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Systemic challenges of modern climate communication: An insight into approaches of overcoming barriers and reshaping holistic narratives

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Affidavit

I, **ANGELIKA AUER, BA**, hereby declare

1. that I am the sole author of the present Master's Thesis, "SYSTEMIC CHALLENGES OF MODERN CLIMATE COMMUNICATION: AN INSIGHT INTO APPROACHES OF OVERCOMING BARRIERS AND RESHAPING HOLISTIC NARRATIVES", 86 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted the topic of this Master's Thesis or parts of it in any form for assessment as an examination paper, either in Austria or abroad.

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Abstract

This thesis examines climate communication and its challenges from a systemic perspective. The idea is to take a systems approach to understand, critique, and reframe current narratives within our systems. It emphasizes that the scientific evidence on climate change is challenging and demands action from society. However, climate communication shows not only to be about mitigating climate change, but also about comprehensive implementation of sustainability. The work builds on the idea that systemic structures of society are formative for narratives of communication and therefore need to be critically examined. The thesis further aims to provide insights into new narratives of climate communication. It is argued that by overcoming problems in current systems, contributions can be made to promote climate action. Climate communication in this sense needs future-oriented considerations for the actual implementation of social change.

The systematic approach can generally be considered a highly relevant for scientific examinations. Especially for complex issues like climate change, which include both environmental and social aspects, a holistic approach is necessary. This can best be achieved by taking a systemic perspective, which assumes that all things are interconnected. Ultimately, systemic societal structures in the political, economic and individual spheres must intervene and implement sustainability as much as possible. Only through a fundamental critical engagement with systems issues can the interactions of earth and social systems be understood and solutions for positive change developed.

Lastly, also narratives can take the holistic perspective and initiate change by intregating progressive approaches. At its core, the goal of climate communication is not just to bring scientific knowledge to the masses and generate understanding, but rather to foster storytelling that promotes a more equitable society based on values such as cooperation, well-being, and resilience. In this sense, climate communication is about much more than saving the planet. It is about developing a narrative that promotes hope for societal improvement on multiple levels.

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1. Introduction

The first part of the thesis aims to provide an insight into the problem identification, the research questions, and finally, the methodological approach to the applied research. Following outlines aims to give a framework for the proposed research of the thesis. The basic procedures and research objectives shall be further established.

1.1 Problem statement

The state of our planet is worrying, and the reasons and implications in this regard are of complex nature. The warming effect of greenhouse gases on the climate has been accepted science for more than a hundred years. The radiative effect of CO2 has been measured in the laboratory, and radiative transfer in the atmosphere is a well-known aspect of physics (Rahmstorf & Schellnhuber, 2006, 8). Despite these and numerous scientific findings and publications on the rise of the global mean temperature, such as international agreements and global promises to limit these effects, the actual ability to take action in the field of climate change remains limited. Voices are growing louder and climate activism is increasingly moving towards the center of society through social movements. Yet, communication on environmental issues remains challenging.

The current status of our planet's environment is undoubtedly serious in its complexity and scale. Increasing climatic changes and other pressures on environmental boundaries create pervasive circumstances that can lead to the collapse of whole ecosystems and may further destabilize the earth system as a whole (Rockström, 2009). In this sense, the ecological challenges affect our entire world and oblige the international community to act. From a political perspective, at the heart of this challenge lies the activation of will and power for transformation. Policymakers, climate advocates, and scientists are globally concerned with complex and interconnected feedback mechanisms that operate between the economy, society, and ecosystems:

„Our world is changing. In fact, Earth has always been changing and will continue to do so for ages to come. Yet, there is a difference between the changes occurring now and those that occurred previously. Earth is changing faster today than it has throughout most of its 4.6-billion- year history. Indeed, it may be changing faster than it ever has, except perhaps in the aftermath of giant meteorite impacts. The cause of this accelerated pace of change is simple: human activity.“ (Kump, 2014, 11)

Natural disruptions and emissions can precisely be attributed to our way of living. It seems that the consumption, short-term, and growth orientation is not in harmony with the realities and scarce resources of our planet Earth. However, despite the relatively

straightforward implications of climate change, its mitigation and adaptation for behavioral values and choices by the public engagement in action are still limited (Whitmarsh et al., 2011). Essentially, it is a matter of bringing the scientific findings to the masses and generating understanding and the will to act. Communicating this to a broad general public is thus to be seen as the major challenge. Although the basis of environmental knowledge is to be found in science, language and communication are a vital part of public perception and communication has certainly developed its own dynamics in regards to climate change (Nerlich, 2010). The following thesis explores the assumption that environmental communication is to be considered challenging, however, if it is done well, part of the solution. With the help of narratives, it is not only necessary to determine scientific information on the latest climate findings, but in the best case, also to stimulate and initiate social change that addresses the very substance of our existing structures.

1.2 Research question

Not only a core scientific method but also a helpful approach to complex issues is the so-called systems approach. It considers multi-layered questions in a kind of holistic attempt of gaining insights on a systemic level. The idea aims to integrate complexity and establish critical points from different fields of science. The interdisciplinary and interconnective approach to global issues is at the center of this approach. The systems approach provides a global and holistic perspective of climate change. The research is related to the struggle of action towards climate change and sustainability and communication narratives assigned to it. The hypothesis around this work assumes that we can categorize whole dimensions of life into systems. Especially relevant here are the earth system and the, human-generated, social system. Given how systems were established, certain narratives are consequently formed and encouraged. In a way, these are embedded in our society through our lifestyle. Further, it can be stated that the systems that humans have established, in which we live, work, and act, impose several systemic barriers. These barriers are not to be considered good or bad at first, but they do impede or complicate the ability to act towards inclusive, sustainable action. Consequently, the barriers make it significantly more challenging to recognize and communicate the challenges of climate change. Climate action and mitigation strategies are significantly dependent on communication around the relevant topic. The research focuses on exploring in-depth communication narratives around systemic formations. In that sense, the research aims to examine the systems from a holistic perspective, identify the imposed barriers, and develop narratives that can help overcome

the barriers. The research question is thus defined as follows: *How can we overcome barriers and reshape narratives of environmental communication towards societal action?* In the broadest sense, it is a question of exploring system approaches regarding environmental communication. Furthermore, an orientation to investigate the research question with additional sub-questions is given. These sub-questions are part of the research and provide a guideline for the structure of the thesis:

1) What is the theoretical background for systems, climate communication and its current narration?
2) What systemic barriers to climate action can be identified?
3) What are progressive concepts that encourage new narratives?
4) What principles could help to shape modern climate communication?

The questions also reveal a particular structure of the thesis. While the first part of the thesis deals with exploring system theory, current systems and systematic barriers, the second half of the thesis takes a deeper look at overcoming narratives. The objective of the research is to bring together a wide range of scientific disciplines and use their key insights to develop helpful communication narratives that are solution-oriented, inclusive and forward-looking. Furthermore, helpful narratives shall be developed, aiming at climate action and a sustainable future orientation for our society and the planet.

1.3 Methodology

The thesis aims to explore the challenges of climate communication through a qualitative methodology to further provide insight into progressive impulses for societal change towards climate action. The research method of this thesis is considered a qualitative research. Since the question being approached is a very contemporary or even future-oriented one, this can be considered an appropriate approach, in terms of the exploration of new problems and opportunities. The work will primarily be a literature study, which includes the most important scientific insights around system theory, the Earth and social system, climate communication, and modern progressive and integrative concepts. Since there are many books and publications on environmentalism and climate communication, the thesis will mainly draw on primary and secondary literature from recent years and take a current perspective. The second half of the thesis deals with more progressive approaches and their implementation in narrations. Three expert interviews aim to deepen, review, and expand on the existing literature insights. The experts draw from interdisciplinary and diverse fields of physics, system change activism, and environmental psychology.

2. Basic concepts and assumptions

First, certain basic assumptions and concepts need to be clarified. It is about understanding how we as humans live and how our systems work, which also brings us into the current situation of environmental uncertainties. To understand why approaching and communicating complex environmental issues is so challenging, it is necessary to understand systems. The first question: *What is the theoretical background for systems, climate communication and its current narration?* Shall be addressed by outlining the earth system as a whole and the social systems, that shape the global environment of people. Also, from a scientific perspective, the human being can be considered a system. Only within these systems can communication take place. The following examination aims to represent reality through relevant concepts and assumptions rooted in the approach of system theories. It is essential to present certain foundations for scientific approaches and fundamental understanding. Furthermore, a look into the system theory is given. By establishing basic assumptions and concepts, the foundation for a holistic system perspective is provided to deepen the understanding of the earth system and the social system perspective to it.

2.1 Science and systems theory

Before looking at the main systemic concepts, we must first establish the basis. This basis can be found in the scientific method of gaining knowledge. It is the foundation of science and also explains how science works. It is also considered the basis of all assumptions about our systems and how we live. The study of the scientific method includes the selection of subjects for experiments, the formulation of theories, and the analysis of hypotheses, but how these pursuits are conducted can vary widely (Andersen & Hepburn, 2019). Science has, in any case, the goal of advancing knowledge and thus tries to seek truths. However, the scientific method is much more about the approximation of evidance than truth seeking in an absolute sense. In general, it can be stated that science is a collaborative and unifying means of human knowledge accumulation. Science can thus be understood as a universal language that should find answers to questions of humanity. Investigations of science are generally based on things that can be directly observed or that produce directly observable events. This is known as empiricism - the view that generalizations are valid only if they are based on evidence that can be directly observed or verified by our senses (Tischler, 2010, 7). In this sense, scientific findings must be

repeatable, observable, and verifiable.

The core of science is to determine the truth. However, this sounds easier in theory than it is in practice. Scientific truth ideally represents an active social consensus among experts after extensive evaluation and disinterested scrutiny (Priest, 2016, 133). So there is not the one truth as such, but scientific hypotheses that are examined. Essential here, however, is the historically developed review process, which goes hand in hand with the hypothesis investigation. The task of the peer-review is to ensure the quality of scientific findings. For this purpose, different reviewers from the same field, notably, are consulted to test the same question and its answer. A hypothesis is thus upright until it is disproved; this is the common understanding of scientific truth and it shows that scientific truth is much more complex than initially and frequently portrayed. The binary approach between true and false does often not correspond to the scientific reality. Instead, it is a matter of differentiated considerations and elaboration of shades between hypothesis and findings. There are further specific categorizations of science. Simplified, a distinction is often made between "hard" and "soft science". Thus, the natural sciences are classified as "hard science," while "soft science" refers to the social sciences. This is undoubtedly a very simplified representation, but it gives an insight into the basic structures of the sciences. The mathematical foundations, especially in the natural science subjects of physics and chemistry, are often seen as the basis for the other sciences. Moreover, even today, research is usually viewed with a less than interdisciplinary approach in certain fields. Nevertheless, a binary understanding in the broadest sense refers to the distinction between the social and the natural perspective, which is also considered in this work. Further, the scientific perspective largely applies a reductionist approach. Reductionism is concerned with reducing the components of the system to the substantial. In physics, for example, particles are divided into their smallest components in order to gain knowledge. The reductionism stands in contrast to the systemic approach. System science, meaning the establishment of systems, is its basis. It is about modeling and resulting conclusions, which can be considered an essential way of addressing scientific research from a different perspective than a focus on examining details. We can distinguish between systems science, which is the scientific study and theory of "systems" in the various sciences such as physics, biology, psychology, and social sciences, and general systems theory as the study of the principles that apply to all or defined sub-classes of systems (Von Bertalanffy, 1792). The systems-level approach helps to understand the aspects of earth system functioning on which the survival of humanity and life in general depends, as it involves complex

interactions, synergies among system components, nonlinear responses, and multiple feedbacks (Steffen et al., 2005, 2). With the system approach, numerous aspects can be combined to draw meaningful conclusions for climate solutions. The systems approach is an attempt to represent realities, but it is, of course, to be differentiated from the actual reality. Like every scientific approach, they act as a model, and a means to understand our lives better. As George Box (1987) so beautifully described it: "Essentially, all models are wrong, but some are useful". In this sense, all scientific approaches to system analyses or other models are to be considered flawed. Nevertheless, the approaches can be considered helpful for complex issues since systems theory works in an interdisciplinary manner. It deals with general structural and functional principles of systems, abstracting from the specific properties of their elements and relationships. It can be further stated that systems and their boundaries are not given by nature or otherwise but are determined by the intention and conception of people, the "system observers". This includes the determination of so-called emergent or systematic properties, which are characteristic of the system as a whole, but not already for its components. Important concerning insights into system theory are insights of Mario Bunge, a philosopher and physicist who coined a materialistic approach to system theory in the 20th century. Bunge formulated a world of systems - systems are integrated wholes. They partly have properties that their elements already have and which they inherit from the latter. However, they also have new properties that their elements do not yet have and only emerge from the interaction of the elements. For example, water has new properties that a water molecule does not yet possess by itself, and living things are also physical things. (Bunge & Mahner, 2004, 18-80) In addition, Bunge also highlights an important principle for systems theory. This holds that there are no completely isolated things, and thus everything interacts with other things. In this regard following four postulates relevant to systems theory were raised:

- Every concrete thing is either a system or a component of a system.
- Every system (except the universe) is a subsystem of another system.
- The universe is the system that contains every other thing as a part.

These principles essentially lead back to the interdisciplinary nature of systems theory. Each thing is part of the system and contributes, thus also influencing the system and its interactions. Further, when looking at a system, specific parameters can be considered. An essential characteristic is the system boundary, which delimits the system from the environment and gives indications of what is placed within the system. Furthermore, a system is always characterized by system interactions. These can be interactions from the

outside to the inside, from the inside to the outside, or just system interactions within the system boundary. Systems also fundamentally strive to maintain or establish a state of stability. We speak here of the equilibrium or state of equilibrium from chemical science. The state of equilibrium defines a balance within a system. Furthermore, distinctions can be made in the way the system is created, and it can be characterized as living and natural or artificial. When it comes to concrete examples of systems, one can look at various subjects, such as biology, which considers organisms as systems. In ecology, one examines populations of many individuals and their development and interactions as systems. The look into the system theory can generally be helpful within several aspects of live. It has been shown that similar concepts, models, and laws arise independently in entirely different fields and based on entirely different facts. Regardless of the field of science there are many cases in which identical principles were discovered (Von Bertalanffy, 1972). General systems theory can therefore help avoid unnecessary duplication. Moreover, going further, a look into it may help to understand the complexity of challenges. System theory is, in summary, a helpful view of the conditions of the real world. It also provides space for understanding complex interrelationships and allows methodological considerations of challenging and overlooked matters.

