence of drought, water scarcity, heatwaves, and low or absent rainfall, and similar climate issues.[6]

Adaptation policies were considered after mitigation policies, in part because Global South countries, who considered themselves less responsible for climate change than those in the Global North were, did not invest economic resources in adaptation strategies, as their resources were heavily devoted to solving much more immediate social problems, often directly or indirectly attributable to wealthier countries (Nespor, 2018). Consider the evolution of the Intergovernmental Panel on Climate Change (IPCC) reports. In the first report (1990), its authors mention adaptation only indirectly in the third volume, *The IPCC Response Strategies,* and do not explicitly define "adaptation." The title of the second report, instead, is *Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analysis*; the entire second volume of the third report (2001) is titled *Impacts, Adaptation and Vulnerability* and is devoted to adaptation. In 2015, with the Paris Agreement, adaptation gained full recognition as a fundamental component of the fight against climate change. Its ascendency was the result of a long

[6] For a more detailed discussion of the two strategies, see the lecture slides found in note 4.

process through a series of initiatives and attempts, including the 2007 Bali Action Plan, the 2009 Copenhagen Accord, the 2010 Cancun Adaptation Framework, as well as documents such as the UNDP's *Adaptation Policy Frameworks* and the European Commission's *Green Paper* (Nespor, 2018).

Adaptation actions include land management, for example, through riverbank maintenance, soil care, and urban planning that avoids construction in areas prone to landslides or floods; coastal protection, through infrastructure works or ecosystem restoration-based solutions; the introduction of more resilient crops and more efficient irrigation techniques, as well as more careful water resource management; and finally, in the contexts of the most vulnerable groups, a gradual relocation of exposed populations in coordination with the countries potentially affected by migratory flows.[7]

Recently, climate finance has been added to mitigation and adaptation strategies. Climate finance involves financial resources mobilized to address climate change and support mitigation and adaptation actions, particularly those in poorer countries. These funds may come from governments, private investors, or international organizations, such as the World Bank or the International Monetary Fund, and thus bring together multiple countries (Nespor, 2018). The first proposal to use climate finance might be the Framework Convention of the 1990s, in which developing states composed of small islands—SIDS (Small Island Developing States) or AOSIS (Alliance of Small Island States)—requested dedicated funds for financing adaptation interventions in response to rising sea levels. However, these requests were rejected. The first significant step toward introducing this tool came with the 1997 Kyoto Protocol and the 2001 Marrakesh Accords, both of which resulted in two different funds—the Least Developed Countries Fund (LCDF) and the Special Climate Change Fund (SCCF)—that were financed through voluntary contributions from developed countries. These two funds, together with the Adaptation Fund, which was formally established in 2005 when the Kyoto Protocol officially came into force, and the Copenhagen Green Climate Fund (GCF), which was established in 2009 with the Copenhagen Accord, were later consolidated under a single international organization: the Global Environment Facility (GEF). This fund, which is the main instrument of climate finance, has had an increasingly central role since 2015, with the adoption of the Paris Agreement, which marks the moment when climate finance began to be implemented concretely. At this time, it was agreed that all developed countries should commit to mobilizing 100 billion

[7] See note 3.

dollars a year until 2020 for mitigation and adaptation projects and to ensure that the 2°C limit for global mean temperature by the end of the 21st century would actually be met (Nespor, 2018). Nonetheless, developed and developing countries took different positions on the three strategies for climate action. In the next section, I provide a brief overview of the current situation in relation to these climate agreements' targets.

1.3.1 Differences in Climate Action between the Global North and the Global South

At present, the Global North and Global South have not reached an effective and shared agreement about how to implement climate action. The main reason for not reaching an agreement is that the management of global temperature represents a perfect example of Garrett Hardin's (1968) "tragedy of the commons." Hardin imagines that an open-access pasture is gradually degraded because each herdsman has an incentive to add as many cattle as possible—acting solely in pursuit of personal gain. This tragedy is writ large with respect to the global climate: each actor (a state or group of states[8]) tends to act in its own interest: it uses the most polluting energy sources in an unregulated way and leaves others (states or groups of states) with the costs and responsibilities of climate action. Maintaining the global temperature below the 2°C threshold should, instead, be a shared goal shared. Unfortunately, this is not the case, and the lack of cooperation undermines the goal of the Paris Agreement—to reach net zero emissions by 2050. Consequently, the ongoing climate crisis accelerates and worsens.

Stephen M. Gardiner (2006) has explained that the greatest obstacle to achieving the goals of the climate agreements is that climate change constitutes a "perfect moral storm":

> The peculiar features of the climate change problem pose substantial obstacles to our ability to make the hard choices necessary to address it. Climate change is a perfect moral storm […] Let us say that a perfect storm is an event constituted by an unusual convergence of independently harmful factors where this convergence is likely to result in substantial, and possibly catastrophic, negative outcomes. (p.

[8] Representatives in the Conference of the Parties (COP)—the annual meetings promoted by the United Nations to monitor and negotiate global actions against climate change—discuss the decisions that sovereign states or coalitions of states have made. The United Nations Framework Convention on Climate Change (UNFCCC) recognizes the central role of state entities both in defining legal responsibility and in the practical implementation of environmental policies. Italy, for example, participates in negotiations both as an individual state and as a member of the European Union, with whom it shares common goals and negotiation strategies but also maintains its own representation. For more on COPs and its various actors, see Anna Pelicci's presentation, https://docs.google.com/presentation/d/1mnPccpePBhZG7HVt4SCD8tF1AkXgde8e/edit?usp=drive_link&ouid=106839558124691916696&rtpof=true&sd=true. Her presentation offers insight into the most recent Conference, COP 29, in Baku. Pelicci is an engineering student at the Politecnico di Milano and a member of the Italian Climate Network (ICN), a non-profit organization that has been active in Italy since 2011.

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Specifically, Gardiner argues that the factors that make coordination of climate action difficult are:

- *Dispersion of Causes and Effects*. "Climate change is a truly global phenomenon. Emissions of greenhouse gases from any geographical location on the Earth's surface travel to the upper atmosphere and then play a role in affecting climate globally. Hence, the impact of any particular emission of greenhouse gases is not realised solely at its source, either individual or geographical; rather, impacts are dispersed to other actors and regions of the Earth." (p. 399)
- *The Fragmentation of Agency.* "Climate change is not caused by a single agent, but by a vast number of individuals and institutions not unified by a comprehensive structure of agency. This is important because it poses a challenge to humanity's ability to respond." (p. 399) The fragmentation of agency leads "institutional inadequacy" (p. 402) at all levels of governance.
- *The Temporal Dimension*. The consequences of climate change unfold in the medium to long term and create a conflict between the current agents' responsibilities to act and the future benefits of such actions. Consequently, climate change produces an "intergenerational storm" (p. 402).
- *Vulnerability to Moral Temptations*. Climate change creates conditions in which, even if fair and shared solutions could be found, actors can easily evade their responsibilities. In other words, the climate crisis makes humanity "extremely vulnerable to moral corruption" (p. 398).

These difficulties are clearly reflected in empirical data from the Climate Action Tracker (CAT), a platform that evaluates and monitors countries' climate action in relation to the agreements' goals. At present, the data show that countries of the Global North—although historically the main contributors to the climate crisis—are also the most active in implementing and financing mitigation and adaptation strategies. Through their domestic policies, countries in the Global North strive to meet the targets of the Paris Agreement through their Nationally Determined Contributions (NDCs; CAT, n.d. https://climateactiontracker.org/). These countries facilitate this given the greater availability of economic resources and fewer socioeconomic difficulties among their

populations, but we should also acknowledge their commitment. Nonetheless, these countries can and should do more and not all of them are equally engaged—in fact, the US under the Trump administration, has offered less of a commitment (Abnett and Furness, 2025).

By contrast, when it comes to climate action, data from the Global South paint a far more discouraging picture. First, consider differences among this group. Some countries are considered particularly vulnerable, including those in regions of Africa affected by drought, desertification, and flooding, and SIDS and AOSIS countries, which not only suffer the most severe consequences of the climate crisis but also face very difficult socioeconomic conditions (Nespor, 2018). Others, such as India, which possess the economic and technological capacity to engage in climate action, tend to slow down this process—something that is only partially justifiable. In India's specific case, while the country still experiences deep internal inequalities and large sectors of the population live in poverty, India also continues to invest heavily in coal and has even postponed its target for achieving net zero emissions from 2050 to 2070 (CAT, n.d., https://climateactiontracker.org/). Similar examples include Brazil, Saudi Arabia, Turkey, and many other developing countries. One the one hand, these countries must address highly complex socioeconomic conditions, ones in which investing in traditional energy sources appears to be the most strategically viable option. On the other hand, they appeal to the principle of common but differentiated responsibilities (CBDR), recognized in climate negotiations and underlying both mitigation and adaptation strategies. As stated in the *United Nations Framework Convention on Climate Change*:

> The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof. (UN 1992: 4)

Indeed, the countries of the Global North attempt to lead this process. Therefore, their invoking greater or lesser responsibilities in climate action only partially justifies the widespread inaction that has led to a situation in which the fight against climate change remains insufficient.

The data demonstrate this insufficiency. Global greenhouse gas emissions have continued to rise since the 1990s, despite mitigation strategies that have been approved

the Framework Convention and the Kyoto Protocol. As shown in the UNEP's *Emissions Gap Report* (2024, p. 31, https://unepccc.org/emissions-gap-reports/), under current policies, the world is far from remaining below the 2°C threshold; projections indicate a rise in average global temperature between 2.5°C and 2.9°C. With regard to climate finance, the UNEP*'s Adaptation Gap Report* (2023: XI, https://www.unep.org/resources/adaptation-gap-report-2023) notes that only 5% of the required funds have been allocated to climate actions. As a result, the financial gap is estimated to be about 10 to 18 times greater than the current, actual needs. Finally, concerning adaptation, about 3.3 to 3.6 billion people currently live in "highly vulnerable" regions. Yet, the funds allocated to adaptation—and thus to reducing vulnerability and increasing resilience in these areas—remain fragmented and lower than those directed toward developed countries. Consequently, the lack of funding exacerbates social inequalities and forces these communities to migrate (IPCC, 2022a, p. 1199). Although 93% of the global population is aware of the existence and dangers of climate change, 55% do not trust climate actions (Edelman Trust Barometer, 2023 https://www.edelman.com/trust/2023/trust-barometer/special-report-trust-climate).

In an effort to overcome the inadequacy of climate action and to address the problems of global and intergenerational injustice, scholars and policy makers developed the concept of *sustainability*—an idea that is central to the remainder of this chapter. Although this notion did not arise directly from the challenges of climate action (indeed, it predates them), sustainability has transformed in response to the inability of mitigation, adaptation, and climate finance to deliver effective solutions; the notion of sustainability ultimately encompasses these strategies within its broader framework.

1.4 What Is Sustainability: A Minimal Definition

Considerable confusion surrounds the meaning of "sustainability" (Harrington, 2016, pp. 365–371). Given the scope of my research, delving into all the possible meanings of "sustainability" or "sustainable" is not necessary. Moreover, as I will argue throughout this thesis, sustainability, despite being a vague concept with multiple interpretations, can nonetheless be understood in a clearly and coherently way.

I begin with how the concept of sustainability was formalized in 2015, during a United Nations summit dedicated to sustainable development held in New York . This summit produced the document *Transforming Our World: The 2030 Agenda for Sustainable Development*, which contains 17 Sustainable Development Goals (SDGs;

UN, 2015, https://sdgs.un.org/2030agenda)[9]. Each SDG articulates specific targets, of which there are 169; the fight against climate change is the transversal challenge that concerns them all.

Regarding the three strategies of climate action, SDG 13 states that it is necessary to "improve […] human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning" (UN, 2015, target 13.3, https://sdgs.un.org/goals/goal13). Yet, climate finance should focus on both on the wealthier countries, which must "implement the commitment […] of mobilizing $100 billion annually" (UN, 2015, target 13.a), and on the poorer ones to "promote mechanisms for raising capacity for effective climate change-related planning and management […] including focusing on women, youth and local and marginalized communities" (UN, 2015, target 13.b).

However, beyond promoting climate action, the *2030 Agenda*'s substantial innovation is framing the fight against climate change within a broader context of social, economic, and institutional transformation. This framework calls for fairer forms of cooperation between developed and developing countries, grounded in the awareness of the inequalities caused by the climate crisis, the principle of CBDR, and the issues of global and intergenerational justice. Antonio Guterres, Secretary-General of the United Nations, says of the 17 SDGS:

> It's time to rebuild trust based on climate justice […]. It's time to accelerate the just transition to a green economy […]. Limiting the rise in global temperature to 1.5 °C is still possible […]. I think all countries are essential in these efforts, but obviously the biggest emitters are the most important […]. A climate solidarity pact in which both would decide to do more: developed countries and emerging economies […] in line with the principle of common differentiated responsibilities and national capabilities (UN, 2023 https://www.unep.org/resources/adaptation-gap-report-2023).

Developed as an evolution of the Millennium Development Goals, which were adopted in 2000 and lack any explicit reference to climate change, the SDGs propose sustainability not only to address the causes and effects of climate change but also to create a new societal model based on a new paradigm of development. While this model

[9] All subsequent individual targets mentioned in this research thesis can be located at https://sdgs.un.org/goals: first select the specific "Goal" and then click on "Target and Indicators."

is no longer grounded in the idea of infinite growth and resource exploitation, it is oriented toward ensuring human well-being while respecting the planet's ecological limits.

In the next two sections, I analyze the main features of the concept of sustainability and show how it differs from sustainable development by briefly retracing the historical evolution of the notions. Subsequently, I shift to my emphasis environmental sustainability and demonstrate how, even within the broader debate on sustainability itself, this conception proves to be the most suitable for addressing climate change's challenges and for clarifying how sustainability should be understood.

1.4.1 Sustainability and Sustainable Development

Nachhaltigkeit, the German equivalent of "sustainability," was first introduced by Hans Carl von Carlowitz in his 1732 treatise *Sylvicultura Oeconomica*, a text dedicated to forest management in Saxony. In his role as the region's forestry and mining administrator, Carlowitz reflects on using timber without excessively compromising the forest's ability to regenerate.

> This is why the greatest art/science/diligence/and organization of the local countries and organization of these lands/how to ensure such conservation and cultivation of the wood/that there is a continuous, stable and sustainable utilization/because it is an essential matter/without which the land cannot remain in its existence (p. 105, my translation).

Although this first formulation of sustainability focused specifically on forest management, it nonetheless represents a starting point for broader reflection on managing natural resources. Interestingly, people of the ancient world had demonstrated great concern for the responsible use of natural resources, something that remains evident today in how Indigenous communities live in relation to nature (Shiva, 1988, pp. 18–25). Yet only during the 20th century did the concept of sustainability officially enter intellectual discourse. Ernst Basler (1972), following a series of lectures at MIT, proposed expanding the meaning of "sustainability" so that it would be understood as a principle for preserving all environmental resources and not just timber.

About a decade later, the *Brundtland Report* offered the first institutional formulation of the concept through the idea of "sustainable development."[10] The report

[10] The document's actual title is *Our Common Future*. But it is best known by the *Brundtland Report* because the Norwegian Prime Minister, Gro Harlem Brundtland, chaired the UN World Commission on Environment and Development.

defines "sustainable development" as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" in the age of climate change (WCED, 1987, p. 16). Given this definition, respect for nature is the fundamental prerequisite for achieving sustainable development:

> The "environment" is where we all live; and "development" is what we all do in attempting to improve our lot within that abode. The two are inseparable […]. We came to see that a new development path was required, one that sustained human progress not just in a few pieces for a few years, but for the entire planet into the distant future. Thus "sustainable development" becomes a goal not just for "developing nations," but for industrial ones as well (p. 7).

The literature on sustainability and sustainable development generally treat the concepts as distinct: "Sustainability is often thought as a long-term goal (i.e. a more sustainable world), while sustainable development refers to many processes and pathways to achieve it" (UNESCO, 2015 https://www.unesco.org/en/sustainable-development/education). One might consider sustainability as the more philosophical set of ideals and principles about how things *ought* to be in relation to the challenges of climate change, while sustainable development involves translating these principles into policies, strategies, and concrete practices.

The more theoretical dimension of sustainability is a result of its proximity to environmental ethics. While maintaining practical aims connected to managing natural resources and fighting climate change, sustainability implicitly acknowledges—albeit in a not precise way—the existence of nature's moral status. SDG 15 confirms nature's moral status, as it states that humanity must "take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and […] protect and prevent the extinction of threatened species" (UN, 2015, target 15.5, https://sdgs.un.org/goals/goal15) because nature is not merely a means to human ends. At the same time, through an approach known as "pragmatic convergence," many environmental ethics—despite differing in their evaluative criteria—agree that, in the face of the climate emergency, sustainability represents the most appropriate, practical strategy. Bryan G. Norton (2005), the theorist of pragmatic convergence, writes that

> The convergence hypothesis says that, provided these antithetical theories are formulated in their most defensible form (defensible, that is, in their own lights as

> independent theories), applications of the […] theories would approve many, perhaps all, of the same sustainable policies. Differing worldviews, when stated in this oppositional way, can still converge on shared policies because advocates of the opposed positions, when faced with shared problems, will often gravitate toward solutions that make sense on non-ideological grounds. (p. 508) The sustainable development of the *Brundtland Report*, on the other hand, is more closely tied to the concrete, economic, and social challenges of climate change: "In addition to natural resources, we also need social and economic resources. Sustainability is not just environmentalism. Embedded in most definitions of sustainability we also find concerns for social equity and economic development" (University of Alberta, 2022 https://www.developmentaid.org/api/frontend/cms/file/2022/05/what-is-sustainability.pdf).

The social dimension of sustainable development refers to the "capacity of a community or society to maintain social well-being over the long term. It encompasses various aspects including social equity, community development, human rights, and social justice" (EBSCO, 2024 https://www.ebsco.com/research-starters/politics-and-government/social-sustainability). This dimension therefore concerns all actions aimed toward ensuring fair and lasting well-being, especially for people in marginalized social classes and populations who are adversely affected by climate change.

Economic sustainability—which has precursors in the works of Robert Malthus and John Stuart Mill and in reports such as *The Population Bomb* and *The Limits to Growth* (Brennan and Norva, 2024)—is instead understood as

> fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities. A return to 'business as usual' would be unwise and ultimately unsustainable, involving risks that could impose human costs and constraints on economic growth and development. It could result in increased water scarcity, resource bottlenecks, air and water pollution, climate change and biodiversity loss which would be irreversible; thus the need for strategies to achieve greener growth. (OECD, 2011, p. 9)

Although scholars debate which of the two dimensions is more important for sustainable development (Boyer et al., 2016), these two "pillars" are interconnected in the SDGs. Economic growth without social progress results in imbalance, just as social progress without economic growth risks being unsustainable over time. Their integration makes development "sustainable." SDG 8, particularly target 8.10, expresses this connection: integration is necessary to "strengthen the capacity of […] financial institutions to encourage and expand access to banking, insurance and financial services for all" (UN, 2015, target 8.10, https://sdgs.un.org/goals/goal8#targets_and_indicators).

Beginning with *2030 Agenda* and the 17 SDGs, sustainability and sustainable development were integrated into a single vision of sustainability, one that encompasses economic and social development, environmental protection, and the recognition of nature's moral status. These elements, in short, are all part of one global strategy. Nonetheless, practitioners still debate how best to reconcile the theoretical principles of sustainability—the protection and preservation of the natural environment—with the social and economic dimensions of sustainable development, how best to apply the principle of *CBDR* to Global North and Global South countries in implementing mitigation and adaptation strategies, and how best to address global and intergenerational justice.

The uncertainty generated by these debates has led to further refinements of the concept of sustainability. While these developments aim to define its essential traits better, they often complicate the notion of sustainability. Consider, for instance, the debate between *weak* and *strong* sustainability: can human-made capital (i.e., machinery, knowledge, and infrastructure) replace natural capital (i.e., the natural environment as a whole) to solve the climate crisis (weak sustainability), or are natural ecosystems irreplaceable and must instead be preserved in their integrity (strong sustainability; Ayres et al., 1998). Another debate concerns how to ensure that environmental protections and a transition toward sustainable energy sources do not result in job losses (Moellendorf, 2022). Consequently, as Arjen Wals (2010) notes, "it seems that most, if not all, contributing authors agree that we do not and cannot know what the most sustainable way of living is" (p. 144). Similarly, Helge Kminek (2020) argues that the existence of so many different approaches to sustainability has only made the notion more complicated. Nonetheless, this uncertainty extends to society at large: as reported by IPSOS (2023a, p. 8, https://www.ipsos.com/sites/default/files/ct/publication/documents/2023-07/ESG-Across-Borders_The-Cultural-Context-WEB_0.pdf), at the global level, only 24% of the

population associates the term "sustainability" with actions against climate change, only 22% with environmental protection, and only 17% with the reduction of inequalities. Therefore, among both experts and the general public, not only is it unclear what "sustainability" or "sustainable development" actually means, but these concepts are often not associated with climate change.

1.4.2 Environmental Sustainability

One possible approach to interpretating sustainability is to focus on its environmental dimension. In addition to social and economic dimensions, sustainability also includes an environmental component, which constitutes a fundamental pillar of the concept (Purvis et al., 2019). This dimension promotes an ecological relationship between humans and the natural environment. "Ecological" ought to be understood in terms of how Ernst Haeckel, the founder of ecology in 1866, used the term; the underlying idea is that nature should be understood as a set of ecosystems that continuously interact with each other (Andreozzi, 2012–2013, p. 32–33). Accordingly, each ecosystem functions as a dynamic universe, and interactions among species and organisms form an intricate system of flexible yet stable cause-effect relationships. The system can thus maintain its own balance. On this view, human beings, like all other forms of life, are not separate from or superior to the natural world but are integrated parts of a complex and unified network of relationships that connect all entities, living and non-living. Maintaining balance within and among ecosystems is essential for the well-being of all life forms, humans included. Although the destruction of a single organism, species, or ecosystem does not necessarily lead to the collapse of the entire biotic community, such loss nevertheless alters the system's biological and ecological balance. Climate change threatens this balance, as it continually threatens ecosystems' ability to sustain life and has direct consequences on the survival and well-being of human societies. The SARS-CoV-2 pandemic is a striking example of such disruption. Several scientific studies have shown that the continuous disruption of ecosystems that result from, for instance, deforestation or the trade of wild species, contributed to the evolution from SARS-CoV to SARS-CoV-2, which facilitated conditions for species spillover and its transmission to humans (Banfi, 2020 https://www.fondazioneveronesi.it/lesperto-risponde/covid-19-prevenire-nuovi-virus-e-soprattutto-una-questione-ecologica).

Given the current epistemic uncertainty among experts and the public about the meaning of "sustainability," insufficient climate action from states, and the resulting

problems of global and intergenerational justice, one of my research's objectives is to argue that a sustainability discourse that explicitly recognizes the centrality of the environmental dimension offers a better conceptual tool than do other interpretations. My goal then is not to propose a new formulation of the concept but to clarify it to better guide political actions.