„General systems theory is, as emphasized, a model of certain general aspects of reality. But it is also a way of seeing things which were previously overlooked or bypassed, and in this sense is a methodological maxim.“ (Von Bertalanffy, 1972, 424)

2.2 The earth system: Climate change, environmental pressures and planetary boundaries

If we apply general systems theory, we can see that our planet is considered one system in scientific considerations. It is named as so-called earth system or planetary system. Within this system, there are numerous subsystems, several natural systems, which interact. The scientific basis for considering the earth system is to be found in the natural sciences. Especially the laws of physics, chemistry, and biology play an essential role. They describe essential mechanisms within the earth system and include numerous sub-disciplines that seek detailed research on them. Looking into the earth system as a whole, we can note that numerous scientific discoveries of the last centuries have given an increasing understanding of the nature of our planet and its interactions within the planetary system. Lee Kump (2014) describes the earth system as a group of interacting components that influence conditions at the Earth's surface. The four main components of the earth system

are summarized within the atmosphere, the hydrosphere, the biota, and the solid earth. Further, each of the components can be ascribed to various other subsystems, which help to identify various changes and interactions within the earth system in more detail. Probably the best-known process attributated to climate change is the occuring global mean temperature change. It refers to the increasing temperature heating of our planet, more precisely of the earth's atmosphere. However, global mean temperature change is just one manifestation of climate change. Another consideration would address the earth systems change in terms of its energy budget. This means the surplus of energy that remains in the earth system by less reemission of radiation that we receive from the sun. Energy is an abstract idea but, at the same time, one of the essential concepts of physics. In order to solve those energy conservation problems, physics applies systems that are considered in isolation, and the conservation laws of energy (Knight, 2012).

If we consider climate change as a significant impact on the earth system, we need to take a look at one specific component, the atmosphere - we assume that the atmosphere is a system. Moreover, fundamental laws of physical thermodynamics are essential for the climate system because we characterize the global atmosphere as fluid. The first law of thermodynamics defines that energy is conserved. This means that in a closed system, the net energy must be conserved as well, and consequently, when heat is added or removed from the system, the internal energy must change for the system to function. These fundamental physical factors must be considered for the climate systems approach. Cosequently, when heat is added to the system, simultaneously a change in internal energy happens, that is the energy stored in the system. This introductory physical approach is now applied to the atmospheric system to understand the temperature changes of climate change: We assume energy input and energy output in the atmospheric system. The input to the atmospheric system can be noted as incoming shortwave radiation from the sun. The output is the reflection from the earth by outgoing shortwave radiation. According to the thermodynamic law, input and output energy must be in global equilibrium for the climate state to be considered long-term stable. The accumulated energy in the atmospheric system and the corresponding change can thus be calculated, and the change can be considered an adjustment to the planetary mean temperature towards a new composition scale. Climate researchers from the Potsdam Institute for Climate Impact Research Stefan Rahmstorf and Hans-Joachim Schellnhuber (2006) have published many scientific insights and findings on these so-called climate model assumptions. They conclude that the reason for the rise in temperature due to the increasing CO2 content of the atmosphere lies in the greenhouse

effect. It is based on the fact that the surface, like any physical body, radiates heat - the higher the temperature, the more. However, this heat radiation does not simply escape into space but is absorbed along the way in the atmosphere, namely by greenhouse gases (GHG). The most important of these gases are carbon dioxide, water vapor, and methane, which in turn radiate the absorbed heat evenly in all directions, and some of it back to the earth's surface. As a result, more radiation reaches the surface than without greenhouse gases: solar radiation and the heat radiation emitted by the greenhouse gases. Since we assume that equilibrium in the atmospheric system can only be restored when the surface also radiates more to compensate, that is, when it is warmer, and the temperature in our atmosphere consequently rises. Researchers refer to this as the greenhouse effect (ibid). The greenhouse effect thus explains why the earth warms up by rising temperatures. In essence, it is an adaptation of the system to the energy supply, such as the striving for equilibrium state of the atmospheric system. Natural systems are often considered autocatalytic, which means that they are, in their nature, complex and can not be controlled from the outside (Haberl et al., 2016, 46). This means that external circumstances cannot change the natural conditions and adaptations of the system - the fundamental physical laws remain. However, current pressures on the earth system are increasingly observed and first and foremost assigned to human behavior. These are increasing factors that affect the reactions and adaptation mechanisms of the earth system and its stability. According to Paul Crutzen (2002), our current times are influenced and defined under term „Anthropocene“. This term means that the current period of time is shaped by humans acitvity. It relates to several activities such as land-use change and emissions and off-gases that are affecting atmospheric composition. Large-scale tectonic events or geological manifests have only defined the past geological timespans. However, what changed within the Anthropocene, humans became the dominating geological force. Consequently, the growing influence of humans on the environment can be considered essential in the current exploartion of the earth system.

The findings on increasing influences on the earth system by humans were already established many decades ago. Already in 1968, the Italian industrialist Aurelio Peccei and the Scottish scientist Alexander King invited a small group of diplomats, industrialists, academics, and civil society leaders to Rome to discuss "the predicament of mankind". The starting point was criticism of the problem of providing effective short-term governance in relation to the potential long-term crisis of our planet or, in short: exponential consumption and growth in a world of finite resources (Jackson, 2017, 11). This group of

interdisciplinary experts is known as the Club of Rome. In 1972, the Club of Rome, in collaboration with scientists from MIT, Donella and Dennis Meadows, Jorgen Randers, and William Behrens, published their most famous report: The limits to growth. The report explicitly discusses exponential growth and the challenges that arise when many different variables in a system grow simultaneously and all variables are interconnected in complicated ways. (Meadows et al., 1972). Thus, the Club of Rome not only took the system perspective - but also made the link to social systems, growth, and limited resources. At the same time, the focus on the interconnectivity of complex issues was firstly demonstrated with the exchange of interdisciplinary experts. The interconnectedness of the environmental systems shows to be linked to multiple questions of human development. Another historically relevant contribution to the earth system considerations is the first assessment of the state of climate science, published by the Intergovernmental Panel on Climate Change in May 1990. It reaffirmed the result that was already widely known: unrestricted use of fossil fuels will lead to an increase in average global temperature of about 0.3°C per decade over the next century. Further, it was elaborated that this would be a more significant change than in the last 10,000 years, but global warming from greenhouse gases would lead to changes never before experienced by humans (Oreskes & Conway, 2015, 388).

The increasing recognition of global environmental change with humans as the driving force in the 1980s called for a new scientific approach. The establishment of "sciences of the earth" was based on recognizing that a new science must be based on the emerging recognition that the Earth is an integrated entity: the earth system (Steffen et al., 2020). This newly devloped scientific approach aims to look at the overall structures and interactions of the planet and deriving interrelated mechanisms, feedbacks, and other effects of the system. Only in this holistic approach are connections visible and can be made more evident formulations about the general situation of the planet. When thinking of the Earth system as a whole, it is essential to note that components of the system interact in ways that can either increase or decrease the system's stability. Components are connected by what is called couplings, which can be either positive or negative. In addition, the presence of feedback loops leads to the establishment of equilibrium states in the system (Kump, 2014, 45). This summarizes the most straightforward fundamentals of the scientific approach to Earth science, which in this form involves many layers of feedback loops, perturbations, or other influences that explain the complexity of Earth system dynamics. Earth system science (ESS), as it is called, is increasingly interdisciplinary in this work and

has been used most notably in recent findings on climate change. Scientists Will Steffen, Katherine Richardson, and Johan Rockström (2020) describe the scientific perspective of the Earth system. They note that three interrelated factors support the evolutionary development of the ESS:

1) Observations of a changing Earth system,
2) Computer simulations of system dynamics in the future, and
3) High-level syntheses that initiate the development of new concepts

Steffen et al. (2020) further note that the transdisciplinary research necessary to understand the Earth system requires consideration of past and present changes in the system at a variety of spatial scales and temporal scales, such as forward and backward. Thus, it is a holistic view of the Earth system that includes historical elements and new technologies, Earth observation capabilities, and climate models. The integration of all these aspects enables a holistic view of environmental change and thus allows conclusions to be drawn about the need for action on climate impacts. The exploration by Steffen et al. (2020) of Earth system science further indicates that there is a shift from looking at disciplines in isolation to seeing interactions between these processes and increasingly global observations, analyses, and modeling. There are bottom-up and top-down approaches to this. In considering climate change, however, there are other relevant considerations by the ESS besides the consideration of GHG emissions and the associated temperature increase for the future. Various pressures on the earth system can be determined with the help of complex models, observations, and knowledge from the historical perspective. This includes changes in the natural water cycle, sea level rise and warming, melting snow and ice, and changes in conditions for plants and animals.

These developments are to be understood as multipliers of further pressure on the earth system. They subsequently lead to changing seasonal patterns, more droughts and wildfires in some places but more precipitation in other places, leading to habitat loss and extinction. But also social impacts can be derived from this. Those further pressures include food and water supply challenges and the resulting shift in ranges and migration. These complex and interconnected pressures on the earth system can be referred to as "climate connections", which create the different connections to temperature rise and other relevant modifications. The term tipping element is highly relevant in this context of different climate connections. The term tipping element appeared around the mid of 20th century. A benchmark was the

paper of Lenton et al. (2008) that took a summary perspective on Tipping elements in the earth's climate system. The term tipping point refers to a critical threshold at which the system tips over and changes into another state. The idea refers to a change in a relatively large climate system, so-called large-scale features that might undergo a system transition. The distribution of tipping elements includes cryosphere entities, circulation patterns, and biosphere components. One example of such a tipping point is the permafrost in the arctic. When the planet warms up, the permafrost soil begins to thaw, which releases methane, a greenhouse gas that has a greater warming effect than carbon dioxide. This process is expected to accelerate beyond the predictions of climate scientists (Malm, 2021). The accelerative power of the tipping elements is thus not even fully understood in the scientific community. However, it is clear that these elements introduce even more significant uncertainty and pressure onto the earth system and its stability.

In contrast, it is already well understood how temperature changes will affect the planet. With increasing climatic changes, most habitable areas in terms of climatic spheres will move towards higher altitudes in the northern hemisphere. Mid-latitudes will remain the most habitable zones, but they will migrate further to high latitudes. This means, for example, more greening for the scandinavian sectors. Some areas, in that sense, will improve their living conditions in terms of mean temperature and precipitation patterns. Still, the parts of the globe where most people are concentrated will be severely affected by climatic changes. From a climatic perspective, living conditions will worsen in these parts of the globe. This will, with high probability, lead to tremendous climatic pressure on a significant part of the global population.

Climate change is already present by far affecting the least developed and poorest economies globally. Furthermore, zones of political tension are also strongly overlaying with a map of additional climate pressures. Not many conflicts can be directly attributed to climate change or changes in meteorological conditions themselves. However, climatic pressures are a multiplier, leading to the enhancement of conflict potentials and additional fuel into unstable economic, political, or other social systems. As previously outlined, the overuse of material resources and the consequent depletion of key natural resources place immense pressure on the planet's ecosystems. Further, it is observed that economic growth and regional economic trajectories are very strongly tied to increasing emissions levels. The establishment of the planet's limits was vital not only in science and related academic findings but also in regard to communication with society. The Stockholm Resilience

Centre's (SRC) work has highlighted the importance of planetary boundaries (PB). Its most important message is that the planetary boundaries matter and have to be integrated into economic structures and social functioning (Jackson, 2017, 201). The SRC highlights that the narrative of the PB concept is essential in communicating environmental threats. Furthermore, the concept can help set a baseline of information regarding the Earth's limits. It integrates versatile earth system insights in an integrative manner and incorporates three areas of scientific research: The first is concerned with the scale of human action with the carrying capacity of the Earth, which includes ecological economics; the second is work to understand essential Earth system processes, including human action, which have been brought together in the development of global change research toward ESS and the development of sustainability science. Moreover, the third area is the concept of resilience and its links to complex dynamics and self-regulation of living systems (Rockström et al., 2009). Thus, the PB concept is one of the essential research findings in general sustainability research. It can be seen as a holistic approach to research that incorporates different perspectives of the triple-bottom-line of sustainability, namely ecology, economy, and social issues. The planetary boundary concept is particularly noteworthy because it integrates all risks and pressures of the Earth system and considers them a collective whole. Although the boundaries are subdivided into individual parts, the planetary boundary approach gives a holistic view of environmental challenges. Quantifying the boundary through the PB concept can help provide a scientific underpinning, such as targets and indicators, for developing policies and evaluating the effectiveness of policy processes (Persson et al., 2022). Boundaries, according to Rockström et al. (2009), are human-determined values of the controlled variable that are at a "safe" distance from a dangerous level for processes. Identifying a safe distance further involves normative judgments about how societies want to manage hazards, and the choice of control variables for the boundary was based on the estimation of the variables that provide the most measurable parameter for each boundary (ibid). The boundaries include nine areas of investigation:

1) Climate change
2) Ocean acidification
3) Stratospheric ozone depletion
4) Interference with the global Phosphorus and Nitrogen Cycles
5) Rate of Biodiversity Loss
6) Global Freshwater Use

7) Land-system change

8) Aerosol Loading

9) Chemical Pollution

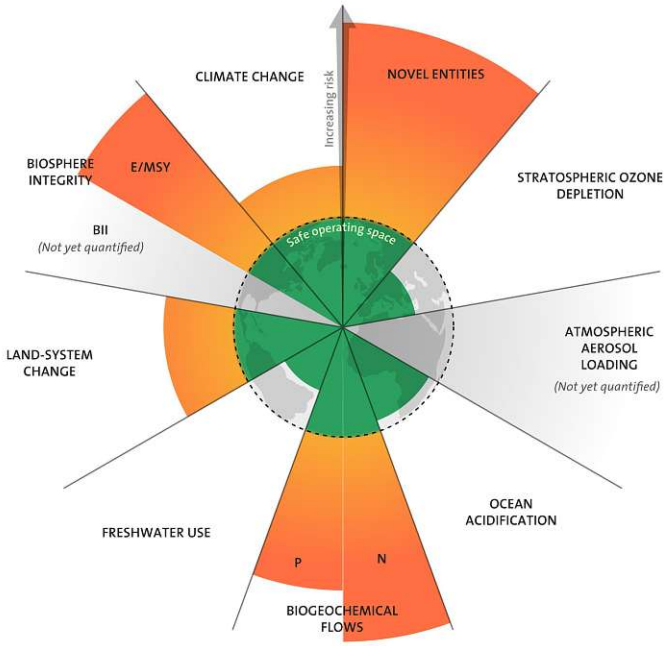

Figure 1) Planetary Boundaries (Steffen et al., 2015)

So far, four out of nine planetary boundaries have been crossed. These include extinction rates, deforestation, atmospheric CO2, and nitrogen and phosphorus fluxes. However, a fifth boundary crossing was identified just recently in 2022. The planetary boundary of novel entities has been exceeded due to annual production and releases increasing at a rate that exceeds the excess global capacity for assessment and monitoring. Especially pollution from plastics was highlighted as a concern (Persson et al., 2022). In addition, biodiversity loss is understood to be an increasingly worrisome condition within the earth system. Among experts, the biodiversity crisis is seen as an even greater challenge than climate change. In any case, several pressures on the earth system are linked. Biodiversity is essential for maintaining the long-term health and survival of a species. The majority of the world's food crops come from just 12 regions, all of which are situated in areas where population pressure is putting increasing pressure on the existing natural habitat. This is due to the fact that modern agricultural culture relies on diminishing this diversity. Current practice, especially in developed countries, is to increase productivity through increased specialization and the use of a restricted number of selectively developed crop varieties (Kump, 2014, 443). Operations within the fields of crossed boundaries are considered not to be in a safe space for humanity. As a result, there is an increased risk of irrevocably

transforming the Earth into a less hospitable state. So this scientific concept and process are not only about bringing together scientific findings and formulating a boundary framework within the Earth system itself. The planetary boundary approach is thus to assist in evaluating and deriving policy recommendations from the available results. This is not only a helpful visual representation but can also be used in the course of environmental communication. In the broadest sense, the PB concept can serve alignments of strategies, instruments or even institutions. In fact, there are also already a number of international institutions that are aligned with the PB concept and thus specific boundaries. Examples include the Montreal Protocol on Substances that Deplete the Ozone Layer, the United Nations Framework Convention on Climate Change, and the Convention on Biological Diversity (CBD). Some, such as the Montreal Protocol, have proven effective, while others, such as the Convention on Biological Diversity, suffer from weak implementation (Galaz et al., 2012). Such policy-related instruments and institutions and events indicate that a variety of discourses, especially on the climate change topic take place. The discourse related to climate-related change has been particularly advanced because of the intergovernmental institution founded by the United Nations Environment Programme (UNEP). The IPCC is an intergovernmental institution founded by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). Its mission is to summarize for policy makers the state of research on climate change, this is done through reports that are intended to provide a basis for science-based decision-making. Further, the annual Conference of the Parties to the UN Framework Convention on Climate Change (COP) should be mentioned. In December 2015, the Paris Agreement, an undertaking was made under this conference by the international community to limit the increase in average global temperature to well below 2°C above pre-industrial levels and to continue efforts to limit the temperature increase to 1.5°C. More than 200 signatories have signed this agreement and yet probably the most considerable criticism is that it is only aspirational (Jackson 2017, 19). Further, when the IPCC released the special report on 1.5 degrees of global warming in 2018, it became clear that two degrees of global warming will endanger hundreds of millions of people, animals and species. The recommendation, therefore, was that urgent efforts should be made to stay as close to the 1.5-degree limit as possible. Even 1.5 degrees of global warming will lead to extreme changes also in Europe but especially in other parts of the world. However, no concrete measures, no implementation strategies, and no sanction mechanisms are tied to this international agreement. At this point scientific knowledge leads to the assumption that the path to

achieving the Paris Agreement's 1.5 °C targets is very narrow – just and targeted measures are needed urgently at all levels: structural, political, and individual (Martin et al., 2021). The science is thus advanced enough to justify urgent climate action, yet action is still constrained.

„We are not limited by our knowledge of the problem or of measures available, but by other obstacles – structural and cultural, but especially political – which inhibit the pace and scale of implementation that are needed to achieve the goals of the Paris agreement." (Martin et al., 2021)

Indeed, topics such as global warming, species loss, and deforestation are largely determined by science, largely evidenced, and produced by the performance of experts (Redclift & Benton, 1994). However, linkages between scientific evidence and society are lacking. The key message that emerges from scientific findings of the atmospheric system and the resulting temperature rise and other noted observations and changes in the Earth system is the following: Urgent action is needed. Human activities and the resulting changes in the Earth system are observable and of long-term importance. Tipping points and other complex mechanisms are not yet scientifically understood in all their interrelationships, so only some measure of irreversible change can be outlined. In this sense, the urgency to act is undeniable and based on a wealth of evidence across disciplines and sectors that benefit both ecosystems and people (Martin et al. 2021). Thus, on the one hand, the call to action calls for the international community to reduce emissions and strive for carbon neutrality. On the other hand, it calls for long-term behavioral changes in human consumption and production patterns that will impact our economy. The scientists behind the latest IPCC's report (AR6) in 2022 essentially stated what can be taken as a warning for governments to get their act together.

"The scientific evidence is unequivocal: climate change is a threat to human wellbeing and the health of the planet. Any further delay in concerted global action will miss a brief and rapidly closing window to secure a liveable future," (Hans-Otto Pörtner, 2022)

2.3 The social system

In addition to considering the earth system and its conditions, it is now necessary to take a look at the social system and its structures. The scientific basis of the social system is sociology, which is commonly referred to as one of the social sciences. According to Henry Tischler (2010), this refers to a systematically organized body of knowledge that demonstrates the operation of general laws of scoeity. Sociology applies general methods of inquiry, as in the natural sciences, where a body of scientific knowledge is built through observation, experimentation, generalization, and verification. The social sciences include all disciplines that apply scientific methods to the study of human behavior; these include but are not limited to cultural anthropology, psychology, economics, history, and political science. Although there is some overlap, each of the social sciences has its area of inquiry (Tischler, 2010, 22). Each of these fields play a contributing role in structure of our society, the social system. In the center of the social system is the human being, the individual, based on our planet earth. The human being is not only the basis of the social system but can also be considered as a system itself in the psychological perception. Society shapes people, but society itself is merely shaped by people as well. Sociology is the overarching science that explores the social system and society as a whole. The sub-sciences can be considered as a deepening of sociology, which shed light on human beings, their actions and interactions, and all other aspects of being human. Therefore several sub-sciences deal with smaller aspects of human existence.

In contrast, social system theory addresses large-scale organizational structures of society and other broad human patterns of interaction. If we look at the system theory of social science, it is about uniting multiple human agencies and organizational structures out of the sub-sciences. In other words, the interaction of individual actors occurs under such conditions that it is possible to treat such an interaction process as a system in the scientific sense. Also, it is possible to subject it to the same order of theoretical analysis that have been successfully adapted to other types of systems in other sciences (Parsons, 1991, 45). The application of system theory is, therefore, also a helpful instrument in social science for the consideration of complex correlations within society. One of the most famous German philosophers and sociologists, Georg Simmel, has elegantly defined society. He saw society as a network of crystallized interactions. In his eyes, there was no "society" as a thing in itself, but only people and their actions – consequently, what is meant by society, according to Simmel, is simply the totality of constant interactions (Martin, 2009, 2). Thus,

the social construct or social system is just a name for all we do as humans and thus shapes our everyday lives. This can range from economic activities to creative activities, sports, the establishment of political institutions, and scientific research itself. Steve Bruce (2000) further provides insights into critical basic concepts of sociology: roles, structure, and order. He argues that human biology does not contribute to the structuring of human society, and thus social roles are independent of biological basis. The term "role" is appropriate because the metaphor of an actor in a play expresses very well that much of social life is governed by rules and that society is a community production. After all, social life only takes place because people play their roles, and these roles only make sense in the context of the big societal picture. Further, in the course of collective roles, Bruce highlights a structure, meaning that every human action, whether conservative or radical, reactionary or revolutionary, requires an entire order is needed (ibid). The accumulation of orders further develops social structures and ultimately "society" as an overall social system structure. The role and organization of the individual significantly form the image of the social structure and our society as such. In addition, there are interactions within the roles and structures that need to be highlighted. These interactions can identify features of actors, institutions, or other individuals. In this sense, social systems can also be viewed as time-varying multilayered networks. The nodes are individuals or institutions, and the links are interactions of various types, and the interactions within these links change over time. The types of connections can be friendship, family ties, exchange of goods, payments, trust, communication, hostility and much more (Thurner et al., 2018, 20-21). The organization of people in different groups, such as the family, the club, the work community, and many more, are probably one of the most formative and influential behaviors in the structural formation of society.

Since a systematic perspective is considered, the basic societal structure has to be clarified. John Levi Martin (2009) has developed scientific insights into the social structure. He holds that patterns of interaction take on a structure that actors can then face as an objective fact. The formations of structures thus range from simple interpersonal relationships to formations of groups, such as cliques and unions, to larger organized institutions in society. These large-scale structures are fundamental to the nature of modern society and contribute significantly to the organization and nature of states (ibid). Institutions, in that regard, form the main structures of society and provide a framework for social organization. Institutionalization can be considered as a transfer of human norms into a long-term establishment of repetitive interactions. Particularly western societies are very much linked

to their structural environment through institutionalization. The approach of Niklas Luhmann (1996) can be considered insightful in that regard. In his social system theory, Luhmann divides our social system into a structure with subsystems. These subsystems are assigned to specific social categories: politics, economy, science, art, sport, legal system, religion, health system, education, mass media, and technology. The subsystems give an apparent insight into our social structures and show which areas people fill their lives in the broadest sense. All these subsystems act with their own social code, a medium, and own function (Luhmann, 1996, 292-300). In a way, the system functions defined by Luhmann can be understood as the assignment of the social subsystem to its actual and practical duties. For example, the science system holds the function of verification, and the art system, in reality, aims to achieve the function of creation. This highly simplified but helpful categorization shows the alignment of the human lifestyle with the functions and much more. It also gives indications of the institutionalization of society. The division of the social sub-systems clearly shows that human norms have been established on a large scale, and most areas of human life are institutionalized. Standford sociologist John Meyer (2010), further addressed modern institutional theory and highlighted that there is widespread agreement that the modern social and cultural environment is full of actorhood models. Modern nation-states are increasingly under the strong global influence, and the more they are connected to the outside world, the greater the pressure exerted on them. Thus, organizations and states are now conceived as actors derived from their individual members. Moreover, Meyer emphasizes that extended models of actorhood thus spread to social life throughout the world, and nation-states adopt the extended economic, political, social, and cultural forms prescribed in the global environment (ibid). What becomes clear through these findings is that we live in a world full of actors. Therefore, the social order is not only divided at micro-level into the small family structures but at the macro-level into nations. Increasingly, multiple actors decide the direction of the global order and social structures. In addition, so-called sociological institutionalism has influenced sociology as a whole. Under world social theory, or simply institutional theory, scholars have emphasized the importance of global institutions and culture in shaping the structure and behavior of nation-states, organizations, and individuals worldwide. Essentially, the point is that institutional perspectives generally shift attention away from individual social actors and toward the social context or environment in which actors are embedded. World society theory is at the latter end of the spectrum, characterizing actors as elements of their context - as executors of social or cultural rules and scripts imposed by their wider environment

(Schofer et al., 2012). Hence, there is an increasing movement towards a global view of social and cultural orders. If we take the view of a world community, we can speak of an overarching global social structure. This structure is decisively characterized by global networking and relationships, which promote institutionalization but also a culture of cooperation between global actors. This establishment is not only to be seen as a historical process, but the idea of a world community that also carries a certain cultural good. The global society tradition emphasizes the historical establishment of international organizations and structures - such as the United Nations and international associations - that serve to institutionalize cultural models and effectively embody and sustain a global culture (ibid). In this sense, the global organization is increasingly characterized by international structures, institutions, and organizations. Although these often retain the concept of national statehood, increasingly, these strict divisions are being blended and provide, in some cases, overarching models of cooperation. The role of the actors in this context remains the same and reflects the interests of different participants in the international structure.

Redclift & Benton, (1994) further state that "extreme" structuralists might argue that individuals' social actions are predictable on the basis of our analysis of the structural conditions under which they act. Thus, actors' conceptions of their situation and their creative ability to set new goals or find new ways to achieve what they want would play little or no role in social explanation. However, in actor-based approaches, these features of knowledge and creativity would be considered primary materials for the social explanation (Redclift & Benton, 1994, 9). It is thus an actor and action-oriented perspective that allows us to chart new societal paths and to use creative approaches and concepts to design them. However, it must be stressed particularly that, above all, a western-oriented approach and a euro-centric perspective are dominant within several social and, consequently, various scientific social perspectives. In addition, when it comes to the distribution of power among actors, structures of inequality are common. The distribution of power structures is inevitably linked to monetary resources and thus also influences within institutions. It leads to the fact that scientific perspectives of western research predominantly correspond to what is perceived as common understanding. In this sense, it is crucial to look at constraints on society or parts of society in terms of their abilities to act within the societal framework. In addition, different global political power structures within society prevail. The forms of power existing in the present can be distinguished according to two basic types: constitutional democracy, meaning the democratic constitutional state, and autocracy

or dictatorship, which implies individual order of rule. This distinction is made based on specific distinguishing criteria, mostly historical-empirical, according to the structures of institutions, procedures, and norms. It is precisely political science that deals with the power relations within the institutional system. But because of the diffuseness of political power, this makes it a synthetic science in the field of social systems, not one based on a particular analytical, conceptual scheme. The common term "government" is relatively close to this view (Parsons, 1991, 49-370). According to Parsons (1991), political power is generalized primarily the extension of scope to relational contexts of a particular target. This means that political power can control the relational system at the level of the particular relational context, which may be an organization or a more diffuse, less integrated system. Moreover, while the structure of economic power, linearly quantitative, is simply a matter of more and less, political power is hierarchical, that is, of higher and lower levels (Parsons, 1991, 85). If the social sciences have a role to play in environmental challenges, it is undoubtedly that of studying the social impact of processes and policies. We will further explore the communication processes in this regard. But it is also about the critical examination of social structures, which are part of the economy, politics, law, and other parts of society. These aspects will be further explored in the chapter on barriers.

3. Communication

In order to take a holistic view of climate or environmental communication, it is first necessary to define the basic principles of the communication practices of society and its theory. With the foundation of these basic communication concepts, it shall be easier to understand the narratives within communication to shed light on current practices and resulting challenges of climate communication. In the following, we will first present basic approaches and theories of communication science. Further on, there will be a direction towards a particular area of communication research, namely environmental communication.