At an epistemic level, reading "sustainability" from the environmental pillar helps clarify the very meaning of "sustainability" because, without this pillar, we lose the main rationale for combating climate change through a development model that not only protects natural resources but also recognizes the existence of an ecological human-nature link. Indeed, the environmental dimension is closely connected with a cultural dimension, the fourth pillar of sustainability. This dimension aims to reconceive the relationship between human reality and the natural world:

> Cultural sustainability was first mentioned in 1995, when the World Commission on Culture and Development (WCCD), building on the SD discourse, defined cultural sustainability as […] The heritage in terms of human-built objects, landscapes, and combined man and nature systems […] such as in terms of practices, representations, expressions, knowledge, skills, and instruments, and objects, artifacts and cultural spaces associated with practices, including tradition, identity, values, cultural diversity, spirituality, and esthetics. (Axelsson et al., 2013, p. 218)

A clear example of cultural sustainability is ecotourism because it conveys what cultural sustainability involves and how it connects to the environmental dimension.[11] Born as an alternative to mass tourism, ecotourism focuses on environmental protection, habitat restoration, and promoting the well-being of local communities and wildlife. Awareness of the human-nature ecological link thus motivates the experience itself, as it aims to regenerate the relationship between humans and the natural environment by promoting practices, knowledge, and lifestyles that respect the places visited (Farsani et al., 2012). SDG 11, particularly target 11.4, confirms this intention, as one of the primary aims of sustainability must be "to protect and safeguard the world's cultural and natural heritage"

[11] I experienced this type of tourism firsthand during my participation in the 2024 online conference of the Australian Association of Philosophy as part of my doctoral research (CUP: D43C22001470004). On this occasion, I visited the sacred Aboriginal site of Ayers Rock, in particular the monolith Uluru. Through guided tours, workshops, educational activities, and the active involvement of visitors, the local Aboriginal communities, together with the Australian government, promote a form of tourism that aims to restore and protect the territory by drawing directly on the Aboriginal ecological approach to nature.

(UN, 2015, target 11.4 https://lc.cx/bOXFjx).

The mobilizing impetus of environmental sustainability explains why, in addition to clarifying the meaning of sustainability (i.e., the ecological rethinking of the human-nature relationship to achieve a new development model), this dimension serves as a guiding reference for climate strategies and policies. At the international level, a sustainability perspective that is more focused on the environmental pillar can help reorient the three climate action strategies, which, in their current state, are not only inefficient but also a reason behind the general public's disillusionment about their actual effectiveness.[12]

In the case of mitigation, adopting a sustainability discourse more oriented toward the environmental dimension would help overcome the purely technocratic approach that grounds much of the current reduction and removal measures and instead promote practices capable of sequestering CO_2 that already exist in nature (i.e., nature-based solutions). For instance, urban reforestation programs concretely reduce greenhouse gas emissions through the protection and restoration of local ecosystems and strengthen the connection between the local population and the natural environment. Similarly, for adaptation measures, a reading of sustainability that centers on the environmental pillar allow one to question the limits of purely technical responses: not everything can, in fact, be "artificially recovered." Increasing resilience and reducing vulnerability must therefore build toward more balanced ecological relationships with the surrounding environment, even if climate change has damaged the environment. One example is the use of mangroves, which are primarily found in tropical and subtropical regions, to retain sediments. As such, mangroves reduce coastal erosion caused by sea-level rise and protect ecosystems. Indeed, many adaptive strategies that are based on technical-managerial approaches have proven inefficient if not counterproductive, despite massive financial investments. For instance, Dubai's cloud-seeding interventions to combat drought have mostly produced intense and sudden storms, that themselves have devastating effects (Lewis, 2021).

A sustainability perspective in climate finance that focuses on the environmental dimension contrasts with the dominant, green growth approach, in which the mobilization of green capital occurs solely as a function of economic growth. This inadequacy is not the result of limited investments but, as highlighted by the Scientific Committee Report

[12] I obtained the following information on how a more environmentally focused reading of sustainability can influence climate action in mitigation, adaptation, and climate finance, through my participation in the *Power Up!* project (see note 3).

of the European Environment Agency, represents a persistent failure to address the systemic drivers of unsustainability, such as resource overuse and economic dependence on continuous growth (EEA, 2020, https://www.eea.europa.eu/en/analysis/publications/soer-2020-executive-summary/italian-pdf-l-ambiente-in-europa-stato-e-prospettive-2020/@@download/file).

For instance, the EU Green Deal and similar initiatives tend to focus exclusively on "green growth" and achieving "climate neutrality." While these practices are positive in themselves, they do not genuinely challenge the production and consumption models that dominated so far or the type of human-nature relationship that sustain them (EEA, 2020).

The paradigm shift that environmental sustainability proposes, however, does not concern only climate actions, as justice and differentiated responsibilities that the Global North and South have are also considered: "an understanding is still lacking in terms of how justice considerations and environmental stability goals can be jointly delivered through effective policy interventions" (EEA, 2024 https://www.eea.europa.eu/publications/delivering-justice-in-sustainability-transitions).[13]

Given the principle of CBDR, a sustainability discourse oriented toward the environmental dimension could help mitigate global injustice related to climate change. While the difficulties of CBDR stem from differing responsibilities related to historical causes of climate change, an approach that places the environmental dimension at the center involves, as a prerequisite, identifying the communities most vulnerable to the impacts of climate change, which would allow for better targeted interventions. Moreover, only action that focuses on the ecological dimension can truly address the climate crisis's economic and social problems, which will inevitably continue to worsen until the environmental issues are addressed. In summary: to tackle the challenges of CBDR and the economic and social inequalities of the climate crisis, we must start from the environmental substrate that underpins these inequalities. Only by acknowledging this connection can we effectively reduce the global injustices that stem from denying the interlinkages between the environmental, social, and economic dimensions.

Adopting environmental sustainability would ensure that we can preserve present and future generations' living conditions. Indeed, an approach based on the environment,

[13] To my knowledge, no one else has produced systematic studies about recognizing the centrality of the environmental dimension of sustainability to address the issues of CBDR, global injustice, and intergenerational equity. Therefore, my thesis offers my own proposal, one that draws on recognizing these three dimensions of sustainability (Purvis et al., 2019), the idea of strong sustainability (Ayres et al., 1998), and the various ways in which the 17 SDGs can be implemented (UN, 2015: https://sdgs.un.org/2030agenda).

particularly in restoring an ecological relationship with nature, presupposes that we protect and preserve natural resources—indispensable elements for ensuring quality of life equity among generations.

Finally, given the close connection between the environmental and cultural dimension, focusing on environmental sustainability would reorient domestic policies toward local communities. Protecting territorial specificities and understanding the ecological relationship between populations and their surrounding environment are, in fact, distinctive features of this approach. As a result, achieving sustainability would involve more active participation from civil society: an indispensable condition for overcoming the widespread distrust about climate actions and for restoring a shared understanding of sustainability. Relatedly, the European Environment Agency specifies that

> the effective governance of transitions requires participatory processes that enable a diverse set of stakeholders to identify shared visions and goals, and credible pathways to reach them. Prerequisites include democratising access to environmental information, increasing public participation in decision-making and providing access to justice in environmental matters. (EEA, 2024 https://www.eea.europa.eu/publications/delivering-justice-in-sustainability-transitions)

In conclusion, the thesis advocates for a different conception of sustainability, one that places its environmental pillar at the center. This approach aims to improve climate action and to make the notion of sustainability more operational and clearer. As shown in Figure 3, which references the 17 SDGs, the environmental dimension constitutes the necessary foundation for achieving sustainability's social and economic dimensions. Thus, the environmental approach I propose appears to be sustainability best suited for realizing truly sustainable development.

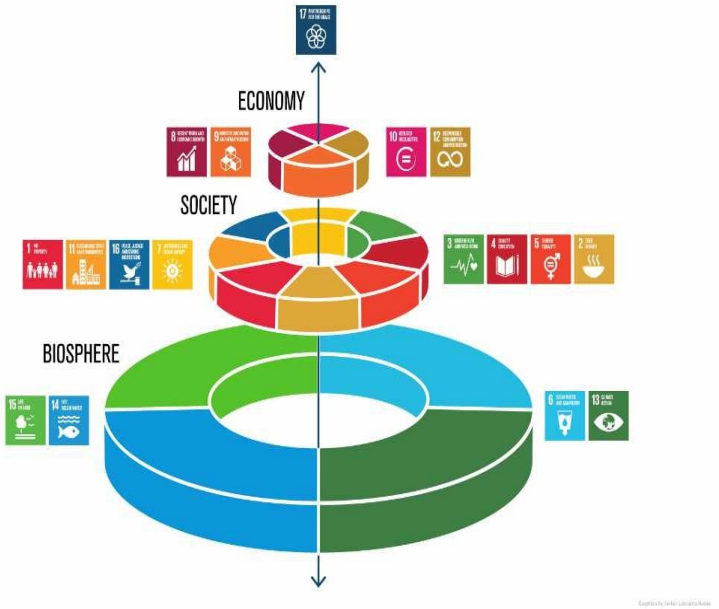

Figure 3. *Credit: Azote for Stockholm Resilience Centre, Stockholm University CC BY-ND 3.0. (https://www.stockholmresilience.org/research/research-news/2016-06-14-the-sdgs-wedding-cake.html).*

So far, I have shown how this notion, particularly its environmental dimension**,** might better guide international and local policies and strategies, given the current alarming data on climate change and sustainability itself. However, clarifying which actors are capable of concretely applying this concept is also important.

Chapter 2. The Actors of Sustainability

2.1 The Climate Challenge between Individuals and Collective Entities

The difficulties—in reaching an effective, shared, and binding agreement on climate actions and the implementation of sustainability principles, particularly for environmental sustainability, and, more generally, agreement about a set of common actions—the various parties have so far encountered in their negotiations raise a question: who are the responsible actors? Here I mean "responsible" in both a practical and ethical sense. As Gardiner (2006) clarifies, climate change is a problem that raises moral considerations:

> It embodies a recognition that there are international norms of ethics and responsibility and reinforces the idea that international cooperation on issues involving such norms is both possible and necessary. Hence, it may encourage

> attention to other moral defects of the current global system, such as global poverty, human rights violations and so on. (p. 302)

However, given the difficulties between the countries in the Global North and South, one might think that individuals could provide a solution and that ascribing so much responsibility to states is misguided. Yet, among individuals, the situation is discouraging.

According to an IPSOS (2023b https://www.ipsos.com/en/36-percent-worlds-population-still-dispute-human-origins-climate-change?utm) survey, about one-third (36%) of the world's population doubts the anthropogenic origin of global warming. A recent survey of the US population shows that 28%—a slightly lower percentage than the global average—deny the human cause of climate change, while 18% question its very existence (Leiserowitz et al., 2023, pp. 9–10). These percentages are very high, given that scientists almost unanimously agree on the anthropogenic origin of climate change (see section 1.1). In fact, only one in five Americans is aware of this near-total consensus (Pongiglione, 2025, p. 81).

The misperceptions, however, also concern the effects of climate change: despite recent heat waves and increasingly frequent and latitudinally unusual hurricanes, droughts, and floods that affect the U.S., 55% of its population does not attribute these events to global warming; only 47% believe that these events will have future repercussions on their own lives (Leiserowitz et al., 2023, p. 11). At a global level, the data appear somewhat more reassuring: 80% of the population is strongly convinced that extreme weather events are attributable to climate change, and 43% are certain of it (IPSOS, 2023b https://www.ipsos.com/en/36-percent-worlds-population-still-dispute-human-origins-climate-change?utm). Nonetheless, 20% of the world's population remains skeptical—a very high percentage.

Doubts, moreover, concern not only the causes and consequences of climate change but also possible actions and strategies that would counter it (Pongiglione, 2025, p. 82). According to a recent European survey, climate change is perceived as one of the most serious challenges that face humanity, and this awareness corresponds to widespread participation in possible solutions. Nine out of ten Europeans, in fact, declare that they have adopted at least one behavior intended to contribute to mitigation efforts. However, 70% of respondents cite recycling as their main action; the second-most cited action is reducing the use of disposable materials (European Commission, 2023 https://europa.eu/eurobarometer/surveys/detail/2954). These are undoubtedly positive

practices, but they have only a marginal impact on the reduction or removal of greenhouse gases. Therefore, in addition to doubts about what sustainability actually is (see section 1.4.1), confusion extends to determining what counts as mitigation and adaptation practices, the nature of climate finance, and the challenges countries in the Global North and South face in engaging in these practices.

Thus, from the data, a significant, epistemic gap emerges between the scientific community and the general public regarding information about climate change (e.g., its existence, its anthropogenic origin, its consequences) and possible solutions to the problem. This latter gap also affects those who are aware of the characteristics of the phenomenon and the risks it entails but do not know how to implement effective actions to counter it. Consequently, many scholars question whether individuals are (or can be considered) blameworthy for their ignorance and whether, instead, individuals can be ascribed as being ignorant. On the one hand, some doubts are justifiable given the complexity of the issue; on the other, climate change is so widespread an issue, one that affects us so closely and whose main information is so easily accessible, that one can naturally ask whether and to what extent such ignorance can be excused.

The main findings on climate change have been public knowledge since the 1990s, and great effort has been made to make this information comprehensible and available to everyone with only minimal research. Accordingly, Steve Vanderheiden (2007) has argued that, following the publication of the IPCC reports, ignorance about global warming is no longer justified and must be regarded as voluntary and, therefore, as culpable ignorance. Similarly, Elizabeth Cripps (2013) has noted that, given the presence of the internet and the ease of accessing information on climate change, we should expect that all those who benefit from mass media are aware of the scientific consensus on the issue. Scholars argue similarly about ignorance of solutions: *The 2030 Agenda for Sustainable Development*, with its 17 SDGs, has been publicly available since 2015 and was designed to be accessible to citizens. Anna Hartford (2019) has argued that individuals who are ignorant of these issues are culpable because, in her view, the duty to be informed extends to all information that is available and easily accessible—as is the case for core knowledge about climate change and sustainability. Moreover, justifying complete indifference toward this problem, especially given the harm and suffering it causes to human beings and ecosystems, is generally difficult (Rosen, 2004). However, as Daniel Dennett (1986) reminds us, the mere presence of information—even if abundant and easily accessible—is not necessarily a guarantee of greater understanding. On the

contrary, the overabundance of news about climate change, together with the many other global problems individuals face daily, complicates the situation and may make understanding the issues at stake more difficult. Thus, numerous entities—international organizations such as UNESCO and NGOs, educational institutions such schools and universities, government agencies, and local administrations and civic movements—are actively engaged in awareness campaigns about climate change and sustainable solutions.

Scholars remain divided about defining the conditions under which individuals are blameworthy for their ignorance of the climate crisis, climate actions, and sustainability. Indeed, people can arrive at wrong conclusions—even with the best intentions—for reasons that may be external or internal to them and for those that they may or may not be aware of. Moreover, this debate presupposes a fundamental assumption that must itself be justified: that there exist epistemic and moral duties to be informed about the facts, causes, and possible solutions to the problem. And if we assume that individuals ought to know information, we do so because we expect them to act on the basis of their obligations. Yet, this leap—from a purely epistemic and moral understanding of the phenomenon and its solutions to a practical one—must be motivated. Additionally, what is the criterion for determining what information about climate change and sustainability individuals are expected to know to not be blameworthy? Furthermore, one's possessing a correct knowledge of empirical facts or moral norms does not necessarily guarantee that one behaves appropriately. Finally, it is unclear which specific actions—individual or collective—an individual ought to perform.[14]

This thesis addresses neither individuals' epistemic and moral duties nor the relevant actions they ought to perform in response to the ecological-environmental crisis. Following Cripps (2013) theoretical framework, I instead argue for the existence of collective duties ("weakly collective duty") or duties borne by collective entities ("strongly collective duty"). Neither type falls upon specific individuals.[15] Cripps writes that

> by a "weakly collective duty" I mean a duty requiring a set of individuals which is not yet a collective agent in any strong sense to bring about some result between them, by organizing themselves, as necessary, to be capable of collective action. This can be distinguished from the strongly collective duty of a collective entity

[14] For a comprehensive discussion on all these topics, see Pongiglione (2025, pp. 55–144).
[15] For further discussion of those who more or less agree with this theoretical position, see Sinnott-Armstrong (2005) and Johnson (2003).

already capable of intentional action. (p. 60)

Cripps's conviction is that, in the case of climate change, the actions of a single individual—for example, in terms of consumption or emissions—make no difference. The individual's contribution to climate change is, in other words, causally insignificant. Consequently, individual actions aimed at solving its problems will also be insignificant not because we ought to reject the idea that individuals have duties to learn, inform, or act but because, in the absence of coordination, such duties are not actually useful in addressing the climate crisis (Fragnière, 2016). In other words, because of many other facts, climate change would occur despite an individuals' sacrifices or actions (Cripps, 2013; Sandberg, 2011; Sinnott-Armstrong, 2005). Once we set aside an individual's responsibilities or duties to climate change, we can begin to explore how groups of individuals and collective entities can fulfill their collective duties to climate change and sustainability—particularly, their duties to environmental sustainability. The following sections define what these collective duties are and identify groups of individuals' and collective entities' capacities and limits in implementing responses to climate change.

2.1.1 Collective Duties

Defining collective duties in relation to the challenges of climate change and sustainability is not an easy task. This difficulty is not because collective duties are less clear or concrete than are individual duties to reduce global emissions—for example, to limit one's unnecessary use of cars or airplanes, to reduce one's consumption of red meat, or to prioritize buying local products. The difficulty lies in that the various Parties lack a collective pact or agreement that clearly defines collective duties and distributes them among actors. Indeed, even the annually renewed agreements of the COPs, including the 2015 Paris Agreement, are not legally binding or genuinely shared by all countries. Consequently, no coercive or sanctioning mechanics prevent a Party's failure to meet their commitments. Such conferences often end with disappointing results and widespread dissatisfaction, especially among the most vulnerable nations of the Global South, who call for greater seriousness and tangible measures. The latest COP 29, held in Baku, ended in disappointment. In addition to ambiguity about the gradual phase-out of fossil fuels, representatives from countries in the Global South were dissatisfied with the lack of responsibility from wealthier nations (UN, 2024a https://news.un.org/en/story/2024/11/1157276). We therefore find ourselves in a situation in which we have rejected individual duties but have not offered a clear proposal

about collective duties.

Since climate change is a *perfect moral storm*, with all its implications for CBDR, the inequalities between the Global North and South, and between present and future generations (see sections 1.2.1 and 1.3.1), the only collective duty that seems meaningful is to exert pressure on the various Parties so that they reach a common and shared agreement. In the absence of such an agreement, the remaining duty is to engage the challenge collectively. However, this duty cannot be carried out individually: the necessary type of pressure can only be exercised collectively, as the goal is for Parties and other collective agents to develop a shared framework for regulating climate actions and sustainability. Moreover, in the absence of such an agreement, collective engagement is the only way that we can address climate change and develop a sustainable future. Of course, the contributions of individuals are not irrelevant: they remain necessary but gain effectiveness only when they are part of a collective effort. Given this position, which has been widely debated (Pongiglione, 2025, p. 121–144), the only possible direct duties of individuals are those that promote collective duties.

> Promotional duties are duties to try to bring about effective collective action, not simply by getting one's government to do "its job," but if necessary via the establishment of international institutions or agreements, or by collective action which bypasses such institutions altogether. Climate change may not be "my" fault, but it is […] "ours." And it is certainly our problem. Direct duties are defended as supplementary: when it is impossible or unfeasibly costly successfully to promote collective action, or if they are one way of fulfilling promotional duties. (Cripps, 2013, p. 23)

A paradigmatic example of such duties are the actions of Greta Thunberg. Through her individual commitment, in 2018, Thunberg inspired a collective movement, *Fridays for Future* (FFF) that exerted pressure on institutional arenas around the world from the COPs to the United Nations; the movement also raised global awareness about the importance of climate change and sustainability. In general, this kind of collective effort may take many forms: from disseminating scientific findings to hosting educational programs in schools and extracurricular institutions; from participating in COPs as members of associations to joining NGOs or political parties that address climate issues; from taking part in environmental movements to writing in blogs and newspapers to spread awareness about climate change and the need for a global climate agreement.

Some scholars, such as Cripps (2013, p. 3), go even further and call on specific categories of individuals—those she considers best suited—"The Young" (i.e., younger generations), "The Able" (i.e. those who have greater economic means), and "The Polluters" (i.e., those who have contributed most to pollution and the emissions of greenhouse gas)—to organize themselves into collective groups to combat climate change. This, *in concrete terms*, means acting together on climate and sustainable development.

Within this perspective, there remains a wide range of ways of conceptualizing collective duties, in part because of the absence of a common rule to adhere to—which, at present, represents the only true objective. Thus, such a position has its evident theoretical limits. First, most of its proponents' proposals for collective action are only possible within democratic forms of government (Pongiglione, 2025, p. 116). For instance, the FFF strikes and protests are possible only within a democratic context in which public demonstrations and civil pressure is protected and guaranteed. In authoritarian regimes, or those less open to public participation, this form of activism would be severely limited or even impossible. Second, individuals, by fulfilling their collective duties, might feel individually exempt from responsibility in their private lives (Lichtenberg, 2010). Moreover, whether some set of collective duties is superior to others is unclear; more generally, it is unclear whether any hierarchy among them can exist. Some scholars, such as Kok-Chor Tan (2015, p. 145–146), argue that indeterminacy is a strength of collective duties, as it compels continuous reflection and the possible elaboration of new duties. Thus, the strongest supporters of collective duties claim that such duties may be far more difficult to fulfill than individual ones (Cripps, 2013; Gardiner, 2011).

Yet, another major, underlying problem is that collective duties are not necessarily effective. For example, the numerous FFF demonstrations neither led to a signed, collective convention among the various Parties nor significantly improved public awareness about the climate crisis and sustainability (respectively, see sections 2.1 and 1.4.1). Thus, it is unclear why collective duties should have greater moral weight than individual ones if they are just as ineffective (Fragnière, 2016).

However, to claim that collective duties are more useful than individual ones does not delegitimize, from a moral or epistemic standpoint, individuals' efforts. Rather, given the two options, pursuing common, shared actions in the fight against climate change is more reasonable than focusing on one's individual efforts. Instead, the purposes of this

thesis, I identify the main agents and collective entities capable of realizing these duties. Not all collectives are the same; their differences determine their varying capacities to fulfill collective duties. For instance, Michael E. Bratman (2023), a scholar of collective groups, has written that

> there is small-scale social organization, when several individuals act together in shared intentional/shared cooperative ways. Think about a string quartet, or painting a house together, or having a conversation together. And there are larger-scale organized institutions such as a neighborhood association, a club, a religious congregation, a small business, a professional association, a city council, a college or university, a non-profit organization, a limited liability corporation, a political party, a legal system, or a democratic state. (p. xv)

The former—the *small-scale social organizations*—correspond to Cripps's (2003) "weakly collective duties," while the latter—the larger-scale organized institutions—correspond to "strongly collective duties." I now turn to clarifying weakly and strongly collective duties, which collective entities belong to each category, and, above all, the different types of action possible within this shared endeavor.