3.1 Communication theory and concepts

Communication as a standardized subject can be understood as a relatively new phenomenon in the social sciences. The departments of communication define themselves in many ways, including speech communication, human communication, general communication science, and media. Within these, interest groups formed by focusing on specific areas of communication research on different levels of communication, for instance, interpersonal, intercultural contexts such as politics, health, feminist study, or processes of understanding communication technology (Croucher, 2016, 6-12). There are numerous understandings and definitions when it comes to human communication. Many researchers and definitions of communication are similar in stating that communication is symbolic. Communication consists of the exchange of symbols through signs - a sign is essentially an object; concretely, this corresponds to a word, a letter, a sentence, an action, an event, or similar that represents something else (ibid.). These symbolic interactions are diverse and significantly influence human behavior. They cannot be described as simple and concrete actions but rather as complex interactions and patterns of human behavior. Further, also all human sciences can be seen as sciences of communication (Coste, 1989, 4). This means that no matter which area of science is used, it is ultimately communication that manifests the dialogue, the linguistic formulations of science, or any aspect of human life. In this sense, linguistics and communication are at the core of human activity, creation and behavior. One way to approach and understand communication is to describe it through models. Numerous models and concepts for understanding and illustrating human communication have been developed. There are various models related to the process of communication, which differ in terms of their scientific tradition, complexity, and content focus. One can distinguish between so-called general and psychological models of

communication. General communication models are interdisciplinary in nature and approach the topic of communication by integrating ideas from different scientific disciplines (Röhner & Schütz, 2015, 19-21). Psychological models focus on human behavioral patterns, their interpretations, and reactions. These models, however, should not be seen as mutually exclusive approaches, nor do they claim to be exhaustive. They each provide information about the puzzle picture of communication from a different perspective so that it can ultimately be better understood in its entirety. In principle, all models are united by the idea that a message is transmitted from person to person (ibid.). The other multiple and associated processes, which are then added, must be considered in their diversity and in the respective context. In addition, there are many other considerations and insights from communication studies that provide a better understanding of the processes. Especially, Paul Watzlawick's communication model (1969) shall be mentioned. It is a description of communication processes based on five axioms. Characteristics of Paul Watzlawick's model are dynamics and interactivity, in contrast to the relatively static sender-receiver model. Watzlawick summarizes the rules of human communication by following five axioms:

1. Axiom on the impossibility of not communicating.
2. Axiom on the content and relationship aspect of communication
3. Axiom on the punctuation of sequences of events
4. Axiom on digital vs. analog communication
5. Axiom on symmetrical vs. complementary communication

Probably the most relevant axiom is number 1. It is based on the fact that all behavior in an interpersonal situation is communication, including multiple forms of action or inaction, silence, words, or lack of words. Thus, all behavior can be seen as communication. Consequently, one cannot not communicate. Watzlawick assumes that communication occurs, whether intentionally or unintentionally, as soon as people perceive each other (ibid.). The effect of the behavior depends on the particular interpretation of the receiver. What is special about Watzlawick's approach is that it moves away from the sender and receiver model and focuses more on communication processes and its characteristics. His axioms provide a beneficial and unconstrained description of communication, which refers to the essential considerations. Also, in the broadest sense, they show the interconnectivity of communication, as items go along with each other or are tied together. It is further worth emphasizing his main assumption that an individual cannot not communicate so that all human actions are a form of communication. Basically, it can be stated that Watzlawick strongly connects communication with human behavior and sees communication as an

element and process of behavior. It can be understood as a very general but, at the same time, helpful understanding of communication. Not only does it show that all parts of behavior can be understood as communication, but it also emphasizes that communication is characterized by the most diverse aspects of human behavior.

In the social sciences, the concept of narration or narratives is increasingly being studied to better understand communication. When we are dealing with communication on a particular topic, it can be constructive to look at the concept of narratives. Narratives are a guiding structure that can embed communication strategy by providing direction. The aim is not to formulate narratives arbitrarily but to guide them with the help of narrative strands. Exploring narratives and their definition in more depth, we can see that narratives are characterized by articulating specific factors that distinguish the narrative as a communication format. In this sense, narratives follow a distinct structure that describes the cause-effect relationships between events that occur during a specific time period and affect specific characters (Dahlstrom, 2014). Thus, incorporating narratives in communication is a strategic consideration with a coherent underlying structure. Communication scholar EunHee Lee (2020) holds that narratives are compositional and logical. Within there is the goal of building a tale that involves not only stylistic aspects but also logical inferences. In the broadest sense, one can speak of a conscious communication strategy compared to storytelling. Narratives can further be strongly linked to a process that occurs when listeners are drawn into a story so that they are lifted out of the reality of their lives and feel the experience of the story. This is called narrative transport, which is in part an affective experience of the unfolding narrative (Shanahan et al., 2019). In this sense, one can state that with the means of narratives, cognitive stimuli and emotional and perhaps even visual stimuli of the human being are addressed. This link with emotions helps to involve individuals in the communication strongly and to build a personal relationship with the narration. However, communication strategies and narratives cannot be considered in isolation, and, being part of the social system, they are also a product of human behavior, interactions, and perceptions. Important in this context is to look at public opinion. While individual perceptions, values, and beliefs are crucial, collective perception has the most impact on communication strategies. This perception is mainly shaped by scientists, but also by the media and thus by journalists. Sunna Priest refers here to a "collective public opinion" as a power of the collective processes, which shall not be underestimated in contrast to individual factors. She assumes that we are all strongly influenced by perceptions of what others think - even when it comes to people's "take "on scientific

factual knowledge. Many interdependent groups and organizations form the social setting for communicating environmental narratives. Those include not just journalists or scientists acting on their own but also media organizations, government agencies, nonprofit groups, corporations, public relations firms, scientific organizations such as universities, research institutes, and academic journals, and a variety of professional associations, including climate science (Priest, 2016, 66). Maturana and Varela (1980) further addressed human communication within the social system. According to their findings, linguistic behavior is orienting behavior since it is oriented to interactions within its cognitive domain. The behavior of communication, the so-called function, depends on the anatomical organization, the structure, and thus significantly on the system itself and its nature. In the case of linguistic interactions, we can only describe through linguistic behavior and construct further descriptions based on these descriptions, which always remain within the same domain of operations defined in relation to the operating system (Maturant & Varela 1980, 30-33). All kind of communication is to be understood in this sense as behavior within the system. It is a part of the interaction within the social system and is also further characterized by all interactions. In a broader sense, one could state that social behavior, and thus also communication, is to some extent limited within the systematic structure. The orientation of the linguistic behavior to the system structure thus not only defines the cognitive possibilities but also limits the linguistic behavior to a certain degree. A certain system dependency is therefore not only to be noted within our communication but also to be critically challenged.

3.2 Environmental Communication vs. Modern climate advocacy and activism

Communication actively shapes human perception and the view of the natural environment (Pezzullo & Cox, 2018). Environmental communication is ever-evolving and adapting to the digital age at the local, state, and international levels. However, global climate interests, awareness, and environmental protection mobilization have proven to be highly challenging and somewhat limited in regards to their effects on climate action. This is true even if the scientific basis for environmental threats and recommendations for action have been available and significantly increased over the last decades. Climate change and the possible responses are challenging to communicate. They hold complex phenomena with resulting causes and consequences beyond the horizons of many global citizens (Schäfer, 2012). Moreover, in a world that continues to be marked by economic and social

inequalities, the global narrative of environmental issues may not appear urgent enough in many regards. It seems that environmental issues fail to stand out in the top of the political agendas and thus in the center of the institutional communication narratives.

In the following, a view is put on the areas of more a specific field of communication, namely environmental communication and modern climate advocacy. Firstly, it is essential to distinguish between the definition of both terms. Environmental communication is a broad umbrella term that includes versatile communication on various environmental topics. It is to be understood as a targeted instrument of mediation for the scientific transfer of climate content and transmission of scientific findings. Climate activism or advocacy is, on the other hand, to be understood around civil commitment or revolt as a form of criticism of current climate action and policy. It can be described as a form of environmental communication, but it is much more specific in itself and often has very concrete objectives related to it. However, because we understood communication as a broader range of human activity, it is emphasized below that alongside specific environmental communication, forms of activism and other types of engagement can also be understood as supporting streams of communication on the climate issue.

When addressing communication on a particular topic, it can be helpful to address certain factors. First, considering the scope of the communication is of relevance. This includes whether the communication has a specific goal or perhaps more concerns of interest. One can thus ask whether is relevant. It can be argued that climate communication does not "only" serve to convey information, but rather that a broader scope in the direction of awareness raising, concern or even reaction is hoped for. The latter, the reaction, thus represents the goal for behavioral change through climate communication. This can be understood as a very demanding task behind communication. In the best case, therefore, climate communication leads to adjustments in society such as changes in behavioral or structural aspects. It is arguably the scope makes environmental communication so challenging. In the broadest sense, climate communication is not only about communication itself, but also about the impact of communication on society, its behaviors and structures.

According to Whitmarsh et al. (2011), to understand explanations of environmental behavior, we first need to understand the concept of utility. While economists interpret "value" in monetary terms, psychologists use the concept of "subjective expected utility" to refer to the assessment of the perceived value of a behavioral outcome. The principle of subjective expected utility has become the key building block of prevailing behavioral

models. Following these models, the specific perceptions of expected costs and benefits linked to a behavioral choice, e.g., price, convenience, usefulness, lead to the formation of a personal attitude. Both models assume that attitudes drive behavior through the effect of behavioral intentions (Whitmarsh et al., 2011, 18-19). Our behavior is thus characterized by a benefits orientation, a summer of personal evaluations. Similar to the communication process, human behavior patterns and changes are a process that is constantly evaluated. New information can thus have an impact on these behavioral patterns. Moreover, it is crucial to recognize that even if information changes attitudes, subjective norms, or perceptions of behavioral control, this does not guarantee changes in intentions and certainly not changes in behavior (ibid.). Furthermore, it must be noted that there is no direct correlation between communication and behavior change (Nerlich et al., 2010) which considerably complicates the task of obtaining the scope. Consequently, the scope of climate communication is highly challenging and complex because it holds aspirations for behavioral change in society.

A second approach includes the view of actors within the communication. The aim is to understand who is involved in the communication. According to Nerlich et al. (2010), multiple actors are involved in climate change communication: governments, media, science, citizens, communities, NGOs, businesses, international organizations, celebrities, and many more. Moreover, the communication of these actors takes place with access to interests and thus different communication strategies. Those may include: raising awareness, convincing people to vote for a political party, supporting government policies, "saving the planet," "greenwashing" a business, expanding a business into new and more profitable areas, and many more. Within this broad community of interests, various communication processes are underway, which consequently carry diverse narratives as well: sustainable food production, alternative energy supply, water access, social justice, local or global health, new technologies such as carbon capture, and much more (ibid.). In this sense, there is not one aim of environmental communication but a wide variety of social groups with different interests, all of which hold different communication narratives. Further, the narratives as such also hold various demands and goals, which are sure to be regarded in a differentiated way. However, those may partly overlap with the scientific findings and their demands, but partly they may deviate from them.

In addition to the aim and scope of climate communication, it can be beneficial to obtain a detailed picture of the actors and thus the communication carriers. An essential actor has to be identified in the government and the public policy sector. This holds true because the

predominant responsibility in climate change and thus in relation to climate communication is to be found within governments and public policy. According to Whitmarsh et al. (2015) global policies have focused primarily on mitigation over the last years, while adaptation to climate change is still considered a more immature policy issue. However, in terms of climate change, most politicians are away from language that does justice to the problem's urgency. As a further carrier of communication, it is essential to consider the media. The mass media provides an opportunity to introduce scientific facts and findings into the broader social debate and to attract public attention to the topic in question. Knowledge about climate change is also disseminated mainly via the mass media. Covering climate change plays a vital role in bringing the issue to the public's attention, making lay people aware of the problem, and generating political pressure. However, climate change communication also poses a challenge for media coverage, which has to deal with the peculiarity that it is a long-term issue with global consequences. Especially in the age of digital media, lurid headlines, timely events, and momentary events are the basis for many views and clicks. At the same time, the actual events remain invisible to most of the audience (Arnold, 2018, 12). The challenge for the media in climate communication is to communicate a long-term event continuously and simultaneously to continuously emphasize the urgency of the issue. For this, the correct narrative must be developed, one that is both informative and educational, but at the same time suitable to be integrated into media communication in the long term. In addition to mass media, one must also acknowledge the role of social media, which has an enormous influence in our digital age. On the one hand, social media creates multiple opportunities to make information and thus communication widely and transparently accessible. Due to the increasing number of people who rely on social media for information and support, climate change has become widely discussed. However, despite the increasing popularity of climate communication through social media, little is known about the effects of online media on climate change and human behavior. The shortcomings of the literature on the effects of online media are probably the largest. More research is needed to analyze the various effects of online communication and how climate change communication can affect various aspects of our lives (Schäfer, 2012). Furthermore, the quality content in social media needs to be critically evaluated. It is a central part of a social role of journalists in democracies to enable informed decision-making.

Considering the line of communication, it is essentially also about science communicating its findings, with the help of the media, to the center of society. But perhaps even more

importantly, scientific knowledge also needs the basis of political decisions and policy directions to be effectively communicated. From this point of view, the role of scientists is essential. However, this is also probably where the challenge lies. Scientists are assigned to a particular function in their social role within their profession; it is about knowledge exploration but not about knowledge communication. The challenge is to enable scientists to communicate effectively and collaborate with other stakeholders and, above all, to provide broad media integration of the topics. Effective climate communication depends significantly on scientists' social role and their awareness of the role they play within society. Scientists are heard, but the full meaning of what they say is not understood by many. Their interjections are often dismissed as one opinion among many. The scientific realizations need to find better hearing. This does not mean, however, that everything must be implemented socially one-to-one in the way scientists model it. There may and will be areas where societies set different priorities. Nor does it mean that public discourse should be replaced by the announcement of study results - but it is certainly necessary to discuss issues socially to build majorities for measures (Schurmann, 2022, 205-215). Especially social movements have managed to draw more focus to needs for action in recent years. They contributed a substantial increase in public awareness. Donatella della Porta (2020) explores social movements in-depth, and emphasizes that social movements are generally considered important actors in terms of their ability to speak out, build, and participate in public space. They are to be understood as "places of learning" since they can build knowledge through discursive processes and consisting conversations within society (Della Porta, 2020, 8-11). The concept of outraged citizenship refers specifically to a reactive form of citizenship that manifests itself both online and offline in response to discourse, actions, or events perceived as norm-violating or violative within and sometimes outside a particular community (Tacchi & Tufte, 2020, 19). It is an extensive definition of social movements that organize to express their discontent and thus stimulate discourse and communication. A well-known approach of activist protest, which can be seen as an approach to outrageous citizenship, is to challenge the laws and norms through civil disobedience. Civil disobedience, in short, is the peaceful but active and public refusal of a citizen to abide by certain laws that he or she perceives as unjust. It is further a means of disrupting the usual course of events and is often the last resort when lobbying, negotiation, and other legal measures do not work (Margolin, 2020, 87). There are, according to Sovacool & Dunlap (2022), different tactics of civil disobedience, which include the widely used ones, such as demonstrations and rallies.Acts of civil disobedience can

strengthen and support the underlying principles of democracy and governance and at times undermine and subvert them. The most famous example of this strategy they mention is Martin Luther King, who was awarded the Nobel Peace Prize in 1964 precisely for his use of civil disobedience in the form of nonviolent direct action. However, the concept of civil disobedience is increasingly being used in the context of the climate crisis. Formations of social movements are using this strategy to raise awareness about the frustration of the inability of governments to act concerning climate change. It can be understood as a form of resistance that aims to attract attention. Whether in front of fossil fuel corporations, government buildings, institutions, or financiers that invest in environmentally harmful business models, the application of civil disobedience by activists is applicable to a variety of actors (ibid.). In general, there are several social activist movements over the last decades that should be mentioned: the women's rights movement, the indigenous rights movement, the Black Lives Matter movement, the reproductive rights and feminist movements, the LGBTQ+ movement, the disability rights movement, and finally the environmental and climate justice movement. All of these movements have in common that they hold diverse female leadership and hold progressive role models. Particularly noteworthy here is the activist Greta Thunberg, who has received much media attention. Born in 2003, she initiated a school strike in August 2018 as a young student, which grew into the Fridays for Future movement. Since then, the movement has inspired school strikes for climate action in more than 150 countries, with millions of students participating. Thunberg has spoken at climate rallies across Europe as well as at the United Nations COP24 in Poland and the World Economic Forum in Davos, and in September 2019, she gave a speech in New York City at the UN Climate Action Summit (Margolin, 2020, 9). She is considered the leading figure of the Fridays for Future movement and inspires others with her often very critical and demanding appeals to political leaders and other decision-makers. She criticizes their inability to act and weak measures towards enormous climatic pressures, which in her eyes are not taken seriously enough. For others, however, she represents an entirely different image, an antagonistic figure that is associated with prohibitions, restrictions, and alleged limitations of freedom. Regardless of how one relates to her and her strong positions, Greta Thunberg also shows that young people are increasingly taking their voices on the need for climate action. Many students have now been on strike for three years to support the 1.5 degree limit, and numerous For Future groups from all sectors of society support it; including thousands of Scientists for Future. They formed to make clear that the demands of young demonstrators of Fridays for Future

are scientifically justified and that there is an urgent need to finally implement comprehensive and effective climate protection measures (Schurmann, 2022, 29). Young people, in particular, have been at the center of climate activist activities.