2.1.2 Groups and Collective Entities in Climate Change

Beginning with weakly collective duties, these belong to those

> sets of individuals as not yet organized collectivities or potential collectivities […]. These duties require them to organize as necessary to respond collectively to collective problems. (It is worth stressing that the "weakly" qualifies the sense in which the harm is collective, not its force as a moral duty). (Cripps, 2013, p. 3)

In terms of climate change and sustainability, such sets of individuals are those who, while not yet forming a structured collective subject, have the moral responsibility to organize themselves to jointly address the consequences of the climate crisis and propose solutions. Given the nature of the problem, sustainable solutions cannot be simply imposed from above; rather, as explicitly emphasized in SDG 11, the active involvement of groups of people in different contexts is necessary (UN, 2015, target 11 https://sdgs.un.org/goals/goal11#targets_and_indicators).

For instance, the collective duty of residents of an urban neighborhood exposed

to air pollution or heatwaves might consist in organizing themselves to demand the local administration expand urban green spaces or strengthen public transport. Alternatively, residents of a rural area undergoing desertification or biodiversity loss can commit themselves to promoting more sustainable agricultural practices or to encouraging measures that would protect natural resources. Or, again, consumers might have a duty to establish a *Gruppo di Acquisto Solidale* (i.e., solidarity purchasing group) to favor local production over environmentally harmful commercial channels. Since they are not yet structured and therefore not "capable of intentional action" (Cripps, 2013, p. 60), the collective duty of such groups lies precisely in constituting themselves as organized entities to gradually expand their capacity for action. In contrast to collective groups, collective entities are already-formed subjects, who do not need to organize themselves to act collectively. Consequently, weakly collective duties are those of groups in the process of collective organization, while strongly collective duties belong to subjects already capable of coordinated action, as these entities possess an internal structure. As Cripps makes clear, collective entities are not morally more responsible than are groups of individuals; instead, they certainly have a greater capacity for action.

I divide various collective entities into three main categories on the basis of their functions. Although they all are structured, the entities differ according to the type of intervention they can implement. Consequently, their collective duties related to climate change and sustainability take very different forms. Nonetheless, in some cases, a single entity may have more than one function, or, in general, they may mutually influence one another. [16] The three categories are:

1. Collective entities with epistemic capacity (i.e., actors capable of producing knowledge and scientific data on climate change and sustainability). This category includes scientific institutions such as the IPCC, NASA, universities, and research centers.
2. Collective entities with political, economic, and regulatory capacity (i.e., actors capable of concretely influencing global climate governance through legislative decisions, investments, or regulations, particularly in shaping mitigation and adaptation strategies, promoting sustainable practices, and directing climate

[16] An institution such as a university is capable of performing both an epistemic function and an educational/communicative function. Similarly, NGOs can act through communication and education and through concrete actions. For the purposes of the thesis, the three capacities described here should not be understood rigidly. Instead, they indicate the primary function of the various collective entities, which does not exclude the possibility of having the other functions.

finance). Collective entities within include nation-states, particularly through ministries dedicated to environmental and climate policies (e.g., Italy's Ministry for Ecological Transition the US EPA) or those indirectly influenced by these ministries (e.g., the Ministry of Agriculture or Transport); supranational institutions, such as the European Union, World Bank, and United Nations; green political parties, such as the Greens in Europe, who influence political and legislative agendas on environmental matters; multinational corporations, such as Microsoft, which has committed to achieving carbon neutrality (UN, 2023 https://unfccc.int/climate-action/un-global-climate-action-awards/climate-neutral-now/microsoft-carbon-negative-goal); and the financial sector, which includes investment funds, rating agencies, and consulting firms, all of which increasingly integrate ESG criteria into their operations (as evidenced, for instance, by the annual sustainability reports published by KPMG, 2024 https://kpmg.com/it/it/insights/2024/12/survey-sustainability-reporting-2024.html, and Deloitte, 2025 https://www.deloitte.com/global/en/about/people/social-responsibility/globally-consistent-esg-reporting.html).

3. Collective entities with communicative and educational capacity that raise awareness, disseminate information publicly, and mobilize social groups. Examples include: environmental NGOs, such as Greenpeace and WWF, which aim to inform the public about how climate change damages flora and fauna and to influence political decisions in favor of sustainability; environmental movements, such as FFF and Extinction Rebellion, that act through protests, strikes, and social campaigns to demand stronger climate policies; media outlets and digital platforms, which—through documentaries (such as *There Is No Planet B*), information portals (such as *Carbon Brief*), or journalistic initiatives (beginning in 2019, *The Guardian* has published a section dedicated to climate change and sustainability (Carrington, 2019))—help spread environmental awareness among the general public; and finally, schools and universities, which educating new generations by including environmental education in their curricula (UN, 2024b https://www.unesco.org/reports/gem-report/en/2024).

Providing this overview—albeit an approximate one—of collective actors' different functions is a necessary step in outlining the possible actions (i.e., the weakly

and strongly collective duties), related to the shared challenge of addressing climate change and achieving sustainability. In particular, the thesis centers the most promising approach—environmental sustainability—because this perspective offers greater practical and epistemic operability. So far, however, the overview is descriptive: it has merely presented the main collective actors. The problem of misalignment among these groups—structured or not—remains, as they act in fragmented and uncoordinated ways. This misalignment stems from the same difficulty that characterizes collective duties about climate policies: that the various Parties and actors lack an effective, shared, and binding agreement—one capable of defining common goals, duties, and responsibilities of the different agents. In other words, we are missing a general framework that can guide the fight against climate change. In the absence of such an instrument, resolving the problems of climate justice between the Global North and South, the challenges related to the CBDR principle, and intergenerational injustice will remain unimaginable. Thus, we ought to ask which collective entity could—and should—take on a decision-making and regulatory role to guide and coordinate other actors' actions.

2.2 States, Institutions, and Climate Governance

Among the various collective entities, nation-states and supranational institutions stand out for their regulatory function. Only these actors are capable of receiving and transforming the scientific information (produced by collective entities with epistemic functions) into concrete actions. As Vanderheiden (2015, p. 306) notes, "given their power to affect domestic greenhouse pollution as well as their command of scientific expertise in the service of environmental protection." In this regard, states and supranational institutions actively engage with the IPCC's various *Summary for Policymakers*, which provides them with a concise yet comprehensive overview of the relevant scientific evidence about the climate crisis. Such entities therefore play a central role in guiding the actions of all others—both those with communicative and educational capacity and those with direct intervention capacity—because of their decision-making and operational authority. In other words, states and supranational institutions are the only actors capable of coherently articulating, among the different agents, both knowledge and concrete action. On the one hand, they can interpret and disseminate epistemic content related to climate change and sustainable development; on the other, they can translate it into normative and practical instruments.

Consider some concrete examples that help clarify supranational institutions and

nation-states' role in guiding and coordinating other collective groups' actions in addressing climate change. An UNFCCC body, such as the COPs, enables climate negotiations so that state and non-state actors can negotiate, identify shared objectives, and monitor any progress in combating climate change or promoting sustainable development. Within a European context, the European Union performs a similar function through instruments, such as the Green Deal, the Climate Law, and the Emission Trading System, all of which were developed to articulate common policies among Member States.[17] Similar reasoning applies, on a national and regional scale, to nation-states. Since *COP 21,* in Paris, all states (the Parties) are required to report every five years on their Nationally Determined Contributions (NDCs), their practical and awareness-raising efforts.[18] Their greater operational capacity (both epistemic and practical) is a result of their privileged position as interlocutors within the COPs or within other supranational institutions, such as the UN, EU, WTO, and FAO. Nonetheless, it is up to each state to implement and adapt climate policies across different territories. For instance, in an Italian context, the *Lombardia 2030* project (https://www.openinnovation.regione.lombardia.it/it/iniziative/lombardia-2030) gathers and coordinates local initiatives in Lombardia oriented toward sustainability.[19] This project demonstrates how national governments—through regions or local administrations—can translate their international commitments into concrete, local actions, both in practical terms and through participation and awareness-raising activities within local communities.

The greater operational and decision-making capacity of nation-states and supranational institutions also depends on their structure. Unlike collective groups—*small-scale social organizations*—and other collective entities, states and supranational institutions are the only *larger-scale organized institutions* whose objectives, for which they were created, transcend the wills of the individual members that compose them. Contrary to some scholars (Bell, 2011; Caney, 2010), who argue that collective entities are merely the sum of the individual intentions of their members, the thesis argues that States and supranational institutions are ontologically irreducible to their internal members (Gilbert, 1990; Pettit, 2003), their ability to adopt what Bratman (2023, p. 115) calls "social procedural rules," those "common operational rules" that govern the decision-making process within such entities and that regulate its members' relationships

[17] I became aware of these organizations through my collaboration with the Italian Climate Network (ICN), see note 7.
[18] To clarify: since the Paris Agreement, states are legally required to communicate their NDCs, but there is no sanctioning for failing to meet these commitments. The idea, therefore, is to encourage and promote climate action and sustainable development.
[19] I became aware of this project through my collaboration with the Italian Climate Network (ICN), see note 7.

and the criteria for making decisions, assigning tasks, and addressing internal difficulties (Pennacchioni, 2025). In other words, these rules govern the behavior of all those who constitute the states and supranational institutions by providing a stable framework that, although modifiable, cannot be ignored. For example, an institution like UNESCO, which has included environmental education among its procedural social rules since the 1970s, cannot disregard this commitment without completely compromising its identity.

In all other collective entities, however, "individual intentions (beliefs) […] follow the formation of group intention […], since the group can only act through the actions of its members" (Bratman, 2023, p. 140). Consider again the FFF activist group. From the very moment members join the movement, they accept participating in or organizing climate demonstrations every Friday to demonstrate their dedication to the cause and to push governments and institutions to adopt sustainable measures. The actions of FFF are thus the direct expression of the "will, […] activity, [… and] responsibility [of all members]" (Collingwood, 1947, p. 150). Under different conditions, a company's decision to adopt a specific, internal green policy—for instance, achieving climate neutrality—rests with the management team; employees can only accept and conform to it in their daily tasks. What unites these two examples is that both collective entities operate as an "extension" (Bratman, 2023, p. 140) of a unified will—either the management's or the members'—who may even constitute the entirety of the organization. Such entities are, consequently, extremely fragile: if all members or those with decision-making power change their intentions, the entity's purpose or *raison d'être* may be completely undermined.

By contrast, nation-states and supranational institutions are "rule-guided and rule-governed" (Bratman, 2023, p. xix); their internal structure "involve[s] hierarchy and differentiated roles, offices, and subactivities" (p. xviii), which enables "crystallized outputs [rules] that shape downstream thought and action" (p. 135). UNESCO, for instance, can deliver environmental education even if many of its internal members do not share education principles because "even when […] outputs are action focused, they need not directly correspond to shared intentions on the part of all participants in the involved social rules" (p. 135), insofar as its purpose surpasses the individual wills of its members. Thus, such entities are "robust in the face of certain changes—actual or counterfactual—of individual participants" (p. 172) and can maintain continuity with preexisting social rules or alternative implementation methods that may emerge over time (p. xviii). For a nation-state, this means that, even if its ruling class or government were,

for a certain period, inattentive to promoting environmental sustainability—focusing perhaps only on economic sustainability or focusing on technological innovations—the State, in its educational role in schools or universities, could still carry out a proper environmental education program, one in which the protection of the natural environment and biodiversity remains central to sustainable development. All these characteristics make such entities the most stable (p. 176) and therefore, from an operational and decision-making perspective, endowed with greater agency to address climate issues.

I now turn to consider the notion of agency and examine in greater detail States' and supranational institutions' epistemic and practical agency regarding climate action and environmental sustainability. States and institutions are indeed the only entities capable of exercising the relevant agency because of their regulatory/legislative function, epistemic position, internal structure.

2.3 What Agency Is

Providing a clear definition of "agency" is challenging because the concept "has a long history in philosophy and it can be traced back to Hume and Aristotle, among other historical figures" (Markus, 2019 https://plato.stanford.edu/entries/agency/). To date, many philosophers have offered interpretations of this notion.[20] These interpretations are often characterized by an "elusive, albeit resonant, vagueness" (Emirbayer and Mische, 1998, p. 962).

> "Theorists of practice" such as Pierre Bourdieu and Anthony Giddens, for example, have given selective attention to the role of habitus and routinized practices; their perspective (perhaps the dominant one in contemporary American sociology) sees human agency as habitual, repetitive, and taken for granted—[…]. Alternative approaches have similarly relied upon one-sided conceptions of agency; for example, traditions as different from one another as rational choice theory and phenomenology have stressed goal seeking and purposivity, while theories of publicity and communication, as well as certain feminist theories, have over emphasized deliberation and judgment. [These different types of agency:] routine, purpose and judgment all constitute important dimensions […], none by

[20] The most common interpretations are intentional agency, which focuses on actions guided by intentions and mental states; agency as the capacity to initiate action; and distinctly human forms of agency, related to reflecting on one's own desires. Additionally, many ways of thinking about agency are detached from the idea of intention; these include minimal or embodied agency, as well as mental, epistemic, shared, collective, relational, and artificial agency (Markus, 2019).

> itself captures its full complexity. Moreover, when one or another is conflated with agency itself, we lose a sense the dynamic interplay among these dimensions. (p. 963)

Following Cripps's (2013) theoretical framework, I focus on collective agency. Unlike *shared agency*, which occurs when two or more individuals (i.e., collective groups) do something together in a coordinated way, *collective agency* occurs when individuals act as an already structured group and follow the groups' principles, rules, and procedures (Markus, 2019). In particular, the thesis appeals to Mustafa Emirbayer and Ann Mische's (1998) notion of collective agency. Unlike other formulations, their interpretation recognizes agency's dynamic nature and temporal situatedness:

> agency [is] a temporally embedded process of social engagement, informed by the past (in its habitual aspect), but also oriented toward the future (as a capacity to imagine alternative possibilities) and toward the present (as a capacity to contextualize past habits and future projects within the contingencies of the moment. [It is] the temporally constructed engagement by actors of different structural environments […] which, through the interplay of habit, imagination, and judgment, both reproduces and transforms those structures in interactive response to the problem posed by changing historical situations. (pp. 963–970)

Emirbayer and Mische insist, on the basis of their reading of agency's historical-philosophical development, is that the essential aspect of agency lies in its temporal situatedness: "complex temporal dynamic" (p. 964). Consequently, agency is a "historically variable phenomenon, embedded in changing theoretical and practical conceptions of time and action" (p. 973). Their view proves particularly appropriate for understanding how the actions of States and institutions guide responses to climate change and sustainability, as it allows us to understand how these actors are embedded in historical time and adapt to evolving environmental, social, and economic challenges and difficulties.

Indeed, it seems the fundamental characteristic of the climate problem is its temporal dimension. As scholars have shown, this phenomenon must be understood in terms of its past and future implications, how the present is a crossroads between what has been and what will be, and how every decision carries significant weight for the climate, society, and the environment. In the words of Dale Jamieson (2014): "Another

feature of climate change that makes it difficult for us to respond is that its causes and effects are […] temporally unbounded" (p. 102). Moreover,

> the problem is that we cannot see all the effects of our emissions because they are so dissociated (temporally and otherwise) from their causes. Not only does this make it difficult for us to know whether we are in a climate emergency, but it leads to a further problem. By the time we might come to an agreement that we are in a climate emergency, there may be little to do but watch it unfold. Or perhaps at that stage the appropriate response would be attempts at radical adaptation and survival rather than trying to exert control over climate. (p. 222)

Likewise, Paul Crutzen (2002), who together with biologist Eugene Stoermer coined the term "Anthropocene" to describe the current geological epoch[21], has used the expression "terra incognita" (p. 23) to indicate humans' condition in the age of climate change, an age in which past and present choices profoundly shape the future, often in unexpected ways: "the climate crisis is not a sheer and occasional incident, but rather a radically different new form of reality characterized by deep existential risk and [temporal] uncertainty" (Fulvi and Wodak, 2023, p. 12–13). Indeed, a focus on temporality is also central to sustainability, given that involves a commitment to shape a society that has stable and equitable social, economic, an environmental living conditions socially for present and future generations (Brundtland 1987; Purvis et al., 2019). The IPCC's Shared Socioeconomic Pathways (SSPs) are emblematic of the centrality of temporality in climate solutions. These scenarios illustrate how past choices and present possibilities lead to very different climate futures (IPCC, 2022a, p. 298; Pongiglione, 2025, p. 33–36). In addition to describing climate change, scientific institutions present it as an open-ended process, one in which temporality is fundamental for developing adequate responses. Consequently, any form of agency that can achieve sustainable development must necessarily consider the temporal dimension of climate change.

> Damages can display many different temporal patterns. For example, they can crescendo much like a musical piece, or they can erupt suddenly far in the future. Damages can be exported to the further future, largely bypassing the two or three generations that present people care most about. (Jamieson, 2014, p. 165)

[21] For a detailed discussion on the debate regarding the starting point of this new geological epoch, see Cera (2023).

Thus, recognizing the greater epistemic and practical capacity of States and supranational institutions is necessary for understanding how these collective entities exercise their agency with respect to climate change. The goal is to determine whether they are indeed "capable (at least in principle) of critically evaluating and reconstructing […] these contexts" (Emirbayer and Mische, 1988, p. 964) and how they can develop three qualities: "iteration, projectivity, and practical evaluation" (p. 970).

The first aspect—the iterational element—is "the selective reactivation by actors of past patterns of thought and action, as routinely incorporated in practical activity, thereby giving stability and order to social universe and helping to sustain identities, interactions, and institutions over time" (1988, p. 971). The second—the projective element—"encompasses the imaginative generation by actors of possible future trajectories of action, in which received structures of thought and action may be creatively reconfigured in relation to actors' hopes, fears, and desires for the future" (Ibidem). Finally, the practical-evaluative element "entails the capacity of actors to make practical and normative judgments among alternative possible trajectories of action, in response to the emerging demands, dilemmas, and ambiguities of presently evolving situations" (p. 971).

In summary, Emirbayer and Mische outline three characteristics of collective agency—iteration (past), projectivity (future), and practical evaluation (present). These characteristics point to an agent's capacity to orient social action over time, draw on established patterns while also projecting scenarios and possibilities not yet present, and critically evaluate the possible choices. This capacity to orient over time social action about climate change, which only States and supranatural institutions possess, is exercised through practical and epistemic actions toward the other involved collective actors. The next two sections further explore what this capacity concretely entails.

2.3.1 The Epistemic Agency of States and Institutions

Vanderheiden (2015) argues that, "in the case of climate change, […] states [and supranational institutions] face a much higher threshold of expected information processing before they can validly claim to have been reasonably ignorant about their contributions toward climate-related harm" (p. 306). In other words, while some cases of ignorance or lack of clarity by other organizations or groups may be excusable, the same is not true for states and supranational institutions, which bear "a higher epistemic burden" (p. 307) and are therefore the most suited to exercise epistemic agency.

Moreover, as Hartford (2019) argues, states and supranational institutions "ought to relieve individuals [and other entities] of a great many of their obligations to know" (p. 57). However, in the absence of an agreement that defines which information other entities must be aware of, they must ensure that all other collective actors become informed and capable of actively orienting themselves in using such information: knowing how to select, interpret, and compare it—especially when complex—so to transform it into instruments for action.

Epistemic agency regarding climate change and sustainability does not involve passively receiving information; rather, it entails exercising an active competence that helps all actors cope with their own uncertainty and ignorance. Consider, again, Emirbayer and Mische (1998, p. 1012): "actors are always living simultaneously in the past, future, and present, and adjusting the various temporalities of their empirical existence […] in more or less imaginative or reflective ways." Temporal awareness has a crucial role. Understanding climate change and sustainability involves interpreting past events—their causes and effects, as well as the actions taken and sustainability practices adopted—to assess present dynamics and comprehending the consequences that current decisions have on the future. Epistemic agency does not merely coincide with better information management but guides all other collective entities engaged in addressing the climate crisis.

UNESCO initiatives, such as the Green Education Partnership (GEP https://www.unesco.org/en/sustainable-development/education/greening-future) or the Greening Education Campaign (GEC https://www.unesco.org/en/sustainable-development/education/campaign), are examples of this regulatory and guiding capacity. In both cases, collective actors, such as schools, universities, local citizen communities, enterprises, and ministries develop skills and tools useful for understanding, selecting, and applying scientific knowledge about climate change and sustainable strategies and situate these skills and knowledge within their temporal context. In particular, the GEC Project, which mainly addresses educational institutions, "provides opportunities to acquire comprehensive, accurate, evidence-informed and age-appropriate information on sustainable development and climate change over time and throughout a learner's formal, non-formal and informal (e.g. museums and libraries) education" (UNESCO, 2024, p. 22).

In summary, with respect to climate change and sustainability, states and supranational institutions exercise their epistemic agency as epistemic facilitators. One of

their tasks is to help other organizations understand the dimensions of climate change: its causes and consequences, its ethical-philosophical implications, its issues of global and intergenerational justice, and the difficulties of reaching a shared agreement between the countries of the Global North and South. Another task, particularly in the absence of a clear normative framework, given their role as epistemic facilitators, consists in clarifying several aspects of climate solutions: what climate actions are and their limits, as well as the relevance of the concept of sustainability, its ambiguity, and its three pillars. Finally, it ought to clarify, in line with the arguments of section 1.4.2, the necessity of recognizing the primacy of the ecological/environmental dimension.

2.3.2 The Practical Agency of States and Institutions

The complement of agency's guiding function is its practical implications. In addition to their role as epistemic facilitators, the agency of states and supranational institutions encompasses direct contributions to implementing climate action. Consequently, these implications involve not only the collective duty to concretely realize sustainable development but also the responsibility to guide and direct the climate-related actions of all other actors involved, at all levels of society. In practical terms, fulfilling this responsibility involves reaching, within the forums in which states and supranational institutions exercise their regulatory and legislative capacity (i.e., the COPs), an effective global agreement that can guide all other collective entities' practical actions. To be effective, the agreement must be binding and widely shared: it cannot rely solely on individual nation's NDCs but also must include mechanisms to ensure their actual commitment and account for countries' different responsibilities and capacities, particularly the vulnerability of countries in the Global South. Furthermore, the agreement must be consistent with the climate targets that the scientific community sets so to genuinely keep global average temperature increases below 1.5°C and achieve carbon neutrality by 2050. The agreement must ensure economic growth and social security while respecting the environmental dimension of sustainability.

In the absence of such an agreement, the duty of states and supranational institutions is to guide and implement, as far as possible, all concrete actions. At the international level, this involves continuing to convene COPs to renew and update sustainability goals, to translate decisions into operational plans for other collective actors, and to make decisions as coherently as possible in a unified direction. At the same time, these strategies must be translated for the local level and promote implementation

at regional and municipal scales. Thus, on a practical level, the role of states and institutions is that of practical facilitators. As with epistemic agency, practical agency must consider not only actions feasible in the present but future consequences and the residual effects of past actions. For example, climate strategies based solely on technological solutions—whether removal, reduction, or adaptive—are limited because they not only neglect the environmental, social, and economic implications of climate change (see sections 1.4.1 and 1.4.2) but also fail to account for the temporality of the climate crisis. A truly effective exercise of practical agency—both in guiding and in implementing climate action—cannot ignore this temporal awareness. For example, the European Union's actions in creating Fit for 55 (a set of legislative proposals launched in 2021 as part of the European Green Deal) demonstrate the role of states and supranational institutions to be practical facilitators (European Commission, 2021, https://www.consilium.europa.eu/en/policies/fit-for-55/) because the program set a temporal goal—to reduce by 2030 greenhouse gas emissions by 55% relative to 1990 levels. In this way, the European Union aims to temporally guide the actions of its member states and those of enterprises and all institutions, whose collaboration is essential for achieving its objective.