Jamie Margolin (2020), activist and leader of theYouth Climate Marche in Washington, describes essential aspects of the activist approach of young people and how they can use their voice. She emphasizes that a personal engagement with climate action and activism starts by being receptive to the various topics related to society and the environment. Margolin arguest that climate activist work is primarily about finding reasoning for oneself to take action. These can also be very personal reasons or strongly anchored in the social collective; in any case, they should all desire positive social change (Margolin, 2020, 25-33). It becomes clear that a personal attachment to the subject can always be helpful in developing advocacy practices. Based on the described sociological assumptions that every individual occupies a certain role in the social structure, one can assume that this is also applicable to the activist formations of the climate movement. However, even though climate activist efforts can be seen not only as an important aspect of communication and thus also as an impetus for dialogue in society, this form of behavior also bears its limitations. Even conscious rebellion against order attempts to "break out," tend to follow preordained lines (Bruce, 2000, 65). Therefore, it should be emphasized that all climate activist measures can only take place within the framework of the social structures. Above all, the political environment is a decisive factor that determines the possibilities and framework conditions of climate advocacy. Thus, on the one hand, social roles determine the possibilities of activist activity; on the other hand, political circumstances, in particular, can limit them. Particularly in anti-democratic environments, societies have limited access to this type of action, and at the same time, they may also lack access to important content that shapes narratives of climate communication. Aspects of the social system, namely political settings as well as political decisions, are therefore not only significant actors and communicators of the climate narrative. They are also influential in how public acts of resistance or revolt are formed, what demands they can integrate and what influence they can have. It is, in fact, political decisions and the inability to act towards environmental pressures that can be identified as drivers for these climate activist approaches. Ultimately, it must be seen as a responsibility of politics to provide education and information on climate-related topics to support effective communication and achieve long-term behavioral adaptations by society. It can be argued that it is in everyone's interest that

politics invests in climate education. Global policies are thus strongly linked to both aspects but are equally separable from communication and activism. In any case, a part of climate communication, or perhaps better understood as an aspect that exerts a significant influence on communication, is education. Education, which is also strongly linked to the political conditions of society, is the primary determinant of how climate communication can take place, who can participate, and of what consequences the often activist demands can be expected.

Finally, there is no "one fits all" approach to modern climate communication. The scope of climate communication is highly demanding, and the actors are diverse in their interests and approaches. Diversity of communication strategies, modes, and different media can be observed, which include environmental activism and advocacy efforts. Scientists considered are essential actors, since they provide the core content of communication. Other actors include the media, which has an influential role as the transmission medium. However, first and foremost, it is about communicating narratives through those actors that find resonance in society. This is proven to work best if people's personal values or emotions are brought into the conversation. Here, too, it must be considered that different means of communication are accessible to each person. So it can be summarized that the more diverse and multifaceted communication to climate subjects takes place, the better. "Communication too has to use a mixture of modes and strategies, from verbal to visual, from the spoken word to the digital message. Communicators can only be sure that their messages will be understood if they understand their audiences, their values, fears, hopes, and the situation of communication." (Nerlich et al., 2010) It is a challenging task that requires the participation of diverse stakeholders in society. However, ultimately, it must also be seen as the responsibility of politics to provide education and information on climate-related topics to support effective communication and achieve long-term behavioral adaptations by society. Indeed, political decisions and the inability to act inherently can be identified as drivers for climate activist movements. Therefore, it is their task to address social discontent through political action and integrate measures for climate protection as a means of communication. In the best case, communication takes place in cooperation between everal social actors. In this way, it can be guaranteed that a broad group of society has access to communication. However, as long as there is a divergence between recommendations for action based on scientific facts and actual political realities through implementation measures, social movements will remain a means of persuasion.

3.3 Climate narration

Climate narration is understood as the narratives that surround climate-related communication. It can be argued that it is essential to understand narratives that resonate with public opinion and broader society. Initially, it has been noted that the narratives of climate communication are as diverse as the actors and interests. In the following approach, we will therefore try to explor essential but also mostly misleading narratives, which have been already established in society. The aim is to get an overview of desirable climate narratives and to develop a unified framework for fact-based climate communication besides the manifold conflicts of interest within the current narratives of actors. But the elaboration of climate narration will start with a look into misleading narratives, which have been present in different dimensions within society. However, ultimately the goal shall be to provide insights into a science-based foundation for substantive narratives.

Narratives about anthropogenic climate change have been within society for many years. In June 1988, U.S. climatologist and NASA employee James Hansen managed to draw significant public attention to the problem of climate change for the first time before the U.S. Senate. That summer, the U.S. was experiencing a historic drought, residents were feeling the heatwave firsthand, and the Mississippi River was carrying less water than ever before. Hansen attested at the time that climate change was real with 99 percent certainty. The absoluteness of the statement was scientifically controversial, but the politicians present were also aware that they were dealing with a dangerous crisis. In 1979, the World Meteorological Organization (WOM) had invited to the first World Climate Conference in Geneva; the public and scientific interest was still low. Further, in 1995, the first UN Climate Change Conference was held in Berlin, by which time, at the latest, the governments of the world realized that the threat was so significant that they had to get serious about stopping global warming (Schurmann, 2022, 17-19).

However, public perception and transmission of climate commuication are to be seen as much more diffuse. Above all, ambiguity about whether humans influence climatic changes seems to have long been present as the central narrative of climate communication. Within the public perception, there have been doubts about the credibility of man-made climate change. Consequently, Havard scientist and professor Naomi Oreskes (2004) undertook a broad survey of the scientific consensus on climate change in response to this perception. The result was astonishing and clear: Without substantial disagreement, scientists find human activities are heating the earth's surface. The study thus showed that public opinion regarding ambiguities about anthropogenic climate change were primarily a matter of

misguided narratives (ibid). Even though this narrative has persisted for several decades, it has been especially promoted by the fossil fuel industry and other actors that stand in opposition to the demands of climate action. Naomi Oreskes also co-wrote the book Merchants of Doubt, among others, describing how a handful of scientists have obscured the truth on issues from tobacco smoke to global warming. Oreskes and Conway (2015) report that misleading narratives complicated a half-century of diverse issues. She found that it is a matter of bringing already scientifically disproved facts into the discourse and thus promoting ambiguity in the public perception. Oil companies like Shell, Exxon, and Total have demonstrably known for decades the consequences of burning more and more gas, oil, and coal for our planet. Their calculations have predicted the damage that is already visible today, in some cases, with astonishing accuracy. For more than 50 years, they have also known that the dirty air produced by burning fossil fuels causes great harm to people's health. Yet they fought stricter clean air laws for decades. Instead of warning the world to take responsibility and change their business strategy, they keep up a massive disinformation campaign that continues to this day (Schurmann, 2022, 117). Also, the media is complicit in this by disseminating a variety of questionable discourses. This includes reporting claims as if they were part of an ongoing scientific debate. But also untransparent interviewers who, as quoted as "experts," had ties to the industry, belonged to ideologically motivated think tanks that received money from the industry or were simply contrarians who may have enjoyed the attention they received by promoting outlier opinions (Oreskes & Conway, 2015, 612). In any case, these tactics misdirected the narrative of climate change. It can be understood as an irrevocable disruption of the narrative. According to Susanna Priest (2016), the Yale Project on Climate Change Communication reported in 2014 that even though 63% of Americans believed that climate change was occurring, and still only 48% believed it was primarily caused by human activity, about 77% supported renewable energy research, 74% supported regulating CO2 as a pollutant, and 63% supported strict controls on CO2 emissions from coal-fired power plants. In other words, a significant number of people supported action on climate even if they did not accept the idea of human causation of climate change and even, in some respects, if they did not believe in climate change at all (Priest, 2016, 3). This points out that there was still uncertainty in any case, especially in relation to anthropogenic climate change. Arguably, public opinion still carries factors of uncertainty concerning climate narratives. Although this public opinion regarding skepticism seems to be decreasing, there are still uncertainties when it comes to the definitions and strengthening of the impacts.

Here it is perhaps helpful to state again that science does not provide certainty or evidence. It merely provides the consensus of experts based on the organized accumulation and examination of evidence. For many people, this definition of science is not clear. Research produces evidence that, over time, can settle the question, and from that point on, there are no "sides" either, only accepted scientific knowledge. This must also be applied to the public narrative. There may still be unanswered questions that scientists then turn to, but for the question that has been answered, there is simply a consensus of expert opinion on that particular topic because that is what scientific knowledge is all about (Oreskes & Conway, 2015, 679-680). However, outside opinions and interests clearly influence this scientific perspective. Not only do lobbies and their campaigns shape people's view of the world more than most people are probably aware of, but many people also accept economic narratives as a generally valid reality and do not question them much. The worldview of many people in Western industrial and welfare states is often shaped, at least unconsciously, by a neoliberal success narrative that economic growth will solve many social problems (Schurmann, 2022, 125). This narrative will be further explored in the chapter on barriers but shall first show that the narrative around climate communication is significantly embedded in societal structures. Thus, not only actors and their interests play a significant role, but also systemic structures and their often unquestioned basic orientations. They provide a framework, which in this sense, provides an outlook on many topics and specific narratives. In any case, the aim is to anchor the scientific consensus on climate findings in the narratives. In this way, arguably, the narrative strands embedded in climate communication can take a direction that is as unbiased and science-oriented as possible. Fortunately, despite all the misguided narratives, it can be observed that the scientific consensus regarding climate change and the accompanying need for action is also gaining more support in public perception. Embedded in the systematic societal orders, certain narratives exist. They make it increasingly difficult for climate communication to be successful. The magnitude of the multiple ecological and climate crises is, to some extent, so far removed from public awareness that clear communication about it seems like hyperbole and is quickly discredited as alarmism. The public debate about the need for and appropriateness of climate change mitigation measures involves the repetition of arguments that are long outdated or generally illogical from a scientific perspective. Lamb et al. (2020) examined and categorized these narratives. They can be divided into the following four main categories:

1. Passing on responsibility
2. Propagating measures that are too weak
3. Emphasizing disadvantages
4. Capitulating prematurely

1. Passing on responsibility: One example is individualism, which reduces climate action from systemic solutions to individual action. This discourse narrows the solution space to personal consumption choices and obscures the role of powerful actors, cooperations and organizations in shaping those choices. These narratives, however, relegate discourse to a person rather than a systemic level. Further, narrations may focuses on pointing at others and emphasizing through blameshifting, which may gives the impression that action is pointless. Climate protection whataboutism is regularly used against a ban on domestic flights or a speed limit. These redirection discourses represent the real challenge of finding a just and comprehensive response to climate change (Lamb et al., 2020).

2. Propagating measures that are too weak: One part of this narration is the primary belief in technology. In other words, a narrative is pursued here that relies on more innovation and research and thus hopes that future technologies will open up entirely new possibilities for climate protection. Research suggests, however, that the transition to sustainability can only be effective if far-reaching lifestyle changes complement technological progress (Wiedmann et al., 2020). This so-called technological optimism and faith may be justified in some cases, but empirically unsupported claims often accompany this delusion. This includes narrative claims that technological progress requires only market-based incentives and no regulation, that breakthroughs are imminent, or that the rapid deployment of renewables makes stringent policies or demand reduction measures unnecessary. In either case, this propagation of technologies as saviors of the climate crisis must be viewed critically, as it also holds true of other empty promises (Lamb et al., 2020).

3. Emphasizing disadvantages: Part of this narration includes social justice as a pretext. The narrative applies, for example, to arguments claiming that climate protection is unfair because poorer people are burdened the most. Even though it can be considered a legitimate argument, it is under-complex and exacerbates social injustice in this form. This is the case because it precisely addresses a question of policy design and measures. It is essential and relevant to discuss how to make the necessary measures socially just and share the burden fairly. Emphasizing the downsides of climate action diverts attention from the harms it avoids while denying the potential for inclusive policies that harness social

benefits and gain widespread acceptance (Lamb et al., 2020).

4. Capitulating prematurely: The last misguided narrative concerns doomsday fantasies. This includes arguments that no matter what we do, we cannot avert climate catastrophe and that we should adjust to it and accept fate. They hold one goal, namely, to not change anything about the current status quo (Schurmannm 2022, 147-148). This discourse implicates that climate change mitigation is hopeless and suggests that the only available response is an adjustment. Doomism further argues that any action we take is too little, too late. Catastrophic climate change is already pre-programmed. Such statements trigger fear and lead to a paralyzing state of shock and resignation (Hulme, 2019). Like many other dialogues of delay, the category of surrender does not favor the challenging work of building climate participation. (Lamb et al. 2020). Furthermore, one can see that the real problem is that, for many people, change seems inconceivable.