2.4 On the Climate Agreement

To return to the main objective of the chapter—the achievement of an effective, shared, and binding climate agreement—we must consider that, aside from the many difficulties of reaching consensus among the actors involved, much debate involves interpreting the possible agreement. The multiple meanings of "binding," "shared," and "effective" are indeed contentious.

On one side, authors, such as John C. Dernbach and Donald A. Brown (2016) and Mónica F. Tinta (2024), argue that, to be effective, climate agreements must necessarily translate into strict legal obligations and possess monitoring mechanisms and sanctions for noncompliance. In particular, Dernbach and Brown emphasize the legal dimension as an essential condition that provide all actors with an understanding of the proper way to implement climate action strategies: "Legal scenarios about different laws or combinations of laws would make it possible for decision makers and the public to visualize what the choices are, and therefore easier to make better choices" (p. 38). Similarly, Tinta (2024) maintains that a legal obligation is indispensable for a global climate agreement to be truly effective: without it, the recognition of certain fundamental

rights of nature would be compromised such that not only the life of ecosystems but also all living beings, including the human communities that inhabit them, would be endangered.

On the other side, scholars such as Daniel Bodansky (2015) argue that in climate agreements, the political-moral dimension is the most relevant and that some flexibility in the legal implementation of sustainable measures and climate actions can be tolerated.

> One thus cannot definitively say how much the legally binding character of the Paris agreement matters. Making the agreement legally binding may provide a greater signal of commitment and greater assurance of compliance. But transparency, accountability, and precision can also make a significant difference, and legal bindingness can be a double-edged sword if it leads states not to participate or to make less ambitious commitments. Thus, the issue of legal form, though important, should not be fetishized as a measure of the Paris conference's success. (2015 https://www.carnegiecouncil.org/media/series/policy-innovations/policy-innovations-digital-magazine-2006-2016-commentary-does-the-legally-binding-character-of-the-paris-climate-change-agreement-matter-and-if-so-why)

Regardless of how best to interpret the binding nature and shared dimension of a global climate agreement, the fundamental problem remains: significant uncertainty about the content of concrete solutions and, possibly, about the content of the agreement itself. This lack of clarity is reflected both in implementing measures to counteract climate change (see sections 1.4.1 and 2.1) and in the increasingly alarming climate data (see section 1.3.1).

The next chapter identifies a way out of this impasse and explores the reasons why it has not yet been implemented. As I have already clarified (see section 1.4.2), this path is based on an ecological interpretation of sustainability, which, among the various options, appears most suitable for achieving sustainable development and, consequently, is the most appropriate for the agreement.

The transition from the first two chapters to the next two is not merely thematic but structurally required by the argument developed so far. Having clarified the nature of the climate challenge, the meaning of environmental sustainability, and the facilitating agency of states and supranational institutions, the analysis must now identify the concrete domains through which such practical and epistemic facilitation is

actually exercised. If collective agency is understood not simply as formal commitment but as the capacity to orient, enable, and coordinate the action of other collective actors, then it becomes necessary to examine the social and institutional contexts in which these orienting functions take shape and acquire practical effectiveness.

From this perspective, the educational sphere emerges as a primary site in which collective agency becomes operational. Education for sustainability represents a key mechanism through which knowledge about climate change is transmitted, evaluative standards are formed, and shared interpretive frameworks are stabilized across different actors and contexts. The shift toward sustainability education is therefore not a departure from the previous theoretical discussion but its natural continuation at the level of implementation. It provides the appropriate vantage point from which to assess whether the facilitating role attributed to states and supranational institutions is actually being fulfilled and to what extent their collective duties are translated into effective, coordinated, and epistemically grounded practices, while also laying the groundwork for a closer examination of how these dynamics unfold in specific international, national, and local contexts.

Chapter 3. On Ecological Sustainability: Towards a Recovery of Environmental Education

3.1 From *Environmental Education* to *Education for Sustainable Development*

Acknowledging the difficulties that states and supranational institutions face in acting as epistemic and practical facilitators—that is, the difficulties they face, on an informational and operational level, in guiding other collective entities in the fight against the climate crisis—and, consequently, in promoting an effective and shared Climate Agreement, education for sustainability[22] (ESD; for a detailed historical overview, see

[22] Several related disciplines also have this function; each originates from environmental education (EE) but complement it the practice. Notably, these include:

- Citizen Science engages the public in data collection by using simple protocols, generally from local habitats over long periods, that aim at scientific and environmental outcomes.
- Climate Change Education enhances public's understanding of climate change, its consequences, and challenges to prepare current and future generations for responding to the crisis effectively. It supports the development of knowledge, skills, values, and actions related to the causes, impacts, and management of climate change.
- Science Education focuses on teaching knowledge and skills to foster initiative thinking in society.
- Outdoor Education emphasizes learning experiences in nature to cultivate environmental awareness and pro- environmental actions; it also emphasizes that learning occurs both "in" and "for" the outdoors.
- Experiential Education involves constructing knowledge, skills, and values through direct experiences; it serves as both a method and process for delivering EE principles.
- Garden-Based Learning uses gardens as teaching tools for integrated learning across disciplines and to promote active, meaningful, real-world experiences.
- Inquiry-Based Science engages students in scientific investigation; it follows methods similar to those of scientists and is often applied in biological and environmental contexts.

Macintyre et al., 2025) can be a possible solution. ESD is a discipline that operates both at an epistemic level by providing knowledge about climate change and, more generally, about the human-nature relationship; at a practical level, it contributes to mitigation and adaptation strategies.

In this thesis, I understand ESD as an educational policy and not as an educational science: rather than rely on teaching methods or learning processes, it adopts a macro-level perspective and focuses on educational laws and directives, national and international policies (e.g., those of UNESCO), and long-term strategic objectives aimed at informing a responsible citizenry.

This explanation is necessary for the reader to make it clear that in this dissertation education should be understood primarily as a political-institutional device for collective guidance, promoted and implemented by actors with the capacity to intervene on a large scale, particularly states and supranational institutions. While I acknowledge the relevance of the micro-level dimension of teaching and learning practices—which also emerges from the empirical analysis I conducted in secondary schools in the Milan area (see section 4.2) —I focus primarily on the systemic role of education as a means through which such collective entities exercise their epistemic and practical agency over other collective actors. From this perspective, I interpret education as a mechanism of facilitation and guidance capable of shaping the conditions of possibility for shared climate action. Consequently, I analyze education not primarily as a sectoral policy instrument or solely as a situated teaching practice, but as a form of institutionally mediated action that decisively contributes to the clarification, dissemination, and implementation of environmental sustainability.

Educational policy regarding ESD has been considered essential for achieving sustainable development (UNESCO, 2018 https://unesdoc.unesco.org/ark:/48223/pf0000261445). Before proceeding to an in-depth analysis of what ESD is and why it is important, I clarify its differences and points of contact with environmental education (EE), a discipline from which it originates (Walid and Luetz, 2018). Clarifying the two fields is necessary for avoiding misunderstandings about which is the better solution for guiding, both practically and epistemically, climate action. William P. Stapp, of the School of Natural Resources and Environment at the University of Michigan, first introduced the term “environmental education” in 1969, as well as its essential characteristics.

> Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution. […] Therefore, for environmental education to achieve its greatest impact, it must (1) provide factual information that will lead to understanding of the total biophysical environment; (2) develop a concern for environmental quality that will motivate citizens to work toward solutions to biophysical environmental problems; and (3) inform citizens as to how they can play an effective role in achieving the goals derived from their attitudes. (Stapp, 1969, p. 15)

However, the United Nations developed "education for sustainability" as a type of education that should empower *"learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity"* (UNESCO, 2018, p. 1 https://unesdoc.unesco.org/ark:/48223/pf0000261445). In line with the three pillars of sustainability, ESD's main goal is to provide present and future generations with the intellectual and practical tools to meet their needs; its approach is attentive to the deep interdependence between the economic, social, and environmental dimensions of sustainable development and to agents' different responsibilities for, given their different capacities, implementing climate actions.

In the following three sections, I provide a brief overview of EE's history with an eye to its key stages of development, analyze how it has influenced ESD, and explore how ESD can contribute to sustainable development. The chapter's objective is to show how EE is an essential tool for enabling states and supranational institutions to fulfill their function as practical and epistemic facilitators—and to fulfill their collective duty. EE can, thus, enable an effective, shared, and binding Climate Agreement.

3.1.1 Environmental Education's History and Development

By "environmental education," I mean teaching about the structure and organization of the natural environment and the practices and principles through which human beings can establish a balanced relationship with ecosystems. In general terms, EE involves transmitting this knowledge throughout the educational system from primary schools to university. More broadly, however, EE includes efforts to raise public and civic awareness about climate issues, including efforts through various media and dedicated spaces (Angelini and Pizzuto, 2007; Beccarini and Cipparone, 2005).

In parallel with environmental ethics (Brennan and Norva, 2024), EE emerged in an Anglo-American educational context during the 1960s and 1970s. The first Earth Day, which was held in the United States on April 22, 1970, was a symbolic moment for EE, as the celebration was the first national initiative devoted exclusively to environmental problems. In the United States, precursor movements of EE had occurred throughout the late-19th and early-20th centuries: *Nature Study* and *Conservation Education*, both based on recovering a relationship with nature, were, respectively, an educational tool for children and a resource for addressing economic, social, and environmental problems (Peterson, 2022). However, in the 1960s–1970s, EE took a more complete form, partially as a result of the growing social interest in environmental issues raised by such works as Rachel Carson's (1963) *Silent Spring*, Paul and Anne Ehrlich's (1968), and Donella Meadows and her MIT colleagues' (1972) *The Limits to Growth*. These studies shed light on the damage to life and health, both human and non-human that degradation of the natural environment caused; they also stressed the urgency of establishing a different human-nature relationship, one based on being attentive to ecological limits rather than on exploitation of nature. Meadows and her colleagues write that

> we affirm finally that any deliberate attempt to reach a rational and enduring state of equilibrium by planned measures, rather than by chance or catastrophe, must ultimately be founded on a basic change of values and goals at individual, national and world levels (p. 195).

Consider some initiatives and measures that, during this period, raised public and generational awareness about environmental problems. First, in 1960, in the United Kingdom, the *National Rural Studies Association* (today known as the *National Association for Environmental Education*) was founded; about a decade later, its American counterpart, the *National Association for Environmental Education* (today, *North American Association for Environmental Education*), was established. Both associations aim to improve general environmental literacy and provide teachers with the resources and programs to integrate EE into schools. Second, in 1971, US President Richard Nixon signed the *National Education Act*, which officially incorporated EE into primary and secondary school curricula (Peterson, 2022).

Third, at the international level, EE was formally recognized in 1972 during the *United Nations Conference on the Human Environment* (better known as the Stockholm Conference). The participants "recommended that the Secretary General, the

organizations of the United Nations system […], and the other international agencies concerned, should, after consultation and agreement, take the necessary steps to establish an international programme in environmental education" (UN, 1972, p. 24 https://digitallibrary.un.org/record/523249?v=pdf). However, during this period, EE still focused on conservation education: faced with the negative consequences of uncontrolled economic development and the indiscriminate use of resources, it was necessary to educate people to more rationally manage nature's resources. Consequently, the dominant model of development, which centered on the idea of economic growth, was not yet under scrutiny. In 1975, a joint effort of UNEP and UNESCO led to another conference in Belgrade, from which the *Belgrade Charter* emerged (UNESCO-UNEP 1975, https://www.eusteps.eu/wp-content/uploads/2020/12/Belgrade-Charter.pdf). The Charter further clarified EE's objectives. From this meeting onward, EE was no longer about conservation education. Subsequently, in the *Tbilisi Declaration*, UNESCO and UNEP (1977) defined EE's characteristics more precisely:

> Environmental education should:
>
> - consider the environment in its totality—natural and built, technological and social (economic, political, technological, cultural-historical, moral, aesthetic);
> - be a continuous lifelong process, beginning at the pre-school level and continuing through all formal and non-formal stages;
> - be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;
> - examine major environmental issues from local, national, regional and international points of view so that students receive insights into environmental conditions in other geographical areas;
> - focus on current and potential environmental situations, while taking into account the historical perspective;
> - promote the value and necessity of local, national and international co-operation in the prevention and solution of environmental problems;
> - explicitly consider environmental aspects in plans for development and growth;
> - enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences;

- relate environmental sensitivity, knowledge, problem-solving skills and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years;
- help learners discover the symptoms and real causes of environmental problems;
- emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
- utilize diverse learning environments and a broad array of educational approaches to teaching/learning about and from the environment with due stress on practical activities and first-hand experience. (p. 27 https://www.gdrc.org/uem/ee/Tbilisi-Declaration.pdf)

With the Tbilisi Declaration, EE became characterized as international, national, and local attention to the environmental dimension of sustainability and to the "ecological interdependence" between humans and nature, in all of its economic, social, and political implications, in both "urban and rural areas" (p. 26).

However, by the late 1970s, implementation of the Tbilisi Declaration was unrealized, in part because the relevant agents had not yet questioned models of unlimited development. A true step forward occurred in the 1980s from a joint effort between IUCN, UNEP, and WWF (1980 https://portals.iucn.org/library/efiles/documents/wcs-004.pdf) to draft the *World Conservation Strategy: Living Resource Conservation for Sustainable Development*. For the first time, with visibility from important political and institutional agents, the dominant model of development and consumption was identified as the main cause of the environmental crisis. Consequently, reflecting on the crisis shifted from its effects to its causes.

> The modification of the biosphere and the application of human, financial, living and non-living resources to satisfy human needs and improve the quality of human life. [….] While it is inevitable that most of the planet will be modified by people and that much of it will be transformed, it is not at all inevitable that such alterations will achieve the social and economic objectives of development. Unless it is guided by ecological, as well as by other environmental, and by social, cultural and ethical considerations, much development will continue to have undesired side effects, to provide reduced benefits or even to fail altogether. (pp. 3–4)

Despite this significant step forward, during the 1980s, states and supranational institutions were not aware that EE could ignore the emerging problems of climate change. Moreover, as emerged during the Moscow conference *International Strategy for action in the field of Environmental Education and Training for the 1990s* (1987)—ten years after the Tbilisi Declaration and in the same year as the *Brundtland Report*—despite the well-established recognition of the environmental crisis, states and supranational institutions had not yet translated that awareness into a new model of development that could reverse economic and social trends (UNESCO-UNEP, 1987 https://unesdoc.unesco.org/ark:/48223/pf0000080583).[23] Thus, ESD emerged in response to the critical issues of climate change and the development model.

3.1.2 Education for Sustainable Development

At the end of the 1980s, a new concept of development—sustainable development—emerged to address the exhaustibility of the natural resources and global warming (see section 1.4.1). Appealing to this concept, actors aimed to transcend the economic sphere and safeguard the "carrying capacity of nature, […] to protect the opportunities of future generations" (UNDP, 1995, p. 13 https://hdr.undp.org/system/files/documents/hdr1995encompletenostats.pdf). Thus, just as with EE, joint actions from the UN and organizations such as UNESCO and UNEP created a discipline, ESD, to transmit, promote, and teach this new concept. *Agenda 21* (UN, 1992) was the first official document to claim that

> education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. Both formal and non-formal education are indispensable to changing people's attitudes, so they have the capacity to assess and address their sustainable development

[23] Throughout the 1990s, the debate on EE focused on the methodologies and teaching approaches that would foster disseminating environmental awareness. Aurelio Angelini and Piergiorgio Pizzuto (2007, p. 236–240) distinguish three main schools of thought:

- The ENSI (Environment and School Initiatives) model, which the OECD's Centre for Educational Research and Innovation (CERI) launched in 1986. The project involved several countries, where "Ecologisation of Schools" (ECOLOG) were implemented to introduce EE into curricula at 22 pilot schools across the primary, secondary, and technical levels (OECD-CERI, 1991 https://www.oecd.org/content/dam/oecd/en/publications/reports/2013/09/innovative-learning-environments_g1g331b7/9789264203488-en.pdf).
- Bill Lucas (2016), director of the Centre for Real-World Learning at the University of Winchester, developed a "learning disposition" theory, which focused on dispositions, such as creativity, tenacity, and curiosity, and on the importance of cultivating these mental habits in students. This theory has been applied to the study of environmental issues.
- Drafted under the guidance of Jacques Delors and published by UNESCO, the report *Learning: The Treasure Within*, articulates four pillars of learning—*learning to know, learning to do, learning to live together, learning to be* (UNESCO, 1996, https://shorturl.at/PmoTn). These pillars provide a useful framework for EE, by showing how education develops the cognitive, practical, and social skills necessary for addressing environmental challenges.

concerns. (p. 320)

Therefore, unlike EE, ESD includes among its "key areas" (UNESCO, 2025b https://www.unesco.org/en/sustainable-development/education/need-know) the fight against climate change. While scholars often consider ESD as an evolution of EE, they debate their relationship. Aurelio Angelini and Piergiogio Pizzuto (2007) distinguish three main positions of their relationship: some regard ESD as the successor of EE; others emphasize the continuing relevance of EE; and yet others consider ESD as one aspect of EE, one particularly oriented toward social and economic concerns. In this sense, ESD builds on EE in response to the new climate challenge and does not overturn its original framework. Indeed, by progressively integrating EE into sustainable development, ESD has not abandoned the primacy of the environmental dimension or the necessity of developing an ecological relationship with it. Rather, as UNESCO (2018) clarifies, the task is to "reorient" and "strengthen" the environmental dimension in light of the new model of development so to account for the economic and social implications of climate change. As Michael J. Scoullos, a pioneer of EE before the Stockholm Declaration, has explained, "the idea of environmental protection was never cut off from the idea or the need for a particular type of development" (Scoullos, 1995, as cited in Sauvé, 1996, p. 8). If anything, the interest in a *"new focus"* of EE—a different model of development—and the need to adapt this discipline to new challenges—climate change—led to a new educational framework, one in which EE was directed toward sustainable development (Walid and Luetz, 2018). The debates and exchanges about this new discipline, such as the Thessaloniki Conference of 1997 and the Santiago de Compostela Conference of 2000 support understanding ESD as the integration of EE and SD (Angelini and Pizzuto, 2007). As specified in the *Strategy for Education for Sustainable Development*, ESD "broadens the concept of environmental education […] encompassing interrelated environmental, economic and social issues [and] has to be considered as a 'life-wide' process" (UNECE, 2005, p. 4–5 https://digitallibrary.un.org/record/545239?v=pdf).

However, ESD is not limited to protecting and conserving our environmental heritage or to sustainably managing, it also encompasses other themes related to climate change, such as human rights, social and economic equity, solidarity, peace, democracy, and health. As such, ESD demonstrates a strong connection with global citizenship and peace education (UNESCO, n.d. https://www.unesco.org/en/global-citizenship-peace-education). Thus, unlike EE, which was too focused only on maintaining an ecological

relationship with the natural environment, ESD aims to confront the various difficulties of the climate crisis by proposing a new model of society and development. At least, from a historical perspective, this is true. From a theoretical perspective, the transition from EE to ESD has received criticism. For instance, Helen Kopnina (2012) has argued that, from the perspective of educational science, this shift involved a move from an ecocentric orientation toward an anthropocentric one that emphasizes social and economic development over core ecological concerns. Nevertheless, from the standpoint of educational policy, as ESD scholar Lucie Sauvé (1996) notes, ESD promotes sustainable development within formal and non-formal education systems:

> No doubt, it was necessary to counter a certain conception that EE was focusing too narrowly on the protection of natural environments […] without taking into account the needs and rights of human populations associated with these same environments, as an integral part of the ecosystem. Likewise, it was also necessary to update the EE discourse by emphasizing aspects related to contemporary economic realities. (p. 8)

In this regard, in 2005, the *United Nations launched the Decade of Education for Sustainable Development*: the framework is a milestone for indicating ESD as a tool of ecological and social, as well as economic and political, change. Ten years later, in 2015, *Agenda 2030*'s SDGs officially included ESD; target 4.7 includes it as an indispensable tool for achieving sustainability.

> By 2030, […] all learners [must] acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development (UN, 2015, target 4.7 https://sdgs.un.org/goals/goal4#targets_and_indicators).

Moreover, target 12.8 establishes the necessity of, by 2030, ensuring "people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature." Before and since *Agenda 2030*, ESD has been further

clarified and elaborated on numerous occasions.[24] Given the purposes of the thesis, I adopt the definition that emerged in the *International Debate on Education for Sustainable Development*, which the IUCN organized in 2000 (Hesselink et al., 2000 https://portals.iucn.org/library/sites/library/files/documents/2000-034.pdf). The document suggests ESD involves four main pillars.

First, ESD is oriented towards the future, as it focuses attention not only on immediate environmental issue, but also on the possible developments of the social, economic, and natural scenarios in which its educational actions intervene (Angelini and Pizzuto, 2007, p. 245). Second, ESD takes a clear political stance, as it rejects the dominant model of development (p. 245). Third, ESD addresses both students and society as a whole. Therefore, based on a lifelong learning model, "educational institutions (e.g. schools, universities, colleges and their governing boards)" (UNESCO, 2018, p. 180 https://unesdoc.unesco.org/ark:/48223/pf0000261445) and their educational and learning efforts must extend to "all levels and in all social contexts," since the discipline will be truly effective only if "can bring about this critical change" (p. 29).[25] Finally, ESD aims to realize the main pillars of sustainability, which concern not only the protection and safeguarding of the natural environment—a distinctive feature of EE—but also social and economic development.

> Education for Sustainable Development empowers people with the knowledge, skills, values, attitudes and behaviors to live in a way that is good for the environment, economy, and society. It encourages people to make smart, responsible choices that help create a better future for everyone (UNESCO, n.d. https://www.unesco.org/en/sustainable-development/education).

Now that I have explained ESD, two sets of questions remain. First, can ESD contribute to achieving a collective Climate Agreement and, if so, how? Second, in the absence of such an Agreement, can ESD support states and supranational institutions in

[24] For instance, other documents that have further specified and elaborated ESD include:
- The *UNESCO Roadmap for Implementing the Global Action Programme on ESD* (UNESCO, 2014 https://unesdoc.unesco.org/ark:/48223/pf0000230514), which focuses on providing operational tools for Member States;
- the strategic framework *ESD for 2030* (UNESCO, 2020 https://unesdoc.unesco.org/ark:/48223/pf0000374802), which emphasizes ESD's integration in the SDGs;
- the UNESCO *Education for Sustainable Development: A Roadmap* (UNESCO, 2021b https://unesdoc.unesco.org/ark:/48223/pf0000374802), which defines ESD's main features.

[25] Although examining this aspect in detail is outside the scope of the, recall that the history of ESD's formation and coincides with an evolution of learning methods. Beginning with the Rio Conference on Environment and Development (1992), several approaches and key references followed, including the OECD's (1986) ENSI (*Environment and School Initiatives*) project, Chapter 36 of *Agenda 21* (UN, 1992), the Delors Report (1996), the LUCAS (*Land Use/Cover Area Frame Survey*) program (2001), and the Ahmedabad Declaration (2007). Today, ESD is embedded within the lifelong learning approach, an educational paradigm that recognizes learning as a continuous and permanent process that extends across one's entire life. For discussion of the history of ESD methodologies, see Angelini and Pizzuto (2007, p. 232–249).

their role as both practical and epistemic facilitators of other collective actors and, if so, how? Indeed, their implementing ESD would constitute their exercise of agency. If, as Emirbayer and Mische (1998) argue, orientative and temporally situated functions characterize the latter (see section 2.3), how does ESD enable them to exercise their agency best?

3.1.3 Towards an Education for Sustainability

Since the 1990s, the UN has recognized the sustainable development model, at least theoretically, as the only possible solution to climate change because mitigation and adaptation strategies cannot address moral issues, climate injustice and justice the countries of the Global North and the Global South, difficulties related to the CBDR principle, and intergenerational imbalances. These strategies too narrowly focus on the physical consequences of increasing average global temperatures (see sections 1.2.1, 1.3, and 1.3.1). Given the sustainable development model, ESD "teaches individuals [and collective entities] to make informed decisions and take action, both individually and collectively, to change society and protect the planet. It equips people of all ages with the knowledge, skills, values, and ability to tackle issues (caused by) climate change" (UNESCO, 2025 https://www.unesco.org/en/sustainable-development/education/need-know).[26]

My focus in the thesis is primarily on the possibilities that ESD offers to collective actors. In fact, especially following two milestones—the Rio Conference (UN, 1992, https://sustainabledevelopment.un.org/outcomedocuments/agenda21) and the United Nations' Decade of Education for Sustainable Development (UNESCO, 2014b https://unesdoc.unesco.org/ark:/48223/pf0000230171)—states and supranational institutions not only recognize ESD but have strongly encouraged collective entities to adopt its practices.

In addition to states and supranational institutions, collective entities come in two other, main groups: those that have the capacity to intervene and those that have a communicative and educational function. Education for sustainable development is not applicable to entities, such as UNEP or IPCC, that have an epistemic function, since they provide states and supranational institutions with scientific evidence of and possible strategies for addressing the climate crisis. Consequently, they provide EDS with its main

[26] ESD and similar approaches are not intended exclusively for collective entities, even though it is dedicated to them, as specified in Chapter 36 of Agenda 21. Other chapters of the Agenda focus on the recipients of ESD. Chapter 25, for instance, emphasizes youth involvement, Chapter 27 addresses NGOs, and Chapter 31 focuses on research (Angelini and Pizzuto 2007: 243).

source of content. According to UNESCO (2025), the five key areas of ESD are:

- advancing policy,
- transforming learning environments,
- building capacities of educators,
- empowering and mobilizing youth, and
- accelerating local level action.

What do these areas entail for collective entities concretely entails? That is, how can states and institutions exercise their agency through ESD to guide other actors on both a practical and epistemic level. Moreover, following Emirbayer and Mische (1998), their orienting action must be situated temporally; they must render other collective entities as "temporally embedded" (p.963) so to push them to confront the past causes of the climate problem, measure themselves against their present condition, and evaluate the consequences of their present choices. As I have already observed (see section 2.3), this is the core of sustainability: a form of economic and social development that respects the natural environment for present generations and future ones.

3.1.3.1 ESD in Political Parties, Multinational Corporations, and Global Finance[27]

Collective entities that have operational capacity—those capable of affecting climate change through laws (of states and major institutions), acting on investments, or through internal regulations—these include: political parties, multinational corporations, and financial institutions.

Political parties, at least those who engage in public discussion of climate issues and their potential solutions, engage in ESD by integrating of knowledge about climate change, climate actions, and sustainability principles into their programs and assemblies. As such, different political forces act as mediators of knowledge about the ecological crisis and sustainable development; they translate it into programmatic orientations for both party members and the citizenry that, ultimately, will lead to legislative action. A significant, national-level example is Argentina's *Ley Yolanda*, which was proposed by the *Frente de Todos* (center-left) and *Propuesta Republicana* (center-right) parties and was approved in in 2020. The law establishes mandatory environmental training for all public officials in the three branches of government (Boletín Oficial de la República

[27] In this and the next section, I describe the impact of ESD on collective organizations will be described. However, the discussion is not based on a specific study or analysis but derives from my own research into the activities and news concerning these entities; all initiatives I consider are directly related to these entities' intentions to address climate change through ESD's practical and theoretical tools.

Argentina 2020, Ley 27592 https://climate-laws.org/document/yolanda-law-no-27592_708b). The *Global Green Charter*, which was adopted in 2001 in Australia by green parties worldwide, is an example at the international level of ESD's epistemic impact. Adhering to this document, ecological parties commit to translating the principles of sustainable development into concrete political measures (Global Greens, 2001 https://globalgreens.org/wp-content/uploads/2020/04/Global-Greens-Charter-2017.pdf). The European Green parties have articulated similar manifesto (European Greens, 1999 https://europeangreens.eu/manifesto/). On the practical side, ESD's contributions to parties can also be identified through their legislative and programmatic proposals, which range from bills about decarbonization to investments in renewable energy, from policies to protect biodiversity to regulations that promote energy efficiency in buildings. For instance, the *European Green Party Choose Courage* proposes a *Green and Social Deal* that includes policies for ecological transition and social justice, creating green jobs, protecting biodiversity, and promoting energy efficiency in buildings and investments in renewable energy (European Greens, 2024 https://europeangreens.eu/2024-manifesto/).

In multinational corporations, the epistemic influence of ESD is also seen in multinational corporations through environmental, social, governance reports, accountability documents through which companies communicate their "sustainability level" to their investors, customers, institutions, and communities (UN, IFC and Swiss Government, 2004, https://documents.worldbank.org/en/publication/documents-reports/documentdetail/280911488968799581/who-cares-wins-connecting-financial-markets-to-a-changing-world). These documents present environmental data about their CO_2 emissions, energy consumption, and water and natural resource use; they provide information about their employees' working conditions and safety, internal diversity and inclusion policies, as well as their relations with local communities, buyers, and suppliers; the reports also share information about the composition and organization of the board of directors, transparency, and anti-trust and anti-corruption policies. The practical dimension of ESD also pass through these documents, as one can evaluate the company's declared commitments and the concrete impact of their actions. For instance, the report might detail efforts to reorganize supply chains to reduce environmental impact, revisions to internal sustainability programs, or sustainable investments. While the companies who prepare these reports range from tech giants (e.g., Apple and Microsoft) to consumer goods companies (e.g., Patagonia and Ikea), from pharmaceutical companies (e.g., Novo Nordisk) to energy companies (e.g., Tesla or Ørsted) even those in the food and beverage

sector (e.g., Walmart or Nestlé), each enterprise offers its own unique approach to integrating ESD principles into its strategies (Theo, 2024 https://reportsesg.com/15-exemplary-esg-reports-a-deep-dive-into-corporate-sustainability/).

Similarly, in the financial sector, the epistemic influence of ESD is visible in measurement standards that assesses to what extent financial operations involve sustainability principles. Examples of such tools include the *Sustainable Finance Disclosure Regulation*, which obliges banks and investment funds to report their environmental, social, and economic impact (EU, 2019 https://eur-lex.europa.eu/legal-content/IT/TXT/?uri=CELEX%3A32019R2088), and the EU *Green Taxonomy*, which defines a set of criteria for determining which activities are sustainable (European Commission, 2025 https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en). Likewise, the internal training of financial analysts and managers, which organizations such as the OECD (2025) or the *Network for Greening the Financial System* (NGFS, 2023 https://www.ngfs.net/en/press-release/ngfs-facilitates-capacity-building-across-its-membership;https://www.oecd.org/en/about/directorates/directorate-for-financial-and-enterprise-affairs.html) promote, help strengthen knowledge of sustainability and guide investment choices. Thus, ESD's epistemic framework translates into concrete actions, such as issuing green bonds that support low-impact environmental projects or social bonds that support vulnerable communities, divesting from fossil fuels, and developing investing initiatives that of generating measurable social, economic, and environmental benefits in addition to profits (OECD, 2021 https://www.oecd.org/en/publications/scaling-up-green-social-sustainability-and-sustainability-linked-bond-issuances-in-developing-countries_8a5c3156-en.html). Thus, development banks, such as the *European Investment Bank* or the *World Bank* have a decisive role in financing climate resilience and energy transition programs in the most vulnerable countries (European Investment Bank, 2025 https://h7.cl/1i5A5; World Bank, 2024 https://www.worldbank.org/en/news/press-release/2024/12/19/bangladesh-receives-1-16-billion-world-bank-financing-for-inclusive-and-climate-resilient-development).

Table 1 summarizes how ESD influences collective entities with operational capacity.

Actors	Epistemic Level	Practical Level
Political Parties	Integrates scientific knowledge and sustainability values into programs and digital platforms.	Translates sustainability principles into legislative and policy proposals.
Multinational Companies	Adopts analytical and reporting tools to integrate sustainability into business strategies.	Implements operational actions: sustainable supply chains, internal programs, green investments, etc.
Financial Sector	Develops standards and measurement tools for sustainable financial practices.	Provides sustainable financial products and policies (e.g., green bonds, divestment, impact investing, etc.)

Table 1. *Influence of ESD on Entities with Operational Capacity.*

3.1.3.2 ESD in NGOs, Environmental Movements, Media, Schools, and Universities

Collective entities, such as NGOs, environmental movements, the media, schools, and universities, have an educational and communicative function. The epistemic impact of ESD on schools and universities, for instance, manifests through its integration into curricula, albeit through various methodological approaches. This integration may entail rethinking teacher and university faculty training towards training in environmental sustainability competencies and promoting academic and non-academic research on these topics. The European Commission (2024) annually publishes the *Education and Training Monitor* to track the impact of ESD on the European educational system. Moreover, in line with ESD's purposes, introducing environmental content into schools and universities implies a redefinition of the very concept of knowledge, which can no longer be understood solely as factual. Instead, knowledge becomes a transformative tool for concretely impacting society.

> ESD is not just a matter of teaching sustainable development and adding new content to courses and trainings. Schools and universities, for instance, should see themselves as experiential places of learning for sustainable development, and should therefore orient all their processes towards principles of sustainability. For ESD to be more effective, some argue that the educational institution as a whole has to be transformed. Such a whole-institution approach aims to mainstream sustainability into all aspects of the educational institution. It involves rethinking the curriculum, campus operations, organizational culture, student participation, leadership and management, community relationships and research. In this way, the institution itself functions as a role model for the learners. (UNESCO, 2018, p. 46, https://shorturl.at/3jitx)

As I have noted, a goal of ESD is to guide these institutions practically. Such guidance may involve greening operations: transforming school buildings and university campuses into sustainable environments, reducing waste, and promoting low-emission mobility (UNESCO, 2018 https://unesdoc.unesco.org/ark:/48223/pf0000261445). Furthermore, ESD encourages interdisciplinary labs, service-learning activities, and active citizenship projects, in which students and teachers collaborate to address environmental and social challenges in their communities. An example is the Globe Program (The Globe Program, n.d https://www.globe.gov/), which is active in 125

countries; primary and secondary schools collaborate with international researchers to collect and analyze environmental data and promote citizen science practices that combine scientific education with active civic participation. Faculty collaboration with local and international companies and institutions allow universities to develop applied research programs and foster green job opportunities. For instance, Extended Partnerships of the National Recovery and Resilience Plan (Ministero dell'Università e della Ricerca, 2020, Investimento 1.3 https://www.mur.gov.it/it/pnrr/misure-e-componenti/m4c2/investimento-13-partenariati-estesi-universita-centri-di) collaborate with companies, the finance sector, and universities on projects that promote applied research and innovation in sustainability and ecological transition sectors. In short, in both schools and universities, ESD is not confined to the classroom but is a social practice, one capable of concretely impacting students' lives and contributing to sustainable development models within communities.

> The overall goal of reshaping education around a learner-centred approach is the holistic development of individuals so that they can actively apply their knowledge, skills and values in real-world situations to improve quality of life and well-being for themselves, their families, communities and wider society (UNESCO, 2018, p. 90, https://unesdoc.unesco.org/ark:/48223/pf0000261445).

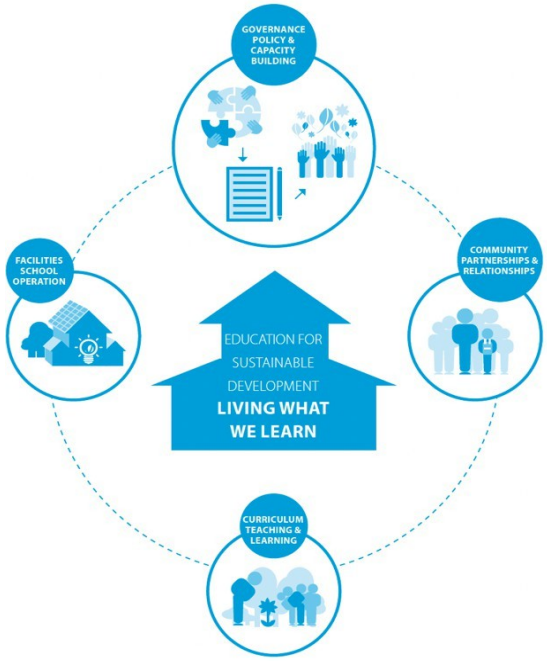

Figure 4. *Credit: Figure 4.2.1.4: The whole-school approach in UNESCO (2014), Shaping the Future We Want. UN Decade of Education for Sustainable Development (2005–2014). Final Report: 89. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000230171.*

The epistemic contribution of ESD on environment movements and NGOs of ESD is exemplified in the increasing collection and dissemination of scientific information, both within the organizations themselves and externally, about climate change and sustainable practices. For example, the FFF, which, through numerous initiatives—including workshops, seminars, and meetings, as well as producing online educational materials—for the general public and other collective actors, aimed to mediate between society and the often complex content that collective entities, such as the IPCC or UNEP, produced (FFF, 2025 https://fridaysforfuture.org/newsletter/edition-no-5-ipcc-conclusions/). During the initiative EYE Forlì-In Tune with Youth: Designing for Europe, which the European Parliament co-financed, FFF Italy activists collaborated with the University of Bologna to raise awareness about the climate crisis and possible sustainable responses among students and citizens (University of Bologna, 2024 https://site.unibo.it/eye-forli/it). Similarly, NGOs, such as Oxfam, have a comparable role in producing and disseminating reports that link the climate crisis, economic inequalities, and social justice to inform public debate with information that would otherwise remain confined to specialist discussions (Oxfam International, 2025 https://www.oxfam.org/en). People's Assemblies also embody ESD principles, as they

combine the learning dimension with an ethical awareness of climate change's damage to ecosystems and humans; ultimately these assemblies lead to proposals for collective and concrete action.[28] On the practical level, the impact of ESD on environmental movements and NGOs is reflected in initiatives, such as the WWF's "Ri-Party-Amo" project (https://www.wwf.it/pulizia-ripartyamo/) that engages citizens and schools in activities, such as waste collection, educational workshops, and community-based care of local areas, to transform environmental knowledge into collective and participatory practice.

Finally, in the media, ESD's epistemic influence manifests in decisions that introduce and integrate information about the climate crisis and sustainability into daily news programs and in-depth reporting. Like other entities with educational and communicative capacities, newspapers, magazines, television programs, and digital platforms are mediators between scientific production and public opinion. A notable example in Italy is the "Green and Blue" section of *La Repubblica, n.d* (https://www.repubblica.it/green-and-blue/); its articles regularly analyze international scientific reports and make them accessible to wider audiences. In this way, the media provides the general public with the theoretical tools to understand the problematic aspects of climate change and the challenges related to implementing possible solutions. The practical impact of ESD in the media has been realized through awareness campaigns and initiatives that transform knowledge into concrete action. Sky Italia's campaign "Sky Ocean Rescue—Un Mare da Salvare" (https://tg24.sky.it/ambiente/sky-ocean-rescue), for example, promoted television specials and a devoted a channel to broadcasting documentaries and in-depth reports that were often linked to public events, such as Legambiente's (2024) "Spiaggie e Fondali Puliti" (https://www.legambiente.it/campagna/spiagge-e-fondali-puliti/), which encouraged sustainable behaviors toward the Mediterranean and clarified how climate change affected it. Similarly, RAI, the Italian national broadcasting company, has supported initiatives, such as "PulisciSpiaggie" and "PulisciFondali," on World Environment Day in collaboration with FIPSAS and the Coast Guard (FIPSAS, 2025 https://www.fipsas.it/news/8194-pulifondali-e-pulispiagge-2). Students, volunteers, and divers have participated in cleaning operations of coasts and seabeds; national and local

[28] For an example of these assemblies, see a 2019 video from ER London: https://www.youtube.com/watch?v=coa6UySrDhQ.

news outlets covered these cleanup efforts and thus embodied ESD principles.

Table 2 summarizes ESD's impact on collective entities that have educational and communicative functions.

Actors	**Epistemic Level**	**Practical Level**
Schools and Universities	Provides curricula about and training in sustainability and research.	Offers educational programs, labs, and practical activities.
Environmental Movements	Makes science information accessible to wider audiences.	Organizes events, assemblies, and collective actions.
NGOs	Analyzes and disseminates scientific and social knowledge.	Promotes concrete sustainability projects and educational campaigns.
Media	Communicates of scientific data through understandable narratives.	Produces campaigns, documentaries, and initiatives that transform knowledge into action.

Table 2. *Influence of ESD on Entities with Educational and Communicative Functions.*

3.1.3.3 Education for Sustainable Development in States and Supranational Institutions

The educational policy efforts that states and institutional actors engage in and promote among other collective entities—those with educational and operational capacities—occur at the epistemic and practical levels. As epistemic facilitators, they influence the various collective entities by,

- internally, integrating scientific knowledge about climate change and sustainability principles into decision-making, training, and organizational processes so to increase internal members' skills and understanding; they do this through reports and documentation, educational and research programs, and other outreach materials.
- externally, mediating and disseminating scientific knowledge to society by translating the specialist information into accessible language and tools; they

produce manifestos, citizen science campaigns, curricula, and reports.

As practical facilitators, states and institutions guide collective entities by,

- internally, using knowledge about the climate crisis and sustainable strategies to facilitate concrete actions, through adapting structures and processes (e.g., sustainable campuses and offices, green supply chains, internal waste management) and developing operational tools (e.g., guidelines and protocols).
- externally, applying such knowledge to propose laws and policies, organize community projects, engage in sustainable financial operations, and promote advocacy.

Accordingly, ESD represents the most suitable tool that can be integrated, adopted, or employed to reach a potential collective Climate Agreement. Education for sustainable development can make implementing sustainable development truly effective, given its embeddedness in the temporal evolution of sustainable development and that it can be taught collectively, as it is applicable in all contexts. Thus, only ESD can regulate the practical and epistemic actions of all actors involved in addressing the climate challenge. Indeed, regardless of the presence of a Climate Agreement, ESD allows different collective entities to operate in the most organized and orderly manner possible; it also enables states and institutions to exercise their agency in guiding other collective entities' climate strategies.

In the next section, I illustrate, through empirical examples, how a specific interpretation of sustainability—the environmental perspective (see section 1.4.2)—further enhances ESD's guiding capacity of ESD.

3.2 Environmental Sustainability in Education for Sustainable Development: Education for Environmental Sustainability

Just as the concept of sustainability has different interpretations (see section 1.4.1), ESD lends itself to multiple understandings. Giovanni Borgarello (2005, pp. 51–52) has proposed education for environmental sustainability (EES), an environmental interpretation of sustainability (see section 1.4.2). Within the institutional framework of ESD, this perspective began in the 1990s and is based on the assumption that achieving

sustainable development requires establishing an ecological relationship between humans and the natural environment:

> Developing a sustainable relationship with the environment requires a deep awareness not only of the biophysical environment within which humans live but also of their own spirituality. Mankind needs to regain its sense of awe and interconnectedness with other creatures and the Earth. (Segovia 2010, p. 749)

However, EES does not exclude economic and social components. On the contrary, the centrality of the environmental dimension and the human-nature relationship aspire to an effective realization of the other dimensions. Unlike ESD, in which the ecological dimension is placed on an equal footing with the other dimensions, EES grants the ecological dimension primacy. Table 3 offers a concise summary of the differences between *ESD* and *EES*.

Characteristic	**Education for Sustainable Development**	**Education for Environmental Sustainability**
Definition	A holistic educational approach that integrates and balances environmental, economic, and social dimensions.	An educational approach that emphasizes the environmental dimension and considers its links to economic and social aspects.
Main Focus	Balances the three dimensions of sustainability (environmental, economic, social).	Prioritizes the environmental dimension and the ecological relationship between humans and nature.
Objective	Promotes sustainable development through an integrated approach.	Educates people and develops their critical skills so they can tackle environmental issues and promote ecological practices.

Characteristic	Education for Sustainable Development	Education for Environmental Sustainability
Relationship with Environment	The environment is one of three, equal dimensions.	The environment is the primary dimension and is foundational for achieving the other dimensions.
Connection to SDGs	Given its holistic approach, it is linked to all Sustainable Development Goals (SDGs).	Strongly tied to environmental SDGs 12, 13, 14, 15, but is also connected to other goals.

Table 3. *Key Differences between ESD and EES.*

In the literature, just as with the concept of environmental sustainability (see section 1.4.2), no clear and shared framework for EES has emerged. Nevertheless, some institutions describe this educational approach in their main reports. For instance, the European Commission defines EES as a type of education that makes people

> aware of, sensitive to, and knowledgeable about the environment and its interconnectedness to social and economic systems, while encouraging them to develop attitudes of concern and motivation, as well as practical, complex systems and critical thinking skills to identify and solve environmental problems. […] EES is strongly linked to the economic and social dimension of sustainability but focuses on environmental topics and views these in social and economic contexts. (European Commission 2023, p. 5 https://op.europa.eu/en/publication-detail/-/publication/1b3ad402-89b5-11ee-99ba-01aa75ed71a1/language-en)

The UNECE considers EES to be the only possible solution that can address the lack of clarity in the meaning of "sustainability" (see section 1.4.1). On their view, restoring the centrality of the environmental pillar and an ecological human-nature relationship is the sole way out: as we have a "urgent need for change from unsustainable practices" (UNECE, 2012 https://drupal-main-staging.unece.org/environment-policyeducation-sustainable-development/educator-competences-esd?utm_).

As with the SDGs, EES is linked to environmental, economic and social sustainability. While it has it has natural links with the SDGs that focus on environmental aspects of sustainability (i.e., SDG 12 "Responsible consumption and production," SDG 13 "Climate action," SDG 14 "Life below water," and SDG 15 "Life on land"), EES is

just as closely related to other goals (European Commission 2023, p.8 https://op.europa.eu/en/publication-detail/-/publication/1b3ad402-89b5-11ee-99ba- 01aa75ed71a1/language-en).