Despite these impactful and misleading narratives, scientists and policymakers can detect a growing consensus. Also, most governments finally agree that climate change is now inevitable and anthropogenic in its origin. Consequently, communication efforts have increasingly developed from persuading people that climate change is happening to persuading people to adopt practical measures to deal with it (Nerlich et al., 2010). However, just because the great skepticism of man-made climate change is gradually being dispelled does not mean that communicating environmental issues has become an easy undertaking. Especially the environmental risks and pressures hold challenges in regards to communication. The environmental changes on the Earth system require the most significant possible degree of communication and implementation to reduce the uncertainty and complexity of the effects of climate change. If we take the climate-related scientific findings, there are numerous approaches regarding what can and should be communicated. Every day new scientific discoveries are developed in the fields of natural science and the earth system. Content-related communication challenges are, therefore, significant obstacles to climate communication. Even though continuous exchange and communication on the topics increase awareness, it is ultimately also a task of education to pave the way for an understanding of content-related complexity. Once again, politics will have to be involved in this matter. Annika Arnold (2018) argues that to understand the nature of the political and public debate on climate change, one must also understand the narrative structures that produce this discourse. She holds that narratives that appear in the media, public discourse, political agenda, or even scientific debate are vehicles for complex

phenomena, such as climate change. Indeed, it is not just the science behind it, the layer of relationships and differences between daily weather events and climate, but also various other factors. They lead from natural causes to climate change to anthropogenic climate change, and the sheer volume of voices in this debate makes climate change a challenging topic to sell (ibid.). Thus, it can be stated that the diversity of actors and their different interests additionally complicate the narration around climate issues on top of their often complex contents. Problem systems are challenges of complex nature that are directed towards an insoluble complexity context (Luhmann, 1996). Climate communication is to be understood as a part of larger, system problems. This is also reflected in the narratives of activist demands. Part of the revolt and demands for climate action carries the slogan: "System change, not climate change!". The criticism clearly addresses systems. At the center are the economic system, consumption patterns, capitalist structures, and other aspects of the societal system, which prioritizes profit maximization and the exploitation of people and nature. The call for system change is thus a profound expression of dissatisfaction with social system structures. In this narrative, the problem of climate change is consequently linked to resource extraction and exploitation structures, that are further amplified by systemic structures.

In summary, even if climate narration is about removing the ambiguities from climate skepticism, it is even more critical to develop clear narratives to minimize the space for groundless attacks on scientific evidence. Many misleading narratives currently shape and guide climate communication. Many of them are based on insufficient argumentation or refuted facts but still have arrived at the center of public perception for many years. For this reason, modern climate communication can be considered particularly difficult. Only if narratives find a clear line and, above all, highlight the substantive aspects can they succeed. In addition, the complexity within the narratives needs to be captured and communicated insightfully and logically. As Luhmann has already introduced, problems are only significant problems if they cannot be dealt with and solved in isolation, piece by piece. Thus, problems exist in his perception only as problem systems, which are directed towards an insoluble complexity context (Luhmann, 1996). This is precisely where the problem is to be found, also in regard to climate action and its communication.

3.4 Towards holistic Narratives

The narratives of communication around climate change and other environmental issues are diverse. Growing demands by social actors and groups, especially science and activists, have expanded the pressure and the knowledge that drifts into the center of society. In addition a broad range of communication modes is helpful for effective climate communication. Broad narratives are thereby increasingly addressed in a wide variety of media, online and offline, by government-led as well as citizen actors. One can certainly note that these narratives are moving toward more holistic storytelling.

However, according to physicist Geoffrey West (Schellnhuber et al., 2010, 11), almost all existing approaches to the challenge of global sustainability have previously focused on relatively specific questions, such as the change in atmospheric composition in the earth system, ecological consequences of future energy sources, or economic consequences of climate change. He argues that while such specific studies are of obvious importance and indeed ought to be the focus of scientific efforts, they are not enough. West emphasizes that no overarching, integrated conceptual framework has yet been developed that provides an overall perspective that unifies the many highly interrelated issues that comprise sustainability. Existing approaches have largely failed to capture the core of the long-term sustainability challenge, namely the profound interconnectedness and interdependence of environmental, ecological, economic, social, and political systems (ibid.). There is a call for integrated sustainability research that works holistically and looks at diverse systems and their interconnections. Indeed, one could apply it to the narratives of climate communication, which are supposed to carry the content of sustainability research - but the task remains challenging.

One approach toward progressive climate communication as part of activism takes this into account and is found in interdisciplinary reappraisal. It is the idea that environmental concerns intersect with social inequalities (Ogden-Jones, 2020). In this sense, environmentalism is integrated with other issues of justice: racism, feminism, and classism (Lovvorn, 2017). The approach stresses that a sustainable global community can only exist under the broad narrative of holistic environmental justice. The integration of social issues and, above all, social inequality topics are increasingly becoming part of the environmental discourse and narratives on climate communication. This activism development shows that it is not only about the mitigation of the global mean temperature rise but also about multi-layered interrelationships, which consistently depict an imbalance in our social systems. So parts of the environmental movement strive for a more sustainable society as a whole

rather than climate action from an isolated perspective. In this sense, a sustainable society and climate challenges can only be considered holistically.

We have already seen such examples concerning research in earth-system science, where overlapping research areas of physics, chemistry, biology, and other natural sciences are combined. But also, the concept of planetary boundaries seeks to unify as much scientific understanding of the Earth system as possible. The result on planetary boundaries by the Stockholm Resilience Centre (SRC) is one of these examples, which tries to integrate other aspects into the approach. Especially SRC's work is to approach research by connecting social and environmental perspectives. Also, other institutions are increasingly trying to use interdisciplinary research to evaluate complex climate issues. It can thus be understood as the objective of climate communication to integrate these research approaches of interconnectedness and thereby formulate them toward progressive narratives. Outside of academia, especially promoting this progressive perspective by national institutions is considered challenging. However, in the global order and especially within international organizations, under their aspirations towards cooperation and diplomacy, the holistic perspective is recognized and increasingly embedded within organizational structures. When looking at the world order and its institutional reporting in the field of sustainability, one will inevitably come across the international organization of the United Nations (UN). The UN addresses predominantly public policy issues, including the totality of governmental actions, in the form of international laws or regulations. They aim to incorporate the concerns of government agencies or the citizens of nations through international agreements and other aspirations of global diplomacy. The United Nations 2030 Agenda for Sustainable Development is a pathway to global sustainable development jointly designed by the world's governments to help our people and planet live more sustainably. It is an approach that takes a holistic sustainability perspective, incorporating multiple areas of the social structure, and follows the previously established Millennium Development Goals. The Sustainable Development Goals (SDGs) are probably the most significant and ambitious policy effort for sustainable development. The agenda includes 17 goals with several associated targets and targets assigned to each goal (United Nations, 2019). Particularly noteworthy is the comprehensive perspective that is taken, which is based on overall scientific knowledge from various areas of human scientific findings. It is about providing a total view and integration of aspects of the earth system and the social system. Some goals are related to environmental issues; others are oriented towards economic activity, educational, or equality concerns. Ultimately, however, it is about

combining these topics to achieve the best possible and holistic policy recommendations.

Goal number 13 is defined as: *Take urgent action to combat climate change and its impact*s, and is thus the specific goal that addresses the mitigation of climate change. It is based on the international agreement of the United Nations Framework Convention on Climate Change, which is considered the primary forum for negotiating intergovernmental responses to climate change. The goal is kept relatively concise, and the targets are somewhat more detailed but still relatively straightforward. The sub-formulations of the goal include targets that call for the integration of measures into national policies, the strengthening of resilience and adaptive capacity for all countries, and especially mechanisms for the support of least developed countries. Especially women, youth, and marginalized groups are to be mentioned (ibid.). Moreover, there is no concrete implementation plan for the goals, only the goal formulations, and targets. One climate action target also deals with the goal of education in relation to climate change and awareness-raising. This shows that climate education and communication in itself is an important contribution to climate change mitigation, adaptation, and impact reduction. It emphasizes human and institutional capacity through growing consciousness. The communication of the topic is thus an aspect of being able to implement the goal of climate action in its entirety. Further, a large part of the implementation effort of the whole SDGs is also associated with communication about sustainable development itself. It is about making clear to the public what the approach is, why it is essential and what is being done to achieve it. In the broadest sense, it is about raising awareness through communication. Mainly the United Nations builds on communication promotion through public diplomacy and broad stakeholder cooperation on a global level. However, the core message of the SDGs is perhaps even another. The various goals show that climate action is only one aspect of a sustainable society in harmony with the planet and its finite resources. A close look at the goals shows that many interlinked targets cannot be considered in isolation. In particular, the environmental goals of the SDGs, including the conservation of the oceans, protection of ecosystems, and halt of biodiversity loss, can be considered the most apparent and integral elements of sustainable climate promotion.

"Sustainable development, as one of the great challenges of our time, is an inclusive concept that applies to all countries of the world; that is, to countries in the northern as much as to those in the southern hemisphere. It is central to all efforts towards the human shaping of the world through globalization." (United Nations, 2019)

However, as ambitious and relevant as the goals are, the challenge is still to implement the goals through relevant national legislation, international agreements, and other measures (ibid.). Despite already existing efforts, decades of scientific observations show that the world is no closer to environmental sustainability, and in many ways, the situation is deteriorating (Howes et al. 2017). The problem here is that the targets are only subject to an international agreement but are not legally binding. However, member states of the UN are expected to report on progress on a voluntary basis. However, it can be stated that most countries are not on track with the agenda. Howes et al. (2017) explored reasons for this in their research. They found that the failure to improve environmental sustainability is due to a complex number of causes. A key element is the failure to implement policy from the international to the national, regional, and local levels of government. This failure is a complex web of interrelated structural causes, implementation pitfalls, and knowledge or planning problems. This shows that although the holistic perspective seems progressive and sensible, it encounters significant challenges in reality, especially in implementation. There are major challenges to be faced, especially at national and institutional levels. At this level, in particular, globally-oriented interdisciplinary approaches are still not well established, and consequently, there is little room for their implementation.

However, a promising approach that can be mutely included in this holistic sustainability process is the dimension of a global society. Apart from promoting this with international cooperation and institutions such as the UN, other efforts also adopt this perspective. Concepts such as “global citizenship” encourage a world community perspective at the social level. The aim is to develop an understanding of global community relations beyond institutional organizations. It is about engaging people in the academic process and thus promoting scientific diversity. It is also about giving individuals a connection to the network of global structures, which can be beneficial for better insights into global connections and interdependencies of societies. This again relates to social but also environmental aspects.

Within science, increasing developments of so-called citizen science can be found. Citizen Science can make a real contribution to mobilizing the global community to become an active part of data generation, for example, the SDG reporting process at the global level. Supporting Citizen Science projects at the local level ensures individuals can take advantage of an opportunity for social innovation. The approach also falls into a holistic view of science and society where citizens can help with monitoring and, more importantly, implementing the SDGs (Fritz et al., 2019). These developments show a holistic

perspective of science and connect societal communities with science.

In addition to the increasing interconnectivity aspects of climate-related issues, one can also see a trend toward other narratives. There seem to be increasing and quite comprehensive demands in the direction of the linkage of human well-being and the right to a future on an intact planet. Also, the human perspective through an individual's lens, such as ideas of a "good life," move towards the center of discussions. Micah White (2016), a US award-winning activist who co-created the global social movement called occupy wall street, argues that the future of activism is determined precisely by our spiritual environment. This means that we care about the health of our natural world and our inner world. He assumes that environmentalism is a story individuals tell themselves and, therefore, an existential and spiritual question. White points out that this so-called mental environmentalism must come through a shift in the way we perceive the world, away from ego instincts and toward a collective uprising. While relating to the individual, this perspective again ties back into the notion that climate action is about more than the mitigation of climate change. It can and is often used as a very personal approach to seeing the world. It is, in this sense, about a collective approach that strives for overall societal well-being. This is done on the basis of systemic criticisms and the removal of self-centered perspectives.

This view of society as a whole can also be used to develop positive narratives for a better future. It is about moving beyond the narrative of temperature rise and towards collective societal improvement. This includes aspects of cooperation between different actors, modes, and communication perspectives. It also emphazises that climate change goes beyond environmental protection, and non-traditional alliances must be sought for solutions (Lovron, 2017, 16). Increasing considerations show that the problems of the climate crisis address wide-ranging questions of human coexistence. Climate narration increasingly addresses holistic sustainability narratives, which include climate action and take into account all dimensions of social and environmental coexistence. In that sense, the aspiration of holistic narratives can, therefore, not only be considered to work out isolated narratives but much more to connect complex narrative strands and incorporate them into a single narration.

Sara Schurmann (2022) argues that, at its core, it is about demanding a world that values life and sustains our livelihoods. Many people have been working for years on many different issues and steps that are necessary for this world. Social groups who fight for good working conditions, fair wages, affordable rents, and social division, communities

who stand up for good education and teaching, and inclusion in all these areas. Because arguably, all of that is also needed if we want to slow down climate change and preserve our livelihoods. One can certainly argue that legitimizing ideas of discrimination, that some people should be worth less than others, have a similar origin. Inequalities and rebalanced power structures in the social system unite demands for a more just and sustainable world. Because oppressed social groups can only prevail if they stick together - it is about solidarity but also strategic thinking. Ultimately, social struggles also have to do with the fight against the climate crisis (Schurmann, 2022, 339-342). Combining these different demands are ultimately the narratives that promote sustainable development for people and our planet.

There is no need to rely on fear to avert the climate crisis. We can also talk about the many opportunities it can create if we believe in positive change: the quality of life that can be gained through climate protection, the expansion of rail and public transport networks, the restoration of ecosystems, and much more. It is necessary to take away people's fear of change with visions while creating awareness of the terrible consequences of the climate crisis. Because one thing is sure, people still have the opportunity to intervene in the climate crisis (Rogenhofer, 2021, 99-100). It is precisely about seeing this intervention as an opportunity for more social justice and the integration of natural systems into our lives. This can be seen as the goal of holistic narration and the formulation of positive opportunities through climate communication.

In conclusion, increasing considerations show that the problems of the climate crisis address complex questions of human coexistence. Climate change can be a trigger to question other system structures in the broadest sense. Climate change is a starting point for new considerations of the economy, society, and many other organizational structures of social interactions. It is also about addressing systemic problems of society, namely inequalities, power imbalances, disconnections of our systems to nature, consumption-related concerns, individual mental perceptions, and many others. The UN's public policy efforts promote sustainable development with multiple goals that take this holistic perspective into account. Essentially, it is about providing a strategy and an answer to complex scientific findings, such as the planetary boundaries. Moreover, in a broader sense, it provides a basis for communication frameworks of holistic sustainability narration. These holistic narratives are arguably the most progressive form of inclusive climate communication.

4. The global sustainability challenge: An insight into limiting factors

The sustainability issue can be seen as a holistic systems approach to promoting integrated social and earth systems. This chapter emphasizes that overcoming climate inaction is significantly related to overcoming barriers. Through the publication of the Brundtland Commission's report "Our Common Future", the subject of sustainability started to take its place on the global agenda in the 1980s. In addition, there has been increasing acknowledgment that science is central to the prospects for successfully addressing this agenda. Although visions of sustainability vary by region and context, a broad global consensus has emerged that the goal should be to promote a transition to development pathways. Those are centered around human needs while preserving the earth's life-support systems, while reducing hunger, poverty and also integrating the three pillars of environmental, social, and economic prosperity (Steffen et al., 2005, 296).