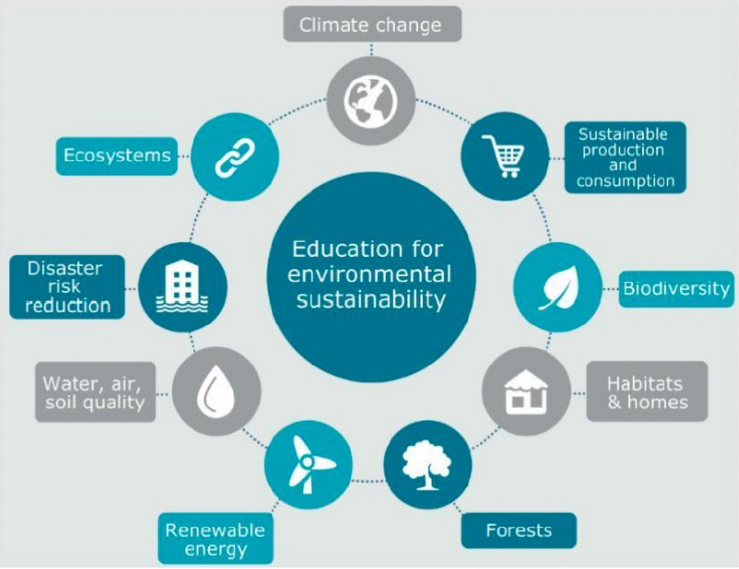

Figure 5. *Crédit: European Commission, Education for environmental sustainability policies and approaches in European Union Member States: update 2023 : final report 2023: 8. https://op.europa.eu/en/publication-detail/-/publication/1b3ad402-89b5-11ee-99ba-01aa75ed71a1/language-en.*

Several scholars have also begun to focus on EES, so much so that BERA (2021) drafted a manifesto for the discipline. The most significant contributions in the field have come from Mohamed Walid and Johannes M. Luetz (2018) and Helen Kopnina (2014; 2020), who emphasizes the considerable absence of the environmental dimension within the educational SDG, Goal 4. Consequently, sustainable development focuses almost exclusively on sustainability's economic and social dimensions such that nature is a resource to be preserved for economic and social reasons. Similarly, other researchers have investigated the actual presence of EES in specific contexts—from primary schools to universities and in external settings, such as companies and NGOs. They find that it is sporadically implemented. Lynda Dunlop and Elizabeth A. C. Rushton (2022) have demonstrated the emotional benefits of EES, which can mitigate symptoms such as eco-anxiety, within the broader goals of raising awareness and transmitting knowledge about the environmental crisis.

From a normative-conceptual level, EES is an educational discipline within ESD, one that develops awareness of, knowledge about, and critical skills for engaging the environment and its social and economic interconnections and for promoting ecological practices in collective contexts to ensure a realization of sustainable development. In line

with EE, this form of education gives greater weight to the environmental dimension. Unlike EE, it is situated within the broader framework of ESD: it does not merely critique the dominant model of consumption and development but also addresses the moral challenges and problems of climate change.

As I have discussed, ESD has influenced both organizations with an educational function (see section 3.1.3.2) and those with operational capacity (see section 3.1.3.1). Although these actions remain sporadic, poorly organized, and insufficient—mainly because of the absence of a binding, shared, and effective collective Climate Agreement (see section 2.3.2) that is shared by states and supranational institutions (see section 2.2) and that guides those entities in a more systematic way (see sections 2.3.1 and 2.3.2)—their existence cannot be denied.

Consequently, a central question emerges, which constitutes a sub-objective of this thesis and connects to its first goal, the one about collective entities' responsibility with respect to climate change, sustainability, and the achievement of a collective Climate Agreement. How can the normative-conceptual content of EES empirically contribute to improving sustainable actions (see sections 3.1.3.2 and 3.1.3.3)? Moreover, why should we implement and integrate it into a collective Climate Agreement?

3.2.1 EES and Collective Entities

Implementing EES may influence how states and supranational institutions guide other collective entities to strengthen their sustainable practices in ecological terms. In other words, EES direct these institutions toward ecological choices and behaviors. Drawing on Emirbayer and Mische's (1998) concept of agency, which involves orienting action with respect to a problem and its temporality, I examine how EES can reconfigure how states and supranational institutions act within the framework of ESD.

In terms of its orienting function, EES enhances ESD by providing a normative-conceptual framework that guides collective entities. It also contributes empirically by revealing the underlying causes of the climate problem and demonstrating how to effectively pursue sustainable development. By prioritizing the environmental dimension, we can better understand the current "reductionist separation," in which the "environment [has been] put to one side in its own closed black box, and organism/society/community/economy is placed on another" (Luke, 2001, p. 193). This separation, in fact, has theoretically and practically enabled climate change, as nature is reduced to a mere resource that can be exploited. Nancy Fraser (2022) notes that

structurally capitalism assumes, indeed inaugurates, a sharp division between a natural realm—conceived as offering a free and constant supply of "raw material" available for appropriation—and an economic realm, conceived as a sphere of value, produced by and for human beings. Along with this goes the hardening of a preexisting distinction between Humanity—seen as spiritual, sociocultural, and historical—and (nonhuman) Nature, seen as material, objectively given, and ahistorical. The sharpening of this distinction, too, rests on the breakup of a previous world, in which the rhythms of social life were in many respects adapted to those of nonhuman nature. Capitalism brutally separated human beings from natural, seasonal rhythms, conscripting them into industrial manufacturing, powered by fossil fuels, and profit-driven agriculture, bulked up by chemical fertilizers. Introducing what Marx called a "metabolic rift," it inaugurated what has been misleadingly dubbed the Anthropocene, an entirely new geological era in which "human activity" (really, capital) is cannibalizing the planet. (Fraser, 2022, p. 11)

Moreover, as Boris Komarov (1983) has argued, even in socialist systems, humans understand nature solely as a means for satisfying human needs; thus, the root cause of the climate change is how Western culture understands the environment. Indeed, as Bruno Latour (1993) explains, the separation of Nature and Culture characterizes the society "in which we live."[29] By "Nature", he refers to the "non-human" realm, the environment in its broadest sense, whereas "Culture" designates the human, industrialized world (see Braidotti, 1993; Haraway, 1991). Evidently, this conception stands in stark contrast to one that emphasizes an ecological relationship between humans and nature.

Because EES aligns with environmental sustainability and the cultural pillar (see section 1.4.2), it promotes recovering an ecological relationship with nature as the path to achieve genuine, sustainable development. Nonetheless, the approach does not exclude the social and economic dimensions, as ensuring true social and economic justice—both for present and future generations—requires treating the environmental dimension as a prerequisite for the other dimensions (Walid and Luetz, 2018). Focusing on the environmental dimension requires that we

> abolish the artificial divisions between the environment and

[29] When and where this way of conceiving nature first emerged is the topic of considerable (Descola, 2005; Soper, 1995). However, whether such a perspective is exclusive to the Western world is beyond the scope of the thesis. Regardless, this particular idea has profoundly shaped Western culture—from which the concept of sustainability, as well as many of the categories employed in this thesis originate—long before the Industrial Revolution (Horkheimer and Adorno, 2002).

> economy/society/community by accepting fully Haeckel's claims about ecology: the totality of the organic and inorganic environments must be acknowledged to accept humanity's organic and inorganic presence in both. What surrounds all organisms now is the environment, economy, society and community of humanity. Seeing economies, societies and communities as environments should force environmentalists, ecologists and naturalists to come "in here" from "out there" to explore how everything works in unified dialectical terms of operation. (Luke, 2001, p. 195)

Recall that any orienting action must also be temporally situated; EES is fully consistent with this aspect of state and supranational agency. To fully implement EES, the collective agent must be aware of the historical moment in which their orientating action toward environmental sustainability is situated (Ralph and Stubbs, 2014, p. 83). Thus, in applying EES, collective entities cannot ignore the "span, planning, the nature and process of change (including challenges)" (European Commission, 2023, p. 13). Indeed,

> to visualise a sustainable future and be able to adjust that image over time, an anticipatory or future thinking competence is also required. Clearly, a sustainability mindset based on normative values, which fosters individual as well as community action in an ecological and fair manner, is inseparable from this approach. (p. 20)

Consider empirical cases in which states and supranational institutions have applied EES.[30] For entities that have an educational and communicative function, exercising EES strengthens initiatives that promote the environmental dimension. To date, given the limited application of EES, examples of its impact on these organizations are few and mostly involve schools and universities. In the Italian school system, for example, the Rigenerazione Scuola project (https://www.istruzione.it/ri-generazione-scuola/), which has been promoted by the Ministry of Education, was developed to educate students about sustainability, particularly the ecological connection between humans and nature. The same goal is evident at universities, such as Western Sydney University (2025)

[30] As with ESD and collective entities, in this case I am not referring to specific studies; rather, these are my readings and interpretations of news and events related to the activities of these entities, which are sometimes explicitly linked to EES.

(https://www.westernsydney.edu.au/future/study/courses/undergraduate/bachelor-of-science-sustainable-environmental-futures?utm_) and The College of New Jersey (2025) (https://envsus.tcnj.edu/graduate-certificate/?utm), that offer courses dedicated to environmental sustainability and EES.

Real world examples of collective entities with operational function applying EES application are also rare. However, as with entities that have an educational and communicative role, EES has led to a reconsideration of sustainable strategies. For instance, the German Green Party (Bündnis 90/Die Grünen) has, for several years, explicitly integrated environmental sustainability into its electoral programs; in doing so, they place ecosystem protection, decarbonization, and the recovery of an ecological relationship with the natural environment as the *conditio sine qua non* for achieving sustainable development (https://cms.gruene.de/uploads/assets/20250205_Regierungsprogramm_DIGITAL_DIN A5.pdf?utm_).

In summary, states and supranational institutions' applications of EEs consist in their recognizing greater importance of the environmental dimension in the activities of collective entities both epistemically and operationally and internally and externally. States and supranational institutions recognition of the greater importance of environmental dimension corresponds to their greater commitment to promote, both locally and internationally, an ecological relationship with the environment.

Because ESS is a relatively new field of research, determining whether it and environmental sustainability generally constitutes a more effective interpretation than the "classical" conception of sustainability is difficult. Nonetheless, at least theoretically, this approach to sustainability aligns more closely both with the causes of the climate crisis—the theoretical assumption of the separation between nature and human reality—and with its potential solutions, which cannot disregard the environmental dimension (see section 1.4.2).

However, explaining how this perspective might address the moral difficulties of climate change, particularly those highlighted by Gardiner (2006), Hardin's (1968) tragedy of the commons, and the different, historical responsibilities of the Global North and South, is complex. Similarly, how environmental sustainability integrates with technological tools, which remain essential for mitigation, adaptation, and climate finance (see section 1.3) is not immediately clear. Therefore, my proposal does involve replacing sustainability entirely with a specific interpretation. Instead, I underscore its potential

when collective entities center the environmental aspect of sustainability and consider reconstructing an ecological relationship with nature.

To return to the central objective of the thesis—to investigate the collective duties related to addressing the climate crisis and sustainability—recall the tasks of states and supranational institutions. Because of their internal structure, legislative and decision-making capacities, and privileged dialogue with scientific institutions (see section 2.2), these institutions ought to guide already-structured collective entities in both action and knowledge. In doing so, states and institutions exercise their agency and enable other collective entities to frame the climate problem and its solutions (see section 2.3). Unlike collective groups or individuals, collective entities, whether educational/communicative or operational, are already structured and therefore capable of receiving complex information and implementing equally sophisticated strategies (see section 2.1.2). Ideally, this orienting function should occur within a binding, shared, and legislatively formalized Climate Agreement (see section 2.3.2). In its absence, states and institutions can still define the boundaries and characteristics of sustainable practices and clarify what information about climate change is necessary. States and institutions can effectively do so through ESD and can further enhance their capacity by adopting an environmental sustainability approach (i.e., EES).

3.2.2 Pedagogical Dimensions and Situated Learning Processes: Engaging with Educational Research

Although it is not among the primary aims of this doctoral thesis, framing sustainability as a responsibility of collective entities and the state requires, at least in general terms, an examination of the main pedagogical models and learning theories that currently guide research in science education. If, as argued so far, EES cannot be reduced to a matter of technocratic governance or individual moralism, then its translation into school contexts must be reflected in transformative learning processes.

In this regard, recent empirical literature in climate change education significantly converges with the perspective advanced here. Studies such as those by Ojala (2012) and Hufnagel (2017) show that a purely informational approach—centered on the transmission of climate data—is not only pedagogically weak but may also produce counterproductive effects, such as eco-anxiety, feelings of helplessness, or disengagement. In this sense, it is noteworthy that empirical evidence confirms that the same individualizing and technicist paradigm criticized normatively in this thesis is also

being questioned at the practical level.

Within science education research, the Socio-Scientific Issues (SSI) framework represents one of the most significant points of contact with the theoretical perspective defended here. A central tenet of the SSI approach is the understanding of climate change not as a merely scientific problem, but as a complex public controversy in which scientific knowledge, value judgments, and political decisions are deeply intertwined (Zeidler et al., 2005). Within this educational model, the classroom becomes a deliberative space in which students are called upon to evaluate distributed responsibilities, conflicts of interest, and the collective implications of climate action.

However, the specific contribution of the present analysis requires insisting on certain normative implications that sometimes remain implicit in the SSI literature. While the SSI approach aims to develop argumentative competence and scientific citizenship, the perspective adopted here places greater emphasis on the need to conceptualize climate change explicitly as a matter of institutional responsibility and structural justice, thus avoiding slippages that shift attention exclusively back to individual behavior.

In this direction, educational research offers two particularly relevant theoretical pillars: Action Competence and transformative and situated learning.

Action Competence, developed by Jensen and Schnack (2006), shifts the focus from the adoption of "correct" individual behaviors—often prescribed in a normative and top-down manner—to the development of students' capacity to participate knowingly in processes of collective change. This educational proposal therefore represents a crucial point of articulation between individual agency and institutional responsibility, as it does not aim to produce environmentally virtuous subjects in a merely behavioral sense, but rather citizens capable of critically intervening in the sociopolitical structures that generate unsustainability.

Transformative and situated learning (Sterling 2011), in turn, suggests that ESD consistent with the perspective proposed here cannot be limited to curricular updating, but must take the form of a deep restructuring of students' interpretive paradigms. Within this framework, approaches such as Place-Based Education (Gruenewald 2003) and Living Labs (Sobel 2004) assume particular relevance, as they allow learning to be anchored in concrete territorial contexts. In this way, the responsibility of the state and collective entities ceases to appear as a macro-political abstraction and becomes lived experience, connecting global climate policies to local impacts and community

practices.

Going beyond these two pedagogical models, however, the type of educational research that best lends itself to the normative proposal advanced here is the Whole-School Approach. The core of this perspective is that the school should not be conceived merely as the place where sustainability is addressed at the curricular level, but as an institution that embodies it through its governance, spatial management, organizational practices, and relationships with the local community (Wals & Mathie 2022). From this point of view, the Whole-School Approach provides important empirical support for the thesis advanced here: the effectiveness of sustainability education depends decisively on the coherence between the educational message and the institutional ecology in which it is situated. This does not diminish the importance of cultivating individual virtues within educational and pedagogical contexts; rather, in light of the argument developed here concerning the role of states and institutions and responsibility as a structural and collective phenomenon, these science education approaches appear particularly well suited.

3.3 The Unsustainable Sustainability

Despite *ESD* and *EES*'s creation and formalization within institutional settings, these two disciplines are still poorly integrated into educational systems and society at large. This poor integration has, in part, resulted in the significant confusion around sustainability and environmental sustainability (Hastangka et al., 2025). As UNESCO (2021a https://unesdoc.unesco.org/ark:/48223/pf0000377362) reports, at a global level, more than 50% of primary and secondary school curricula do not refer to climate change, only 20% of curricula include sustainability or climate change as cross-cutting topics, and fewer than 40% of teachers feel adequately prepared to address these subjects. An SOS international (2020 https://www.sos.earth/posts/2020-survey) survey of approximately 7,000 students worldwide found that 92% consider integrating sustainable development into the curriculum to be necessary; nevertheless, current efforts fall far short of these expectations. This lack of attention to climate change and sustainability is a primary cause of the uncertainty about sustainable strategies and climate change (see section 1.4.1) and so contributes to the progressive deterioration of the planet's condition.

However, disinterest in ESD is not limited to schools and universities; it extends to most collective entities, regardless of their function. Even those whose objectives should include promoting or implementing ESD—such as environmental movements,

NGOs, and political parties—often fail to reflect it in practice. In other words, the impact of ESD has remained largely discursive without affecting real institutional and societal transformations (Biermann et al., 2022). The ESD literature itself highlights that too many "barriers"—scarcity of resources, weak leadership, lack of adequate training, and poor integration within curricula—have prevented it from fully realizing its potential (Foley, 2021). Consequently, instead of creating conditions for "embedding sustainability in the structure and administration support" (UNESCO, 2011, p. 92), ESD has been confined to episodic and fragmented interventions and so has failed to systematically influence the practices and policies of collective entities. Moreover, collective entities often use sustainability and related educational initiatives as tools for greenwashing (Pearse, 2012). For instance, a business or financial actor might greenwash by claiming to undertake sustainable actions, but these claims mask business models that significantly pollute. Such nominal applications of sustainability legitimize activities that remain fundamentally harmful. For example, given that ESG criteria lack a single binding certification system, and that business often self-defined these criteria, such greenwashing practices have become widespread.

Attributing these difficulties to the lack of a Climate Agreement that clearly defines how collective entities ought to engage in sustainability education, which indicators to use, and which information to disclose is reductive. Even without a unified regulatory framework, there are ways to promote and implement more consistent and systematic educational practices. The fundamental issue is states and supranational institutions' lack of responsibility to better guide the operational space of other organizations, despite their recognizing the severity of the ongoing climate crisis.

This inertia can be traced to two main factors, both of which are linked how states and supranational institutions understand sustainability. On the one hand, these institutions desire to preserve dominant production and consumption models (i.e., they wish to continue business as usual). On the other hand, they have the tendency to reduce sustainability to a purely technical problem.

3.3.1 Business as Usual

The first paradox of sustainability arises from making the concept of sustainable development compatible with production and consumption models that caused the climate crisis, those in which nature is as a resource to exploit. This idea has its roots in the Brundtland Report (1987). Collective entities that wish to continue business as usual

have interpreted the Report's term "sustainable development" as a legitimization of continuing with traditional production models. On this interpretation, sustainability does not represent a break with the model but rather an *ex post* corrective tool or a set of minimal interventions, neither of which can genuinely affect the mechanisms that have caused the climate crisis. This interpretation is not only practically limited but also theoretically contradictory: sustainability cannot be conceived as a slight revision of the current development model because sustainability emerged against this model—against the idea of unlimited progress. Instead, sustainability requires an openness to a new form of society, one in which nature is not merely a resource but a reality with which humans can establish an ecological relationship.

Between 2000 and 2010, this interpretation resulted in the proliferation of (often heterogeneous) certification systems (e.g., ISO 14001), environmental management systems, and ecological footprint measurements (Delmas and Toffel, 2004). On the one hand, these tools helped establish concrete parameters to measure and communicate environmental commitment; on the other, they fostered value-action gaps, as formal adherence to certain standards did not always correspond to actual changes in behavior or production models.

Between 2010 and 2020, this trend intensified further, as sustainability became nothing more than a central element of communication strategies (Biermann et al., 2022). The concept thus assumed a symbolic, rather than transformative, role, as numerous companies and institutions adopted sustainability-related language and educational campaigns without effecting any real change.

This progressive reduction of sustainability into technical and communicative language functionally maintained the status quo and reinforced the idea of "green capitalism": a global plan to reconfigure capitalism by incorporating sustainability to drive competitiveness, innovation, and consumer appeal. Thus, the critical dimension of sustainable development was not recognized as an alternative horizon to the dominant economic model but instead became absorbed into the dominant model's mechanisms.

3.3.2 Technical Reduction

The second factor contributing to the inertia around sustainability is that the concept underwent technical reduction. In other words, the idea of sustainability—especially its environmental dimension—was sacrificed in favor of the belief that only large-scale technological solutions—climate engineering (CE)—could address the

climate crisis by intervening in Earth's natural processes (Reynolds, 2015). By "technical reduction," I mean narrowing the field of sustainability to technological interventions that are separated from the ecological, socio-economic, and ethical implications inherent in the concept. Its technical reduction has resulted in a complete erosion of its normative and moral significance.

During in the 1970s, the literature on climate action and sustainability (Fulvi and Woday, 2023; Parson, 2014; Reynolds, 2015) was already arguing that mitigation and adaptation strategies solely based on natured would not be sufficient for effectively addressing climate change. Today, reports from the Climate Overshoot Commission (2022) and the IPCC (2023b) have confirmed this: even a drastic energy transition would reduce, but not eliminate, the now inevitable consequences of climate change. For this reason, in *Sixth Assessment Report* the IPCC (2022b) presents geoengineering, and mitigation technologies in particular, as unavoidable if climate-effective outcomes are genuinely to be achieved. Hence, a growing interest in the possibilities CE offers, which many currently consider indispensable to achieving net-zero emissions by 2050—one of the central goals of the 17 SDGs. CE technologies are divided into two main types (Reynolds, 2015):

- Carbon Dioxide Removal (CDR) and Negative Emission Technologies (NETs), each of which aim to capture and store greenhouse gases.[31]
- Solar Radiation Management (SRM), which aims to increase the Earth's albedo to counter global warming.[32]

At present, however, all CE technologies remain highly controversial (Parson, 2014, p. 90). In addition to their uncertain effectiveness, the technologies raise concerns, given the extensive lobbying of CE technologies at recent COPs, especially by representatives of the fossil fuel industry. As Gardiner (2013) has pointed out, assuming that current climate crisis dictates the use of geoengineering technologies or that such technologies inevitably serve the public good is mistaken. The strongly application-driven nature of this technology risks that we avoid ethical and philosophical reflection on the impacts of their use.

In this regard, several studies have highlighted the problematic implications of

[31] These technologies include carbon capture and storage (CCS), direct air capture (DAC), bioenergy with carbon capture and Storage (BECCS), and applications of synthetic biology.
[32] The main techniques include stratospheric aerosol injection (SAI) and marine cloud brightening (MCB).

relying on geoengineering: scholars have pointed to the risks of moral hazard associated with the promise of technological solutions (Mintz-Woo 2025), the concerns related to intergenerational justice and moral responsibility (Lenzi 2018), as well as the characterization of geoengineering as a socio-political project that presupposes specific infrastructures of power and governance. The fact that states in the Global North control these technologies raises a number of serious concerns. While some regions of the world might benefit from their implementation, others could risk experiencing negative effects, partly due to their effective exclusion from decision-making processes regarding the planet's future, from the ability to voice dissent, or to propose alternatives. In the absence of meaningful participation, these regions would therefore remain exposed to unintended or even hostile consequences, including at the environmental level (Buck 2018). Thus, the rhetoric of the global public good of geoengineering masks power asymmetries, ignores the diversity of local vulnerabilities, and perpetuates structural climate injustices. Overall, as Christopher J. Preston (2013) notes, everything related to the environment and ethical implications of these technologies constitutes a risk: to what extent can we morally justify the potential environmental damage that such research will cause?

Although increasingly present in international negotiations and political agendas, CE raises far too many new and complex problems—both in terms of practical implementation and governance at the global level. Moreover, the strategies are based on theoretical assumptions that oppose an ecological vision of the human-nature relationship. Undoubtedly, reducing sustainability to CE technology would completely distort the concept, since climate change and nature were never intended to be "simply" controllable through technology.

3.4 Final Considerations

The reduction of sustainability to geoengineering or the business-as-usual development model is a result of states and supranational institutions—actors who, by virtue of their internal structure and societal position, possess the greatest practical and epistemic capacities to play a regulatory role—have not interpreted sustainability correctly. These actors should help all collective entities understanding the concepts and guide them in taking practical action by promoting ESD. At the same time, however, claiming that sustainability and ESD are entirely absent is misleading. In a Western context, governments and major international institutions have made considerable efforts

to promote this kind of education. Nevertheless, in the absence of a shared, binding, and effective climate agreement, such initiatives remain fragmented and provisional. These attempts, while significant, are still insufficient—especially in certain countries. This insufficiency underlies a poor understanding of what climate change entails, the weak implementation of sustainable development, and the persistence of resource-exploitative growth models. Thus, ensuring climate justice, determining the differing responsibilities of Global North and South countries (via the CBDR principle), and responding to the moral dilemmas that emerge from the climate crisis continue to be difficulties we must address. Moreover, the plurality of interpretations to which the concept of sustainability lends itself reinforces this insufficiency. In the absence of a clear, shared proposal, it is unsurprising that sustainability has been reduced to a technical or economic tool. Accordingly, states and supranational institutions that have failed to adequately promote or practice sustainability should be held morally responsible, as they have neglected their role as practical and epistemic facilitators. These institutions should also be held morally responsible for the collective failure of reaching a genuinely binding global agreement, one that would clarify the concept of sustainability and established a clear framework for ESD.

However, holding states and supranational institutions responsible does not absolve individuals, collective groups, or collective entities of similar responsibilities. Indeed, while occupying a less central position than states and institutions, these actors still have critical roles, both epistemically and practically, in engaging in or promoting sustainable practices. Nonetheless, such considerations lead to a different line of inquiry.

The next chapter, instead, continues to explore the extent to which states and supranational institutions have failed their collective duty. The chapter focuses on the Italian case, drawing on my curricular internship at Istituto Oikos in the province of Milan. It examines both the legislative framework governing the implementation of education for sustainable development (ESD) in schools and a small dataset concerning students' awareness of climate change and sustainability, as well as their capacity to act as citizens. The focus on the Italian legislative context is methodologically justified by the location and structure of the internship, which involved delivering ESD in the Milan area and therefore required a contextual analysis of the relevant national legal framework. It also illustrates how, in Italy, the absence of a collective, shared, and binding climate agreement on sustainability and education in this field has resulted in weak ESD provision and limited implementation of sustainable practices – thus

highlighting the need to achieve such an agreement. This emphasis on ESD serves as the starting point for a broader, though partial, understanding of sustainability education in formal and informal contexts beyond Italy's borders.

Chapter 4: Education for Sustainable Development in Italy and Worldwide

4.1 Education for Sustainable Development in Italy: The Legislative Framework

As I have noted (see section 3.1.1), the late 1980s, marked by the *Brundtland Report*, were a turning point not only for clarifying the concept of sustainability but also for developing EE and, consequently, for integrating EE into national education systems, particularly those in the Global North, whose institutions also fostered the emergence of sustainability. Indeed, the first Italian regulation related to education for sustainable development (ESD) dates back to 1986: Law No. 349 established the Ministry for the Environment, which in its very foundation was responsible for EE (Gazzetta Ufficiale della Repubblica Italiana, 1986, https://www.gazzettaufficiale.it/eli/gu/1986/07/15/162/so/59/sg/pdf?utm).

Subsequently, through the 1990s, the Ministry of Education (MIUR), together with the Ministry for the Environment, launched the first structured EE initiatives—the first Italian educational programs in this field.[33] This process found a key reference point in *Agenda 21* (UN, 1992). Italy, in line with the international trajectory, transitioned from an education focused exclusively on natural sciences (i.e., EE) to a broader perspective centered on sustainability (i.e., ESD; see section 3.1.2).

Over the following decade, several *Protocolli d'Intesa* (e.g., the MIUR 2005 Memorandum https://archivio.pubblica.istruzione.it/news/2005/allegati/ecd_new.pdf?utm) were signed between the Ministry for the Environment and MIUR, all of which promoted ESD in schools. These agreements sought to bring the content of *Agenda 21* into educational institutions and foster educational projects with a territorial dimension. At this stage, however, Italy lacked a formal or nationwide requirement for including sustainability

[33] MIUR is an acronym for the Ministero dell'Istruzione, dell'Università e della Ricerca, a department of the Italian government responsible for managing the national education system. Over the years, it has merged with and been separated from other ministries several times; in 2020 it was divided into two new ministries: the Ministero dell'Istruzione e del Merito (MM) and the Ministry of Universities and Research (MUR).

education in school curricula.

A structured recognition of the discipline only emerged in the 2010s, particularly in 2017, when the Presidency of the Council of Ministers, in collaboration with the Ministry for the Environment, developed the *Strategia nazionale per lo sviluppo sostenibile* (*SNSvS*; Ministero dell'Ambiente e della tutela del territorio e del mare, 2017 https://www.mase.gov.it/portale/documents/d/guest/snsvs_ottobre2017-pdf-1?utm) and, in 2018, the National Council for Development Cooperation (CNCS) adopted the National Strategy for *Educazione alla cittadinanza globale*. Both documents include an explicit reference to ESD and are consistent with Target 4.7 of the *2030 Agenda* (UN, 2015). For instance, the *SNSvS* states that

> education […] represents one of the key dimensions for the effective achievement of the objectives set out in the SNSvS. The "culture of sustainability," to be promoted at all levels (business, civil society, institutions, research) and in all educational settings, both formal and non-formal, within a lifelong learning framework (continuous learning throughout the entire course of life),[34] is the main driver for transforming the current development model, as well as for spreading knowledge, skills, lifestyles, and virtuous models of sustainable production and consumption. This driver will be implemented by facilitating networks and collaborations among those engaged in sustainable development and education for sustainable development (p. 99, my translation).

The *SNSvS* considers schools the primary setting for implementing ESD, even though networks of schools, NGOs, and local institutions promote ESD through initiatives and projects. Subsequently, with Law No. 92 of 2019, ESD was incorporated into civic education, a subject that is compulsory for 33 hours each year at all levels of education in Italian schools. Certain thematic areas within the subject must be devoted to sustainable development, as well as global and digital citizenship (Gazzetta Ufficiale della Repubblica Italiana, 2019 https://usrfvg.gov.it/export/sites/default/it/home/menu/aree/Percorsi-educativi/educazione-civica/Allegati-educazione-civica/Normativa-educazione-civica/L-92_19.pdf?utm). Finally, in 2020, the MIUR (2020 https://www.mim.gov.it/documents/20182/0/Linee%2Bguida%2BEducazione%2Bcivic

[34] See section 3.1.2.

a.pdf/9ffd1e06-db57-1596-c742-216b3f42b995?t=1725710190643&utm) published the *Linee guida per l'insegnamento dell'educazione civica*, which continues to define the methods for implementing the 33 hours of *civic education* and how to officially integrate ESD into school curricula. Currently, *civic education* is promoted and funded through PNRR programs or collaborations between MIUR, the Ministry for the Environment, and several organizations such as UNESCO, ASviS, and INDIRE. In particular, through participation in the *Scuola 2030* project (INDIRE 2023, https://scuola2030.indire.it/), these organizations provide teachers with resources, materials, and educational kits to support ESD (see the *ASviS (2023)* report, https://asvis.it/public/asvis2/files/Rapporto_ASviS/Rapporto_ASViS_2023/Report_ASviS_ENG_2023_FINAL.pdf?utm). Additionally, since the 2021/22 school year, a ministerial monitoring project assesses the actual implementation of ESD (Ministero dell'Educazione e del Merito, 2022 https://www.mim.gov.it/-/educazione-civica-al-via-il-monitoraggio-inviata-la-nota-alle-scuole--1?utm). The project has produced several recent reports that confirm the ongoing effort to integrate the subject formally (Eurydice, 2024 https://eurydice.eacea.ec.europa.eu/publications/learning-sustainability-europe-building-competences-and-supporting-teachers-and?utm_).

Given this brief historical overview, the Italian school system has progressively integrated ESD into its curricula. Thus, criticizing the institutional promotion of sustainable strategies is difficult, as integration has indeed occurred. However, in practice, implementing ESD remains highly uneven. Different regions have developed their own guidelines for adapting ESD—an initiative that, in theory, might have enhanced territorial particularities in an otherwise coherent, nationwide implementation of the discipline but, in practice, has contributed to its fragmentation. Consequently, the actual implementation of ESD within the 33 hours of *civic education* largely depends on the initiative of individual schools and teachers. In the next section, I identify the main causes of this uneven implementation because it has hindered the creation of a national strategy in ESD.

4.1.1 Obstacles to Education for Sustainable Development *in Italy*

The Eurydice report (2024, https://eurydice.eacea.ec.europa.eu/publications/learning-sustainability-europe-building-competences-and-supporting-teachers-and?utm), *Learning for Sustainability in Europe: Building Competences and Supporting Teachers and Schools*, confirms that Italy

has formally integrated ESD into school curricula across all levels of education. However, it notes that there are significant gaps in teacher training and in its practical implementation, gaps that result from a highly fragmented national framework. The main causes of this fragmentation are fourfold. First, Italy has not yet systematically introduced university-level training courses for prospective teachers that include specific—or at least mandatory—modules on *ESD* and *EE*. This gap directly affects teaching quality: many teachers do not feel adequately prepared to address these topics, as they lack proper training, updated guidelines, and sufficient educational resources (ASviS, 2023 https://asvis.it/public/asvis2/files/Rapporto_ASviS/Rapporto_ASViS_2023/Report_ASviS_ENG_2023_FINAL.pdf?utm). As a result, existing *ESD* practices are often perceived as outdated or poorly aligned with contemporary challenges—for instance, the current practices give limited attention to *EES* and the potential role of technology in addressing climate change (see section 3.2).

Second, the high degree of curricular autonomy that Italian schools enjoy is another source of inconsistency. While such autonomy should, in theory, encourage adapting ESD to local contexts, in practice it accentuates territorial inequalities: schools with greater financial and human resources tend to implement ESD projects, whereas those with fewer resources tend to neglect them. Consequently, a clear territorial divide has emerged: northern regions and autonomous provinces are generally more active in teaching ESD than are southern regions, where ESD programs remain marginal (ASviS, 2023).

A third issue concerns the regulatory framework. Despite the compulsory inclusion of ESD in *civic education*, clear directives for integrating, structuring, funding, or assessing ESD are lacking. This vagueness leaves ample room for different interpretations and contributes to fragmentation, Moreover, absence of a specialized teaching body and stable dedicated funding exacerbates the fragmented teaching practice (MIUR, 2020 https://www.mim.gov.it/documents/20182/0/Linee%2Bguida%2BEducazione%2Bcivica.pdf/9ffd1e06-db57-1596-c742-216b3f42b995?t=1725710190643; UNESCO, 2021a https://unesdoc.unesco.org/ark:/48223/pf0000374802).

Finally, the political discontinuity of Italian governments is another major obstacle to implementing ESD *fully*. Since 2019, when sustainability was formally introduced into school curricula, successive governments have changed priorities and

policy directions repeatedly, which has generated uncertainty for schools' planning and curricula continuity. In other words, in the absence of a central coordinating body, ESD remains vulnerable to political shifts and lacks a stable funding structure. This condition severely limits the establishment of consistent, long-term educational pathways in schools, particularly those that involve laboratory activities, fieldwork, and, more broadly, an experiential dimension, which is essential for effective ESD (ASviS, 2024a https://asvis.it/rapporto-asvis-2024/?utm).

4.1.2 Education for Sustainable Development *in Italian Schools*

An analysis of the implementation of ESD in Italian schools reveals a rather fragmented picture, one characterized by encouraging signs as well as significant challenges. Overall, while many students report having learned something aboutsustainability, its implementation has been anything but uniform: many initiatives remain isolated and are not structurally integrated into school curricula. The same applies to teacher training. Numerous reports highlight that teachers' preparation remains insufficient; these studies are consistent with international findings (see section 3.3). Moreover, Italian efforts rarely align with European recommendations and with the competence framework of *GreenComp* (European Commission, 2022, https://op.europa.eu/it/publication-detail/-/publication/bc83061d-74ec-11ec-9136- 01aa75ed71a1?utm), which should serve as a guiding reference.

Marked territorial differences also persist—between North and South and between urban and rural areas. As ASviS (2024a) points out, if the goal is to achieve Goal 4.7 of the *Agenda 2030*, Italy still presents a very complex picture, primarily because of insufficient funding. Despite the existence of successful initiatives—such as the *E.ON Scuole* projects (E.ON Italia, 2024 https://www.eon-energia.com/chi-siamo/media/Progetto-Scuole-E-ON-2024-2025-punta-sulla-educazione-alla-sostenibilita.html?utm) or the ASviS (2024b, https://asvis.it/progetto-gift/) e-learning programs on the *Agenda 2030*—the efforts of Italian education institutions remain sporadic and insufficient to ensure a systemic impact**,** despite the mandatory 33 hours of civic education and other ministerial efforts to make ESD an integral part of national policies, particularly through the *Strategia nazionale per lo sviluppo sostenibile* and the *Strategia nazionale per la cittadinanza globale.* In short, ESD has a solid, formal foundation within the Italian education system, but its concrete implementation remains weak. On the one hand, public perception of increased sustainability-related activities is

increasing; on the other hand, key ESD requirements—such as continuous teacher training, developing transversal competences, and integrating the three dimensions of sustainability within curricula—are lacking. According to ISTAT (2024 https://www.istat.it/comunicato-territoriale/il-benessere-equo-e-sostenibile-dei-territori-report-regionali-anno-2024/), some northern Italian regions—particularly Trentino-Alto Adige, Friuli-Venezia Giulia, Emilia-Romagna, and Veneto—have a high level of integrating ESD into the social and territorial fabric, so much so that the principle of sustainability strongly influence local policy choices. A second group of central regions, including Toscana, Umbria, Lazio, and Marche, as well as Liguria, Piemonte, Lombardia, and Valle d'Aosta, have integrated ESD to some degree. In these areas, while ESD is present, incorporating these competences into society and the labor market have been difficult. Finally, the southern regions and islands—Sardegna, Molise, Campania, Calabria, and Sicilia—have a low level of ESD integration, which is often absent from school PTOF (Piano Triennale dell'Offerta Formativa) documents and university programs. This lack already has produced negative consequences in the job markets and other economic opportunities in these regions and, consequently, has widened the gap between other Italian regions.

For the purposes of this research, further examining interregional or intraregional differences related ESD is not worthwhile. However, a useful analytical approach might study UNESCO Associated Schools (Scuole italiane associate UNESCO ASPnet, 2024 https://www.scuoleitalianeunescoaspnet.it/wp-content/uploads/2024/07/Le-Scuole-Italiane-Associate-UNESCO-ASPnet-nel-contesto-nazionale-IIS-G.A.-Pischedda-Bosa.pdf?utm) or those that participate in the *Scuole 2030* project (INDIRE, 2023 https://scuola2030.indire.it/), which could serve as proxies for participation through the number of registered teachers. Other tools would include ministerial monitoring data (MIM, 2023 https://www.mim.gov.it/web/guest/home), INVALSI (2024, https://invalsiareaprove.cineca.it/docs/2024/Indagini%20internazionali/RAPPORTI/RAPPORTO_NAZIONALE_ICCS_2022_INVALSI.pdf) surveys, or the examination of each school's *PTOF*. Nonetheless, section 4.1 pointed to deep inequalities and disparities related to ESD in Italian schools. In short, although MIU promotes and includes ESD within the education system—alongside digital citizenship and education on the Constitution—its practical implementation remains challenging. Some progress has been made, but a more serious and coherent integration is still needed. Today, ESD remains overly dependent on individual initiatives, and the absence of a shared, binding national

directive continues to make overcoming this impasse difficult.

4.2 Education for Sustainable Development in Milan Schools: The Power Up! Project

A goal of my doctoral dissertation is to explore the state of ESD in Italy through a focused analysis of several schools in the municipality of Milan. In general, various initiatives have contributed to the dissemination of ESD. Among the most significant is the Green School project—a well-established network that involves approximately 250schools in Lombardia including numerous institutions in Milan, and a total of 40,000 students and 2,000 teachers. The network's activities include hosting teacher training courses, implementing "eco-actions" within school buildings, monitoring resource consumption, and facilitating a Green School certification system that both the Municipality of Milan and the regional network Lombardia Green School recognized (Comune di Milano, 2025 https://www.comune.milano.it/aree-tematiche/relazioni-internazionali/milano-internazionale/cooperazione-internazionale-2/green-school).

Another significant initiative is the "Lead Schools for Environmental and Sustainable Education" program, which has established a territorial reference network of 13 state schools (one per province, one for the City of Milan, and one for the Metropolitan City). The goal is that these schools will coordinate and promote good ESD practices in collaboration with local authorities and universities (Regione Lombardia, 2024 https://sviluppsostenibile.regione.lombardia.it/it/b/201/pubblicazione-del-bando-per-la-selezione-delle-scuole-polo). Unlike the Green School project, which falls under the jurisdiction of the Municipality of Milan, the Lombardy Region, in collaboration with the Regional School Office (USR), promotes the program, which is valid for a three-year period (2024–2026).

Among the ESD initiatives that the Municipality of Milan promotes is *project Power Up!* (Istituto Oikos, 2025 https://www.istituto-oikos.org/progetto/power-up/), a European initiative in which I took part during my internship at Istituto Oikos.[35] The overall goals of project *Power Up!* include fostering young people's active engagement in public climate policies and promoting informed and meaningful participation in Europe's ecological transition. The initiative recognizes that addressing the climate crisis requires a collective and cross-sectoral effort in which younger generations take on a

[35] See note 2.

leading role. To this end, project *Power Up!* provides young people with tools, training, and opportunities to engage with international and national experts, policymakers, and peers and encourages them to contribute concrete proposals within local and European institutions. Launched in June 2024 and scheduled to conclude in June 2026, project *Power Up!* involves young people aged 15 to 23 from four European cities—Milan, Pernik and Kyustendil (Bulgaria), and Ljubljana (Slovenia)—and ensures inclusion among participants from different gender, cultural, and economic backgrounds so that the program and its subsequent debates truly represent all segments of society. Led by Istituto Oikos and funded by the European Commission under the CERV Program (Citizens, Equality, Rights, and Values), project *Power Up!* involves a series of ESD actions, to which the Municipality of Milan also contributes. These include

- the creation of a digital participation platform designed to connect organizations, public institutions, and international networks and facilitate the exchange of experiences, thematic training, and collaboration on issues related to sustainability and intergenerational justice;
- the *Youth Climate Assembly*, to be hosted in Milan in 2026, which will involve 100 students from six upper secondary schools in the city—the initiative is an innovative civic participation experience that aims to develop concrete proposals for the municipal administration ad continue the *Permanent Citizens' Climate Assembly*;
- the *Milan International Forum*, a two-day event that brings together young people, policymakers, experts, and activists and offers a space to discuss project outcomes and best practices.

My contribution to project *Power Up!* consisted in participating with colleagues from Istituto Oikos and the Italian Climate Network in a series of meetings dedicated to ESD that were held in Milan's secondary schools. The goal of these meetings was to raise students' awareness of climate change and sustainability and prepare them for active involvement in the project—both in exchanges with students from Slovenia and Bulgaria and in the preparation for the Milan Youth Climate Assembly.

My collaboration was structured around two meetings at each school. The first, introductory session assessed students' level of knowledge about climate change, climate action, and sustainability; it also addressed possible gaps in knowledge with a dialogical lesson. The second session was a more practical, workshop-oriented format that included

a group activity that Professor Andrea Turolla of the Politecnico University of Milan designed. In this activity, the class was divided into groups to simulate a Conference of the Parties (COP) to highlight the challenges of managing the climate issue at national and international levels and the complexity of reconciling different countries' social and economic needs. During the first session, I asked students to write on two Post-it notes the first two words that came to their minds when they heard "climate change." Table 4 presents the results from the Post-it responses of 121 students.

28 – Pollution
22 – Melting glaciers / ice, Animal extinction / species loss
15 – Global warming / heating, Extreme heat / hot
13 – Greenhouse effect
10 – Global warming
9 – Heat / hot, Animal extinction (various phrasings)
6 – Sustainability, Temperature changes / fluctuations
5 – Sea-level rise, Forest fires, Greenhouse gases
4 – Environment / planet, Extinction (general), Climate (general), CO_2 / carbon dioxide
3 – Temperature extremes / extreme weather, Ice (general), Ozone hole, Floods & drought, Ecosystems / habitat loss, Emergency, *Agenda 2030*
2 – Cold / getting cold, Habitat loss, Electric cars, Renewable / sustainable energy, Climate denial, Greta Thunberg / Greta, Health at risk / human well-being, Temperature rise & glacier melt
1 – Climate pollution, Suffering of animals, Catastrophe, Ecosystem protection, Highways, Instrumentalization, Garbage / landfills, Industrial emissions / CO_2 emissions, Destruction of the environment / planet, Death, Polar bear, Sun, Clouds, Planet Earth, Nuclear, Antarctica, Indifference, Paris Agreement, Research on living beings, Fear for future generations, Time, Injustice, Ecosystem changes, Capitalism, Consumerism, Factory / industries, Underestimation, Extreme events, Floods; Environmental Damage, Loss of human lives, Danger, Smog, Disappearance, Egoism, Smoke, Deforestation, Science, Future, Revolution, Industrial Revolution, Community, Responsibility, Air, Anxiety, Activists, Plastic, Eco-green, Goals, Fewer nutrients, Now, A big problem, Trump, Current issue, Exploitation, Wars, Future of next generations, Destruction of natural animal habitats

Table 4. *Student Responses: Words They Associate with "Climate Change."*

Given their responses, although students in certain secondary schools within the Municipality of Milan have some awareness of climate change, considerable confusion persists. The responses show a fragmented understanding, one in which accurate scientific notions, generic or incorrect terms, and emotional or symbolic references are intertwined. Some students correctly associate climate change with the concepts of greenhouse effect (13), greenhouse gases (5), CO_2 or industrial emissions (6), and deforestation and forest fires (5); this association demonstrates a basic knowledge of the main anthropogenic causes of global warming. However, the parallel use of terms like "pollution" (28) or "climate pollution" indicates a possible conceptual overlap: many students appear to identify air or environmental pollution generically with climate change, without distinguishing the former as a main cause of the latter.

Many responses accurately refer to the main effects of climate change, such as glacier melting (17), sea level rise (5), temperature increases or fluctuations (8), and droughts or extreme events (6). However, other responses—ozone hole (3), nuclear, highways, or garbage—refer to phenomena that are marginally related or entirely unrelated. These suggest widespread confusion about the nature of climate change, which is often perceived as an all-encompassing environmental problem that involves all forms of ecological degradation or damage.

In addition to responses that refer to scientific notions, many responses were emotionally or ethically charged: fear for future generations, injustice, selfishness, indifference, anxiety, danger, death, extinction. These expressions reveal a growing sensitivity to the moral and intergenerational implications of the climate crisis, yet they also show that students understand climate change in terms of concern, helplessness, and a sense of loss rather than have a structured understanding of the phenomenon.