The goal of sustainability is precisely about combining the earth system approach and the social system approach. It is about bringing the two areas into balance and finding a coexistence humans and the planet by finding a holistic perspective. In that sense, sustainability concerns require an integrated approach that include all areas of society; this means the goal of institutionalizing sustainability. Since institutions largely shape our social system, the concept of sustainability must be integrated into its framework. This also requires the consideration of a long-term perspective. So far, however, the implementation can still be considered as challenging and inadequate. A general explanation is that many challenges are relatively new compared to the permanence of nations main bodies of laws and regulations. However, there are still more specific reasons why institutionalization is particularly difficult for sustainability concerns (Berg, 2019, 160). These reasons can be found in the various barriers of the social system in regards to climate action.

Christian Berg (2019) approached the sustainability issue from a holistic perspective. For this purpose, he has elaborated on the different and broad-reaching barriers that prevent society from carrying out sustainable action. In the following, his elaboration is outlined in attempts. In any case, however, the barriers to sustainable are to be understood as much more diverse and complex in reality. The following overview is again an attempt to give a rough outline of essential elements of climate action barriers. It addresses the second question: *What systemic barriers to climate action can be identified?*

4.1 Systemic barriers

Systematic barriers refer very clearly to global structures. These structures are so strongly embedded in our social system. They are part of the essential structure of the system and are deeply embedded in institutions. Much more, institutions are built according to these characteristics. In that regard, the following barriers hold a systemic structure, meaning that they are far-reaching and all-encompassing in the social system. We identify three primary sources of systemic barriers that will be further examined: The economic system and market failure, the tragedy of the commons and lack of global governance, and lastly insufficient institutions that include structural silos.

- *The economic system and market failure*

In order to better understand our global system barriers, it is necessary to take a look at the current dominant economic system. Only by understanding today's economic dynamics it is possible to understand our planet's rapidly increasing emissions. The history of our current economic system is complex and dates back as far as human trade itself. Many see Adam Smith (1776) as the father of capitalism, while historians argue that today's economic system arose much earlier. In this same general view, the origin of the economy is, in any case, anchored in humans natural tendency to swap and trade. In the 18th and 19th centuries, however, Smith was undoubtedly one of the first who tried to establish economics as an independent discipline of a scientific theory subject to a "natural" order. Adams Smith's definition of economic prosperity in his work, The wealth of nations, is based on the concept of division of labor. It emerged during times of the industrial revolution and is a pillar of the market economy. Economic systems have since been characterized by specialization and division of labor. Smith, however, provides only a very theoretical and ideological justification of the system. The actors themselves ultimately invent the institutions of capitalism. It is argued that capitalism cannot be seen as the realization of a concept but more as the result of historical and social processes.

The economy, in this way, is detached from its social, cultural, and moral context. It operates as a scientific discipline that has become highly mathematized in its continued development. This development was shaped mainly by the liberalization of markets and strong privatization in the 1980s, especially by the policies of U.S. President Ronald Reagan and U.K. Prime Minister Margaret Thatcher. This predominant economic model is the so-called neoclassical model. It operates on a global economic approach through a

capitalist dogma. The fall of the Soviet empire can be broadly marked as the end of communism - thus, it was clear to many that the only functioning economic system was capitalism. Nevertheless, at the latest, since the financial crisis of 2007, this thesis seems more than questionable. Especially in recent years, with increasing recognition of climate change and resource scarcity, there is also increasing criticism of the economic system under capitalism. Further critique applies when looking at the essential foundation of the global economic system in the division of labor. Here, of course, the price is carried by the people who perform poorly paid work. They are an essential part of the system because only in this way can prices be kept low. In addition, the division of labor does not promote human development in the profession but monotonous tasks. Many people still suffer from poor working conditions due to the division of labor, especially in less developed countries. "Capitalism's core credential of steadily rising living standards for all has been tarnished: it has continued to deliver for some, but has passed others by." (Collier, 2019, 12).

Further, it is well known that nations around the world measure their economic performance through the paramenter of the Gross Domestic Product (GDP), which captures the total value of all goods and services produced or offered in a country within a year. About two hundred and fifty years ago, the concept of GDP was invented in England, then found targeted political use during World War II when the U.S. wanted more accurate information on rearmament performance. Since then, it has become the key figure at the center of growth and, above all, associated with prosperity (Göpel, 2020, 79). The indicator carries enormous power and position in global decision-making structures and thus influences all global developments. The current economic model relies on a continual, exponential expansion of its size, and the conventional view is that economic expansion will lead to rising prosperity (Jackson, 2017, 20).

However, it is important to note that carbon dioxide emissions are also directly related to economic growth. The problem becomes more clear: infinite growth does not seem to be possible with sustainability efforts. The debate about economic growth is increasingly moving to the center of economic systems critique. Tim Jackson (2017), in his work Prosperity without growth, elaborates on the basic assumptions as to why the present economic construct is flawed - the debate about growth being at the center. He argues that living well on a finite planet cannot be about suffering consumption or accumulating more debt. He points out that the core of prosperity is quality of life and relationships, the resilience of communities, and finally, personal and collective meaning. Furthermore, he argues that the moment it is no longer permissible to question the basic assumptions of a

dysfunctional economic system, political freedom ends, and cultural oppression begins. It is also the point at which the possibilities for change become significantly limited. However, the capitalist economic model shows other problems, namely, the concept of the "homo oeconomicus". This perspective of human beings knows no qualitative differences between resources, no difference between genders, no cooperation, no compassion, and no responsibility neither on the level of the individual nor on the societal level (Göpel, 2020, 67). In capitalism, this image of man, characterized by egoism, ruthlessness, and cold-heartedness, is promoted.

This encouraged behavioral patterns arguably pass over to the environment. The neoclassical approach to environmental economics pursues only one goal: to turn the environment into a commodity. Critical economists here note that the environment is often undervalued as a result. Since natural resources can often be used for free, it tends to be overused and thus damaged. Economists argue that if the environment were given the value it deserves, in economic decision-making, it would be much more protected (Benton & Redclift, 1994, 69). In this sense, current prices do not reflect ecological truths in that they do not include the costs of resources extracted from the earth.

Overall, there is no single methodology used by economists when it comes to analyzing the environment and natural resources within economics. Some economists believe that a more holistic approach is needed in order to address the issue of sustainable development. On the other hand, some argue that going beyond traditional methods is not an essential step in addressing environmental problems. Instead, they promote the establishment of a complete set of incentives. Many ecological economists believe that despite certain social values, there is still much faith in the ability of technical progress to address the various problems (Perman et al., 2011). In the current economic system of growth, this techno-optimism is often applied. However, this should be taken with strong caution, as many studies indicate that we should not rely only on technical solutions. Often, new technologies are developed and introduced so quickly that their social and environmental impacts are only vaguely foreseeable (Berg, 2019, 226). Thus, relying on this single approach to solving issues as complex as the climate crisis and other sustainability issues seems inconceivable. It is, in summary, important to note that the environmental degradation and exploitation of ecosystems in liberal and state capitalist economies, combined with the resulting profiteering, have contributed significantly to the current ecological crisis (Sovacool & Dunlap, 2022). Without addressing the barriers within the economic system, transformation and authentic climate action will not be possible.

- *Tragedy of the commons and lack of global governance*

Garret Hardin initially introduced the concept of the global commons within his paper The Tragedy of Commons in 1968. The tragedy deals with the challenge of the distribution and management of the common goods of our planet. In this sense, it concerns the use of freely available natural resources such as land, forests, oceans, or the atmosphere (Hardin, 1968). All these parts of the planet cannot be used sustainably, according to the concept, because actors can pursue their benefit by exploiting them or discharging emissions and wastes on or into them. Therefore, the egoistic and competitive actor view concludes that only private property rights or strict government control are likely to prevent such exploiting behavior (Göpel, 2016, 139). According to Robert Manning (2007), the tragedy of the commons has become one of the most compelling and influential ideas in environmental science, which has stimulated an enormous amount of research and writing. Addressing management issues of environmental and related commons contains diverse narratives, including wildlife and fisheries, surface and groundwater, rangelands, forests, parks, the atmosphere, climate, oil and other energy resources, food, biodiversity, and population (Manning, 2007, 7-9). It is about the treatment and distribution of resources, which could not be more complex in its entirety. The idea of equal rights to the global commons represents the mindset in which a consensus solution may be found. A global climate governance mechanism for greenhouse gas emissions that builds on the principles of the UN Framework Convention on Climate Change and states that burden-sharing must be based on capacity and responsibility has been developed by the Stockholm Environment Institute with partners and under the so-called Greenhouse Development Rights (GDR) framework, which links climate science with the right to development for the world's poor (Schellnhuber et al. 2010, 41). The challenge of distributing and managing the global commons in this way will, however, still remain a significant sustainability challenge. This is also partly due to the lack of global governance. There is simply no single global rule. Christian Berg (2019) points out that, of course, many organizations operate globally, but they have limited influence and operate only within economic profit constraints. International agreements, treaties and public international organizations codify popular interests. However, these are also to be considered limited. Multilateral international agreements and treaties, and IGOs face numerous challenges that hinder effective regulation of global issues. These include reliance on voluntary commitments, limited sanction mechanisms, non-compliance with existing regulations, and other complex

problems. Moreover, many institutions reflect the geopolitical balance of power in the past. This intensifies the problem of legitimacy, and democracy struggles are also evident within organizations. As an example, the permanent members of the UN Security Council can be compared to the post-war world order, but they do not reflect the geopolitical situation of today (Berg, 2019, 134-139). This question of global order is a significant challenge of our time, which is also aggravated by increasing conflicts over resources and climatic changes. However, it must also be noted that the global structure and positioning can undoubtedly be considered part of the solution and needs to be addressed for the implementation of global sustainability.

- *Insufficient Insitutions and Structural Silos*

In addressing systemic barriers, it is also essential to highlight the general inefficiencies of institutions and their structures. Institutions carry a wide variety of barriers that make action difficult. One primary institutional carrier of global communication can be seen within the media. Noam Chomsky (2012) aptly described the positioning of the media in his work How the World Works. He clarifies that there are distortions within the global media, which are reflected in a bias of domestic media landscapes. If we look at the media world, we can see that big media are big companies owned by giant conglomerates. They intend to sell a product within a market, and that market is advertisers and, therefore, other companies. Moreover, the product is a privileged audience for the elite media, which sets the primary agenda to which others conform. The inferential thus makes it, according to Chomsky, impossible to prevent the image of the world presented from reflecting the narrow and biased interests and values of the sellers, the buyers, and the product (Chomsky, 2012, 90). Hermann (2010) goes one step further and speaks of a propaganda model when addressing the media, especially in the US. He believes that the media and their other functions serve the powerful social interests that control and finance them. In his view, these representatives of interests have important agendas that they want to enforce. They are in an excellent position to shape and influence media policy. This happens, in his assumption, through the selection of the right personnel and the internalization by editors and working journalists of priorities and definitions of news values that are consistent with the institution's policies (Hermann, 2010, 10). Especially in the sphere of social media, this problem intensifies. But there are other barriers in institutions to consider as well. Structural silos refer to the strongly pre-formed stubbornness of society. With their

institutional anchoring, the social system carries a strict, often bureaucratic orientation. This can also be understood as biased because the same approaches or research methods are promoted by various actors and applies to science, media, institutions, and all other areas of society. Only by breaking down these insufficiencies and silos can the way to sustainability in society be paved. So it is a matter of critically questioning in which social setting the financing, decisions, and knowledge findings of the whole society occur.

4.2 Societal barriers

The social barriers to sustainability deal with the structures that shape our social interactions. They are strongly linked to and shaped by the systemic structures and the human condition itself - yet they fall between these two poles. In their totality, however, the societal barriers again have systemic manifestations in that they are broadly present and thus have a formative influence on the overall structure of the system as a whole.

- *Inequalities*

Challenges in addressing climate action also exist because of how our social system functions regarding the current distribution of power within our systems. Power often does not sit with the public. Thus, the actors of society hold a different weight in terms of power distribution. This is to be observed structurally at the national as well as global levels when it comes to the distinction between diverse actors. Inequality in this sense results from different power structures in the more acute society. Therefore, the systems are driven from behind by influential people holding money, and therefore, underlying system change is much more complicated.

Global warming may be humanity's most significant problem because carbon dioxide emissions are directly related to economic growth and because allowable growth in the future will have to be shared equitably among nations and people. Inequalities are further reflected in almost every climate-related concern. The rich world has "accumulated a huge natural debt" by overshooting its share of the global commons (Schellnhuber et al., 2010, 114). Further, the world's poorest countries in the global south have contributed the least to climate change, for example, in regard to long-term emissions. Nevertheless, they suffer the most from the impacts such as extreme weather events and water scarcity. Climate change, in that sense, acts as a multiplier for other social injustices. The responsibility, vulnerability, and decision-making power of individuals and groups concerning climate

change can be attributed to social structures based on characteristics such as gender, socioeconomic status, ethnicity, nationality, age, and location (Kaijser 2014).

Inequalities of all kinds need to be considered here. These include inequalities between the global north and the global south, economic inequalities within social groups, and ultimately gender inequalities.

Especially countries in the global south that contribute less to global emissions are highly affected by climatic changes. Recent studies also show that women and marginalized groups in society, in particular, are increasingly suffering from climate change and its effects (Arora-Jonsson, 2011). Climate change is already present by far affecting the least developed and poorest economies globally. Not many conflicts can be directly attributed to climate change or changes in meteorological conditions themselves; however, it can be seen as a multiplier that adds fuel to unstable scocial systems.

Inequalities are also significantly reflected in other systemic barriers outlined earlier, such as the economic system. The colonial history regarding the economic system is an essential aspect to consider in this context. Only through global exploitation structures could essential powers generate strong growth through their colonial powers. For a long time, slavery was the most common attribute of the capitalist market. The early developments of economic models and theories, which are considered the basis of our current economic structure, are strongly influenced by the west and still carry in practice oppressions structures deeply rooted in them. These assumptions are at variance with other theories that capitalism results from a natural evolution of society. Regardless of assumptions of origin, it is clear that inequalities in society are formative. They are reflected in various forms in our system and must also be considered within sustainability efforts.

- *Conflicting interests and values*

The concept of actors within the social system has already been addressed previously. When it comes to the barriers,, another perspective draws more specifically towards the different goals and interests of those actors. Indeed, it can be stated here that the interests of various actors, such as institutions, corporations, climate activists, and other actors, often stand in conflict. Christian Berg (2019) holds that people have conflicting interests, and in most cases, these conflicts can be resolved within existing legal and political frameworks. However, there are circumstances in which this is not the case, either because such settings do not exist, such as at the global level. Alternatively, when the conflicting interests are

masked by lobbying or corruption, or when the parties to the conflict differ significantly in their bargaining power due to socioeconomic inequalities. Furthermore, he points out that the needs and desires of young individuals differ from those of older people, small and medium-sized enterprises have different concerns than large multinational corporations, the interests of employees differ from those of employers, and so on. Conflicts of interest, in this sense, reflect the diversity of demands of members of a society (Berg, 2019, 97-98). In any case, the different interests of the actors are reflected in the challenges of sustainability and its communication. What appears to be an aspiration for one stakeholder conflicts with the goals of another. Only by overcoming conflicts sustainability can be integrated.