Finally, some students connect the topic to contemporary figures, policies, or concepts, such as Greta Thunberg, Trump, the Paris Agreement, *Agenda 2030*, capitalism, and consumerism. These references indicate some awareness of the public and media debate around the climate crisis, but also suggest that political narratives, and not disciplinary knowledge, shape their understanding. Overall, from the sample of responses from Milanese secondary students, my impression is that, while students have a general awareness of climate change as a global and urgent problem, they often lack of clarity in distinguishing causes, consequences, and related phenomena, as well as its political, social, and moral dimensions. It seems their knowledge is generally

unsystematic and consists of scattered information from the media or political debate rather than from a structured educational pathway. Thus, Italian education institutions in concert with the ministries ought to strengthen ESD in school curricula, as climate literacy is lacking. Nonetheless, the experiment would have been a success if students had indicated, on their two Post-it notes, a cause and consequence of climate change. The collected data show that this goal was only partially achieved and that, in general, students are confused about or misunderstand the conceptual framework of climate change.

From a methodological standpoint, it is necessary to clarify more explicitly the status of these observations. The empirical component of the thesis was conceived as exploratory and illustrative, not as an evaluative or comparative study grounded in validated instruments. The Post-it activity used in the first session had a preliminary diagnostic and dialogic function, aimed at eliciting spontaneous representations rather than at standardizing the measurement of levels of climate literacy.

In terms of science education research, the inquiry is not based on a quasi-experimental design, nor on coding protocols derived from established frameworks (e.g., rubrics for assessing scientific competencies, operational indicators of agency, or validated tools for measuring alternative conceptions). The analytical criteria adopted are qualitative and interpretive in nature and do not aim at the statistical generalization of the findings. Moreover, the educational objectives of the intervention were not formalized through learning outcomes explicitly anchored to national curricular standards or to widely shared theoretical models in sustainability education.

Consequently, the considerations proposed here are not intended to establish a definitive judgment about the level of preparation of students in Milan, nor to provide a systematic evaluation of the effectiveness of ESD in Italian schools. Rather, they should be understood as preliminary indications useful for highlighting the presence of not always well-structured representations and the possible need for more systematic educational pathways.

The intervention can be considered only partially successful with respect to the minimum objective—namely, that each student identify at least one cause and one consequence of climate change—but this observation must be interpreted in light of the methodological limitations outlined above. Rather than providing conclusive evidence, the data collected point to the opportunity for future research employing tools more closely aligned with methodological standards in science education and sustainability education, so as to distinguish more precisely among disciplinary knowledge, media

representations, emotional dimensions, and forms of agency. Nonetheless, they do indicate—albeit in a very general sense—the need for a stronger effort to implement ESD.

4.3 Education for Sustainable Development Worldwide

Outside of the Milan and Italian contexts, scholars have conducted many on the challenges of encouraging ESD globally (UNESCO, 2019 https://unesdoc.unesco.org/ark:/48223/pf0000370215.locale=en). To discuss these challenges, I consider data from UNESCO's Institute for Statistics (UIS), specifically its *Metadata and Data Explorer* reports for indicators 4.7.1 and 4.7.4 (UIS, 2024 https://databrowser.uis.unesco.org/browser/EDUCATION/UIS-SDG4Monitoring). The data reveal an uneven picture of how national and supranational institutions, which, given their position and function, should be central to the educational process, act differently on the basis of the geographic area in which they operate. Indicator 4.7.1 measures the degree to which ESD has been mainstreamed; that is, it measures how effectively *ESD* has been integrated into national policies, school curricula, teacher training, and evaluation systems. Indicator 4.7.4, on the other hand, measures students' understanding of issues related to climate change and sustainability. Indicator 4.7.1 is available for 55 to 70 countries, mainly based on 2020 data. The results are expressed as an index (from 0 to 1, where 1 represents the maximum value and 0 indicates complete absence). Indicator 4.7.4. for the period from 2016 to 2022, is available for only 32 countries, mostly in the Global North. Note that the two indicators do not always correspond: a high level of ESD integration in institutional channels (4.7.1) does not necessarily imply a widespread understanding of climate issues within civil society or the education system (4.7.4).

Although one could analyze almost every country in detail—for instance, examining how indicator data have changed over time and how national or supranational policy choices have influenced ESD integration—my aim is to highlight the discrepancy between the Global North and Global South.

First, countries in the Global North tend to report and make their data public, while many Global South countries do not. Investigating the reasons for this lack of transparency or limited ESD implementation—which involve complex moral, economic, and political factors, as well as the CBDR principle—is beyond the scope of this research.

Consequently, my aim is not to blame Global South countries, given that many not did not contribute to creating the climate problem, but these nations suffer its effects more severely and from much more disadvantaged socioeconomic conditions, which are often the result of activities of countries in the Global North.

Nevertheless, countries in the Global North demonstrate consistency between their mainstreaming of sustainability and ESD and their younger people's having a genuine understanding of these issues. For countries in the Global North, their 4.7.1 values typically range between 0.5 and 0.8, which demonstrate that ESD has been integrated into policy documents, curricula, teacher training, and evaluation systems. For instance, consider the UNECE ESD Strategy, which the EU adopted in 2005 and which has led to national plans focused on this type of education (Nevin, 2008). Moreover, since 2018, Japan has made ESD a mandatory part of the national curriculum (MEXT, 2018 https://www.mext.go.jp/en/unesco/title04/detail04/sdetail04/1375695.htm). Similarly, the 4.7.4 indicator percentages exceed the global average: over 60% to 70% of students demonstrate adequate understanding of sustainability topics. In these countries, the alignment between policies and school practices is therefore strong.

In contrast, in Global South countries, 4.7.1 values are generally lower: ESD is only partially present in curricula or policy documents and is rarely integrated into teacher training or evaluation. The 4.7.4 percentages—when available—are also low, often below 40% or 50%. Rural areas further amplify this disparity, a phenomenon that, although present in the North, is much less pronounced given their stronger institutional structures. A primary cause of these results is that less than 10% of youth in the Global South have access to higher education, compared to 79% of children in Europe and North America who do have access (Dixon, 2025). Of the countries in the Global South, only 20% to 40% have integrated ESD practices into educational policies (UNESCO, 2021a https://unesdoc.unesco.org/ark:/48223/pf0000374802). In some cases, such as in South Africa or Latin America, local resistance and institutional barriers have led to the gradual abandonment of ESD (Acosta, 2025; Kioupi and Voulvoulis, 2022).

Various reports confirm this discrepancy in the implementation of ESD and sustainable practices. UNESCO's (2021a) *Education for Sustainable Development: A Roadmap* reports that Europe and North America display very high percentages of ESD principles in educational policies: up to 80% of the countries in Europe and North America include ESD in their curricula and teacher training. Globally, only 7% of teacher training programs fully integrate ESD. Moreover, this number is primarily the result

European and North American efforts, especially following the Bonn Declaration (German Commission for UNESCO, 2009, https://unesdoc.unesco.org/ark:/48223/pf0000188799) and the Berlin Declaration (UNESCO, 2022a https://unesdoc.unesco.org/ark:/48223/pf0000381228; O'Donnel and Baloch 2022). Similarly, UNESCO's (2023*) Global Education Monitoring Report, Technology in Education: A Tool on Whose Terms?*, reports that ESD implementation is very active in Global North countries, in part because its implementation is strongly correlated with higher levels of income, institutional development, and technological advancement—a fact that explains the greater commitment of Global North nations. In contrast, in Global South countries, ESD often remains a fragmented educational approach, one that is heavily dependent on individual actors' or local institutions' initiatives.

> Access to and use of education […] is characterized by inequality, a phenomenon that received greater attention during the COVID-19 pandemic. The costs of electricity, internet connection, and hardware and software are high and often underestimated. Sustainability concerns go beyond social dimensions and extend to economic and environmental aspects. As technology is constantly changing, making decisions that promote equity and quality requires expert guidance from trusted sources [….] Regulatory enforcement of equitable policies and practices can be difficult to implement if governments are unable to invest sufficiently in the technical expertise which it requires. […] Procurement regulations and standards need to embed sustainability as a criterion for adopting interventions that are economically, socially and environmentally effective and efficient and can be scaled up for the good of all. (UNESCO 2023, p. 142 https://www.unesco.org/gem-report/en/publication/technology)

Additionally, most publications on ESD originate in the Global North. A 2021 study found that over 70% of ESD publications produced during the UN Decade of Education for Sustainable Development (2005–2014) came from Europe—particularly Germany, the Netherlands, and Sweden—as well as from Australia, Canada, the UK, and the US. Among Global South countries, only China, South Africa, Brazil, and Turkey produced ESD publications and did so to a much lesser extent (Nordén and Avery, 2021).

This same difficulty is observed regarding indigenous populations, especially those in Global South countries who are even more disadvantaged and marginalized than

indigenous populations in Global North countries.

> Few survey participants reported that indigenous stakeholders were involved in the implementation of school based environmental activities, which raises questions about the dominant culture from which environmental knowledge is selected. While these results may reflect missing country cases or sampling issues, this relative exclusion of indigenous knowledge in school environmental learning deserves further scrutiny. (UNESCO, 2021b, p. 38 https://unesdoc.unesco.org/ark:/48223/pf0000377362)

Colonial practices both progressively erased indigenous cultures' ways of life and ecological relationships with the land and introduced industries based on resource extraction or that transform the environment. Consequently, colonial practices generate and perpetuate environmental violence and related harms that disproportionately affect these communities (Whyte, 2018). Nonetheless, attempts to integrate indigenous culture into the institutional framework of sustainability should not be excluded (Druker-Ibánez and Cáceres-Jensen, 2022). On the contrary, such integration helps students and citizens understand the existence of ecological cultures that are not necessarily linked to the Western scientific world and strengthens their connection to the territories in which they live. Kyle Powys Whyte (2013, p. 10) argues that "TEK and its synonyms indigenous knowledge and native science […] must play the role of inviting cross-cultural and cross-situational learning for indigenous and non-indigenous policy makers, natural resource managers, scientists, activists, elders, and youth." Doing so can contribute to a gradual decolonization of the concept of sustainability, which, if reduced to only a technical-functional dimension (see section 3.3.2) or the *business-as-usual* paradigm (see section 3.3.1), is not immune to such distortions, even though it was never meant to be understood in this form.

In conclusion, the different histories and socioeconomic conditions of countries in the Global North and South, the disparities between rural and urban areas, and, not least, the contrast between contemporary societies and indigenous cultures, are all factors that have led *ESD*—and even more so *EES*—to remain underdeveloped and under-supported. On the contrary, the fight against climate change should start from these disciplines, both practically and epistemically, as the fight cannot rely solely on climate actions, given the crisis' moral challenges. UNESCO states that

> a new relationship must be established between education and the knowledge, capabilities, and values that it cultivates. This starts with examination of the capabilities and knowledge that enable students to build a peaceful, just and sustainable world and maps backwards along the curricular pathways that help them develop those capacities. To make a new social contract for education together, we need to think about curricula as much more than a grid of school subjects. Curricular questions need to be framed in relation to building competencies and two vital processes that are always present in education: the acquisition of knowledge as part of the common heritage of humanity, and the collective creation of new knowledge and new worlds. Trends and theories abound about what and how to teach and learn. Learning designs can be framed as child-centred or subject-centred, learner-centred or teacher-centred. Knowledge can be categorized as academic or applied, scientific or humanist, generalist or specialized. While each approach has something to offer, new paradigms and perspectives are needed to reflect the increased complexity of the interactions of knowledge with the world. Educators should approach the acquisition of knowledge by simultaneously asking: what should be learned, and what should be unlearned? This is a particularly important question at this critical juncture in which the mainstream development and economic growth paradigm needs to be rethought in the light of the ecological crisis. (UNESCO, 2021c, p. 64 https://unesdoc.unesco.org/ark:/48223/pf0000379707.locale=en)

Thus, the absence of a collective Climate Agreement—one with a fair enforceable mandate based on the CBDR principle—and the lack of genuine shared commitment among countries and supranational institutions explain the differences in realizing sustainable practices, climate actions, and understanding climate issues between the Global North and South. As highlighted in the Berlin Declaration, this gap perpetuates existing global injustices. Establishing a set of effective, binding, and shared solutions appears to be the only concrete way to reverse this trend. This common proposal must be based on the willingness to increase North–South partnerships to transfer ESD knowledge (UNESCO, 2022b https://www.unesco.org/sites/default/files/medias/fichiers/2022/09/esd-net-cn-en.pdf), invest in teacher training in the Global South, and continuously monitor progress through indicator 4.7.1. In reaching a Climate Agreement, states and supranational institutions would fulfill their collective duty by assuming their roles – agency – as practical and

epistemic facilitators and thus would avoid culpability.

It is important to clarify that, in this case as well, the empirical component serves a primarily illustrative and contextual function. The analysis of the indicators is not intended to constitute a systematic comparative study or a causal evaluation of national educational policies, but rather to provide a descriptive framework useful for situating the theoretical argument within broader institutional dynamics. Moreover, the available data present significant limitations: incomplete coverage (55–70 countries for indicator 4.7.1; 32 countries for indicator 4.7.4), a predominance of countries from the Global North, differences in data collection and reporting systems, and the absence of perfect correspondence between the two indicators.

From a methodological standpoint, these normative considerations must also be distinguished from the descriptive data. The UIS indicators do not in themselves demonstrate the existence of a global injustice in the implementation of ESD; rather, they make visible disparities that—when interpreted in light of principles such as CBDR and analyses of North–South inequalities—may be read through an ethical-political lens. The normative argument does not mechanically derive from the data but is grounded in a theoretical analysis that uses them as elements of empirical contextualization.

Accordingly, the global empirical component, much like the one related to the Milan case, does not claim to meet the standards of experimental research in science education nor to provide definitive generalizations. Instead, it performs a critical supporting role for the conceptual analysis, helping to show how institutional, economic, and epistemic conditions influence the implementation of ESD. From this perspective, the call for a fair and binding Climate Agreement and for strengthened North–South partnerships should not be understood as an empirically demonstrated conclusion, but rather as a normative proposal consistent with the theoretical framework developed and with the trends highlighted by the available data.

Conclusion

In November 2022, when I began working on environmental ethics and climate change, the global response to the climate crisis appeared considerably more reassuring than it does today. In Sharm el-Sheikh, COP27 was about to begin and would lead to an important breakthrough in the financial management of the crisis: the creation of the "Loss and Damage" fund that would compensate vulnerable countries for climate-related harm (UN, 2022). During the same period, the European Union launched the "Fit for 55" plan, a broad legislative package that aimed to reduce emissions by 55% by 2030 (Council of the European Union, 2023). Since the 2022–2023 biennium, a great deal has changed. The geopolitical instability that marked the last two years of my research has contributed to pushing the crisis out of focus and has reduced both public interest and political and institutional engagement. Consequently, adopting effective solutions has slowed. The United States is representative of this trend. During Joe Biden's presidency (2021–2024) and through the Inflation Reduction Act (2022), the climate crisis occupied a central place in its national political agenda. Today, however, with the return of Donald J. Trump, this commitment has been substantially scaled back—at least as far as federal action is concerned. Yet regardless of fluctuating levels of public or governmental interest in climate change, the COVID-19 pandemic clearly demonstrated to humanity the importance of preserving a balanced global ecology. Although the virus has not been directly linked to rising global temperatures, the climate crisis helped to create the conditions for its emergence and rapid spread. The pandemic revealed the deep interdependence of human health, ecosystem integrity, and global systems of mobility, production, and consumption. At the time of submitting this work, many of the issues addressed here—closely tied to the climate crisis—are far less present in political agendas than they were in 2022. Nevertheless, despite increasingly widespread indifference, climate change continues and intensifies its effects year after year. In 2024 alone, the global average temperature exceeded the indicator—1.5°C above pre-industrial levels for twelve consecutive months—articulated in the Paris Agreement.

This is not the place to list all the existing impacts of rising global temperatures, but we should acknowledge that we have collectively made some progress. Nonetheless, these efforts have not been sufficient, and true collaboration between the countries of the Global North and the Global South is still lacking, particularly in establishing an

effective, collective Climate Agreement (2.4). Noting this lack of an agreement is not meant to be a generic criticism but is a recognition that climate change should be an absolute priority. Moreover, as I have shown in Chapter 1, the crisis is even more insidious, give its medium- to long-term nature: it does not reveal its worst consequences immediately and, especially in temperate regions, creates the illusion that there is still time—and room—to address it ordinarily. Its temporality is crucially different from other environmental issues humanity has faced, such as the hole in the ozone layer, which demanded an immediate and effective solution and demonstrated the international system's ability to act swiftly when the effects of a phenomenon are evident and indisputable. In contrast, the complexity of climate change—combined with the complexities of the contemporary world—makes implementing action that is sufficiently concrete and coordinated difficult.

The main objective of my research has been to examine the concept of sustainability, which has been proposed as the principal solution to the climate crisis because of its material and moral implications. In this thesis, I have approached it as a genuine vision of society and not merely as technical or economic tool (Chapter 1). My analysis is neither a critique of sustainability itself nor an attempt to put forward alternatives; rather, it is a critique of the ways in which we currently apply, interpret, and discuss sustainability. In other words, I am not proposing an alternative to sustainability but am clarifying the concept through theoretical and practical inquiries (Chapter 1). All of this has allowed me to investigate which collective entities bear the greatest responsibility for disseminating information about and implementing sustainability (Chapter 2) and which discipline best promotes its learning: sustainability education (Chapter 3). Moreover, the complex nature of the climate crisis has convinced me that, in addition to greater commitment from states and supranational institutions to sustainability education, we need to emphasize a specific normative proposal, one that combines environmental sustainability (Chapter 1) with an educational approach that is consistent with this perspective (Chapter 3). This normative proposal has been a secondary aim of the thesis. Finally, the central role I assign to sustainability education is highlighted in Chapter 4, which presents an analysis of Italian legislation on environmental education and the empirical research I conducted in several schools in the province of Milan during my internship at Istituto Oikos. This investigation helped reconstruct the Italian situation, revealing all its limitations due to the absence of a shared collective agreement on sustainability education, and to analyze differences in how countries in the Global

North and the Global South understand this notion.

i. Remarks for Clarification

Investigating what sustainability is and sustainability education involve, as well as whether and to what extent collective entities are responsible for implementing sustainability and sustainability education, is undoubtedly in the realm of interdisciplinary research. For clarity's sake, I should indicate which debates the thesis is *not engaged* in, even though it may marginally touch these fields.

First of all, this is not a work of political philosophy or one that engages theories of justice. Although it touches on related topics, such as responsibility, justice, and intergenerational equity, I have not engaged in an in-depth investigation of these issues. I have simply assumed that, among collective entities, those endowed with greater practical, epistemic, and (above all) regulatory capacities bear a more significant share of responsibility.

Second, this is not a work of normative ethics or applied moral philosophy. The thesis does not address questions about individual rights and duties or about individuals' behavior related to the environment and climate change. I consider concepts such as blame, moral obligation, and personal responsibility instrumentally—namely, insofar as the concepts help identify and analyze the greater responsibility that collective entities bear, particularly the responsibilities of states and supranational institutions.

Furthermore, this thesis does not fall within the field of environmental economics or political science, as it does not focus on environmental policies, climate governance, cost-benefit analyses of sustainability, or the tools associated with environmental economics, such as carbon taxes or green finance. My critique instead concerns the discourse about sustainability and that surrounds sustainability education, given that, at the international level and within climate governance contexts (such as the COPs), sustainability is considered *the* solution to the climate crisis.

Although I refer to technosciences and geoengineering approaches, I do not engage with the technical-scientific details of these technologies and instead focus on their epistemological and ontological implications. Likewise, although I draw on the territorial awareness and refer to Indigenous populations, the work is not an empirical or ethnographic study of these communities. Instead, it is a bibliographic analysis that supports a theoretical discussion about the ecological dimension of sustainability and the relevant differences between the Global North and the Global South.

Finally, this dissertation does not offer an in-depth analysis of environmental or international law: it does not examine legal frameworks or mechanisms, such as the Paris

Agreement, in detail. Instead, it reconstructs their main content, as these instruments contribute to the international debate, without delving into the specifics of their implementation or legal soundness.

ii. Clarifying the Scope

Today, we seem to be living in a post-climate era, one marked, on the one hand, by resignation from collapse theorists and, on the other hand, by adherence to an eco-modernism, which entrusts human survival to the technological domination of the climate. On the collapsism side, which has been depicted in cinema, its prophets offer the image of a nature completely out of control—an unstoppable force, such as the comet in Adam McKay's *Don't Look Up*—that, given the climate crisis will inevitably lead to the breakdown of human society. Béla Tarr's *The Turin Horse* explores the possible consequences of such a scenario. More recent reflections are found in novels such as Stephen Markley's *The Deluge* or Paul Lynch's *Prophet Song* or, again, in the philosophical essay *How Everything Can Collapse: A Manual for Our Times* by Pablo Servigne and Raphaël Stevens. On the eco-modernist side, its advocates imagine a fully de-naturalized and technicized future, as if governing natural processes in their entirety were possible. This perspective is represented in Christopher Nolan's *Interstellar*, a film in which humanity—pushed to the brink by the climate crisis—is left with no option other than scientific progress, including exploring and colonizing other worlds, to overcome the limits of our planet. Kim Stanley Robinson's *The Ministry for the Future* expresses a similar idea, as it depicts how a set of radical technological interventions, from geoengineering to the direct manipulation of the atmosphere, save humanity – an idea that aligns with Elizabeth Kolbert's argument in *Under a White Sky*.

Within these polarized visions of the future, sustainability emerges as the only development model that can overcome the dichotomy between collapsism and eco-modernism, as it recognizes the value of technological tools and does not deny, as eco-modernism does, the ecological relationship that inevitably links humans and nature. Moreover, it draws our attention to the genuine unpredictability of natural processes without succumbing to collapsism yet still values the possibilities—albeit partial—that technological innovation offer.

In addition to re-centering the human-nature relationship, climate change also focuses our attention on the question of what sort of society we should strive toward as we confront the climate crisis. Here too, the outlook is far from reassuring. On one hand, proposals abound that challenge individual and collective rights: eco-authoritarian

models, in which governments impose environmental or ecological transition measures that restrict freedom; eco-fortress responses that, given nationalist strategies, protect domestic territories and exclude, for example, climate migrants; and climate-feudalism in which economic and technocratic elites control the tools of the transition while much of the population remains marginalized. On the other hand, there are commendable but difficult to implement proposals—such as degrowth strategies or certain forms of eco-socialism—(Volpi, 2025) that clash with the complexity of contemporary geopolitical fault lines. Even in these scenarios, sustainability represents the most desirable theoretical and normative framework, as it integrates environmental, economic, and social dimensions. Evidence of this integration abounds in economic support mechanisms for climate damage, financial instruments, and criteria such as ESG standards—all of which are follow from this conception of development.

Sustainability constitutes the most robust theoretical and normative response to climate change precisely because it can balance concreteness and realism. Its strength lies in integrating the various dimensions implicated in the climate crisis, reconciling technology with recognition of the ecological bond between humans and nature, preventing climate action from being reduced to a purely technical plan, and being able to account for moral challenges of climate change. While acknowledging criticisms (from greenwashing to conceptual vagueness) and the many limitations of the proposals derived from it (e.g., the Green New Deal or the 2030 Agenda), which are often hampered by weak enforceability, uneven national commitments, and difficulties in international coordination, I maintain that clarifying the meaning of sustainability, identifying the actors involved, understanding their responsibilities, and making the concept more comprehensible and actionable through education are necessary. These tasks have been the primary focus of my thesis. The possibility that actors other than states and supranational institutions—such as individuals, climate movements, or NGOs—could achieve also these objectives is not excluded here, despite its not being a focus of the work.

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