Another aspect of social barriers can be considered in humans' norms and values. They are ultimately reflected through political representation within the social system. One can generally hold that any organization, movement, or school of thought that runs counter to the values of sustainability or disagrees with its premises will undoubtedly be a barrier to sustainability (Berg, 2019, 86). As addressed before, despite the scientific consensus on anthropogenic climate change, there are still other voices of skepticism regarding climate action or other progressive views. Here sociological and psychological phenomena intervene. Often, religion or other value orientations indicate this scientific inertness. It is difficult to convince people with populist or fundamentalist orientations with scientific facts. Economist Paul Collier argues that anxiety, anger, and despair have shredded people's political allegiances, their trust in government, and even their trust in each other, resulting into answers led by old ideologies, returning people to a rigid and simplified confrontation of left and right (Collier, 2019, 13-14). Especially populism and fundamentalism are to be mentioned here. The rise of populism can be observed in many world regions, threatening the global pursuit of sustainability. Evidence is abundant that right-wing populist politicians, in particular, are mobilizing against policy goals in environmental protection and climate policy. However, populism cannot provide complex or comprehensive answers but responds to people's insecurity and anxiety (Berg, 2019, 87-88). In addition, essentially undemocratic political spheres are firmly in conflict with the values of sustainable change. However, this does not mean that an autocrat cannot also make climate-friendly decisions. It is much more about the overall political alignment of values and interests, which do not align. Political orientations and mobilization that are not in line with sustainability efforts will thus remain one of the most significant barriers to societal action.

4.3 Indiviudal barriers

The human system, its behaviors, thoughts, and actions can also be understood as a barrier to sustainability efforts. These individual barriers, refer to different patterns of the human psychy. Thereforet is necessary to understand basic psychological assumptions that influence individual climate action to get a full picture of sustainability barriers.

- *Trade-offs*

The objectives of parts of the social system may often differ from the objectives of the overall system. This means that the behavior of the overall system can be quite contrary to the objectives of individuals. Thus, if we consider this system assumption, we can see that a goal of sustainability for society is desired and is being pursued in the social system. However, many personal behaviors do not go hand in hand. What is meant here are so-called trade-offs, which can be found in the complexity of systems - environmental and social - and thus also affect personal behavior. These trade-offs are all the more reasons to take a global perspective and understand complexity in its entirety. Since many individuals make daily personal decisions, large behavioral patterns can be derived from the system, which have in their entirety significant influence. Even if individual behavior through trade-offs does not serve as the only barrier to global sustainability in this sense, the behavioral decisions add up so that they can be seen as a collective system with lmiting consequences. The trade-offs in each case are to be seen in a personal context with individuals, groups, or social communities. Nevertheless, the responsibility for the trade-offs should not be shifted off to them alone. It can be stated here that the reduction of personal and societal trade-offs is undoubted to be prescribed as the main task of politics. Therefore, policymakers must succeed in rewarding climate-friendly action and, above all, provide support for socially disadvantaged groups in the transformation. Only in this way can the individual trade-offs be reduced as far as possible.

- *Cognitive limitations and the action-value gap*

The cognitive and, thus, individual mental environment influences our ability to act. Under cognitive Iimitations fall aspects of human suppression. A part from human barriers to climate action lies in the condition of our species which is prone to repress much more than they might imagine. This is normal and, as a fundamental human mechanism, considered healthy. People's lives are complex and crowded, consequently it is not possible to question and classify every piece of information. Human brains therefore sort out what is relevant

and what is irrelevant. Everything that we are not constantly confronted with, everything that seems too complex and outside our own scope of action, is faded out. When it comes to blocking out the climate crisis, however, things are different. It is of such magnitude, socially and individually, that our failure to address the issue can be seen as dangerous to our lives (Schurmann, 2022, 158-159). The concept of cognitive dissonance is a significant factor in human limitations. In psychological sciences, the discrepancy between one's attitude and actual actions and the resulting unpleasant feeling is referred to as cognitive dissonance. The conflict can be resolved either by adapting the lifestyle to one's attitude or by carrying out sustainable behavior in the future (Uhl-Hädicke, 2022, 114). In this sense, only a conscious confrontation, as well as long-term continuous engagement, can help resolve this internal conflict of humans.

Psychologist Per Espen Stoknes (2015) further identified psychological barriers to climate action, one being the distance from the topic. The climate problem is therefore distant for most people in several ways. Melting glaciers tend to be far away, as are the places on earth now experiencing sea-level rise, more severe flooding, droughts, fires, and other climate disruptions. Moreover, the most severe impacts are far in the future in terms of time. It often still feels far away from everyday concerns. Thus, climate change is not visible to people daily, on a tangible basis (Stoknes, 2015, 200-203). Here, too, a conscious exposure to the subject matter is needed. However, an empowering approach is essential because otherwise, a mental blockade or aversion to the topic can be expected or even increased.

In general, there is an action value gap in regard to our individual means of action. It refers to the idea that even if there is knowledge and a desire for change in individuals, it often simply does not lead to action. This state of inaction can be attributed to a very human and, again, complex behavioral pattern. In any case, the psychic system is significantly influenced by scientific findings on climate change and calls for action.

Just recently, the most extensive scientific study of its kind found that climate anxiety affects the daily life and functioning of nearly half of children and young people surveyed globally (Hickman et al., 2021). In addition, the study results show that for about 75% of young respondents, the future appears scary. For the first time, climate anxiety and fear are significantly related to perceived government inaction and the associated sense of betrayal. This is cause for concern in any case.. Only through continuous confrontation can these inner conflicts be overcome and developed into climate action. In any case, however, they must be incorporated into the solutions and new narratives.

5. New pathways: Insight into progressive thinking concepts

Previously, it was shown how diverse the barriers to climate action and sustainability intregation are. Insight was gained into the diverse dynamics within institutions, social relations and the nature of individuals. It is therefore clear that complexity in barriers must be reflected in the narratives of communication as well. A special approach for this are new thinking concepts. The ability to think creatively means seeing events, situations and objects in a new light and finding an unusual solution to problems. In this regard, creative thinking, in contrast to template thinking, involves the rejection of the usual appearance of phenomena and objects and exposes original solutions to tasks. It advances the possibility of creating new combinations, whether from the approach to solving a problem or from the thoughts that are there (Sultanova, 2021). The aim is to introduce new ways of looking at issues by including new ways of thinking and addressing them within narrations. After all, complex challenges need complex solutions. In the following, it will be shown that new thinking approaches can be used to better deal with the complex challenges of sustainable action. The concepts below address the challenges and barriers to climate action. In this sense, they can be understood as a new narration to shape climate communication. In the following, three important scientific concepts are presented which can be understood as progressive and integrative. The underpinning with practical examples and implementations in society should show that the concepts can effectively change the discourse. The aim is to demonstrate the advanced ways that are leading to successful approaches of new climate narratives and address the 3rd sub-question: *What are progressive concepts that encourage new narratives?*

Reverting linear thinking

The idea of moving away from linear thinking aims to reorient from linear thinking toward complexity-based thinking. It is initially somewhat abstract. However, it relates very appropriately to system structures and can therefore be applied to all systems previously highlighted. The idea is to get away from linear constructs and thought structures. The earth system and social system can be defined as complex systems. Furthermore, many aspects of these systems consist of further complex subsystems. In principle, truly complex systems consist of a large number of different components that interact with each other in a non-linear way. Despite the complexity of these systems, the natural sciences have a long way to go in reliably analyzing nonlinearities since the earth system holds millions of complex subsystems from a wide variety of categories (Steffen et al., 2005, 145). In

contrast, the same type of analysis for complex ecological or even socioeconomic systems is still in its infancy.

Transitions, as prevalent through climate change, are inherently social, full of uncertainties, twists, and turns, and are best viewed as dynamic, multidimensional, multi-actor, and multi-level challenges that cannot be planned and predicted linearly (Grin et al., 2010, 6). It istherefore essential to apply different thinking this major issues and challenges. Climate change and the associated need for action can be understood as a large-scale transformation. This is to be considered a vast, conflict-ridden, and long-term task, and its results will usually be different from those foreseen by the individual actors in the process. Thus, the processes are not predictable in a linear fashion, as a comparatively small change in one subsystem can have significant effects on another. There are often time delays between cause and effect, especially between small individual causes and the cumulative effect of a tipping point - moreover, here, no one has a precise idea of when a critical mass or threshold is reached (Göpel, 2016, 160). This applies, for example, to tipping elements in the earth system and to unrest in the social order and other aspects of global systems. Consequently, society has to deal with the approach to complex system dynamics and learn to understand them. Understanding them is the first step to apply them later in thought processes and in relation to systems.

Helpful here can be the approach to understanding complexity as something very ordinary. Complex systems are part of our everyday life in the form of computers and ecosystems, but also our brain or the crowd at the concert carries these complex properties. Complex relationships are thus part of our everyday life. Moreover, even if our brain - fortunately - often simplifies, filters, or represses them, it is important to recognize the complex phenomenon and integrate it as a concept in our thinking. In the same way, the idea is also being pursued in science and used in an interdisciplinary approach for climate-related research. In order to better understand these scientific phenomena in society as a whole and, ultimately, to be able to communicate them, a confrontation with complexity in society is thus increasingly required. The shift away from linear thought patterns and approaches can find application in various fields of science, but also more concretely within the social system, its structures, and institutions. A significant barrier, as previously outlined, can be seen in the economic system. The application of non-linear models is becoming increasingly prevalent here. In the specific concept of the so-called circular economy, a shift is made away from linear economic thinking, which forces the wasteful consumption of resources, toward circular thinking. Circularity thinking can be understood

as an aspect of extended complexity thinking. The circular economy creates a cycle of resources to minimize waste and inefficient consumption. This idea is already being applied in policy recommendations and implementations. However, also other approaches to changing the linear economic model are being pursued. Kate Raworth (2012) introduced the concept of the doughnut economy, which is based on the principles of the Sustainable Development Agenda. The goal of the concept is to create an economy that is safe and socially just for everyone. The doughnut model shows how humanity can thrive amidst the various social foundations and planetary boundaries on earth (Raworth, 2012, 11-14). In very simplified terms, the concept is about transferring the complexity of social and environmental dimensions into our economy. The assumption of otherwise isolated markets, which contain an equilibrium state and move in linear dimensions, is increasingly changed with Kate Raworth's approach. However, complex social and environmental dynamics cannot be integrated into communication without a systemic perspective. Moving away from linear thinking and introducing non-linear or complex models can be helpful to approach holistic narratives.

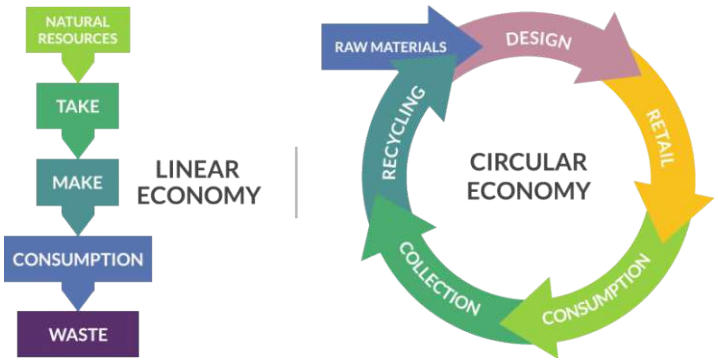

Figure 2) From Linear to Circular (Kendall Harrow, 2020)

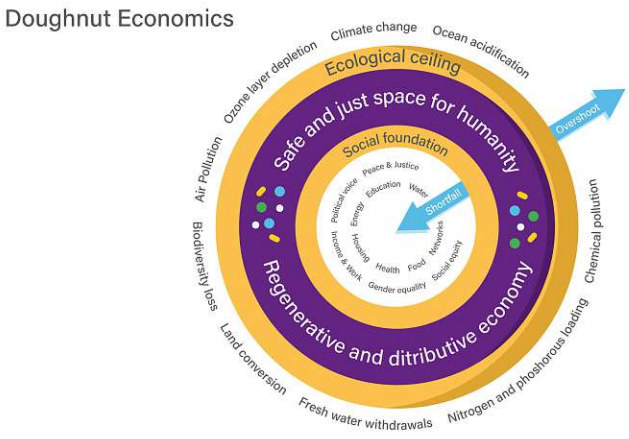

Figure 3) Doughnut Economics (Davide Perillo, 2020)

Applying the lens of Intersectionality

When implementing sustainable solutions to a particular problem, often other problems are created. This needs to be avoided by taking into account a broad and holistic societal perspective. Personal identities are affected by different realities of life, which should be taken into account. Through the lens of intersectionality, aspects of social inequality, human psychology, and other behavioral dimensions are integrated. The term intersectionality was introduced in the late 1980s to draw attention to the confounding dynamics of equality in anti-discrimination and social movement politics. It highlights how one-way thinking undermines legal thinking, disciplinary knowledge transfer, and social justice struggles.

In recent decades, intersectionality has proven to be a productive concept used in disciplines such as history, sociology, literature, philosophy, and anthropology, as well as in feminist studies, ethnic studies, queer studies, and legal studies (Cho et al., 2013). It is about grasping the complex personality dynamics in the social system. Coined by Kimberly Crenshaw in her 1989 legal essay, intersectionality describes the ways that humans benefit from or are harmed by systems of oppression according to our overlapping identities. Dr. Jennifer C. Nash (2021) highlighted how intersectionality is not a tactic for fighting oppression but a lens through which anti-oppression tactics can be formed. By applying this lens, it is possible to look at social dimensions and people's experiences of discrimination and thus find a holistic approach to answering complex social challenges. Through the intersectional lens, climate reparations bring in new spheres of influence through their holistic perception. It is about addressing diverse groups, especially marginalized groups of society.

According to Leah Thomas (2022), social injustice and environmental injustice are fueled by the same flame, namely the undervalued commodification and exploitation of all forms of life and natural resources. This includes sources such as water, grasslands, or endangered animals, and results in people living in poverty and oppressing others around the world. Thomas advocates for an intersectional future that is green, regenerative, sustainable, and more equitable for all people. A redefinition of climate change can be conceptualized as an overarching social justice issue through an intersectional approach. Climate change advocates are challenged to look inward, examine their own biases and assumptions, and rethink the traditional focus of climate change advocacy in recent decades to advance this broader view of climate policy. It starts with a new look at the likely magnitude and impact of climate-related harm to the most vulnerable elements of our

society, focusing on the least-mentioned and, indeed, often invisible victims of climate change (Lovron, 2016). Addressing these vulnerable groups is important in that it points to problems but also solutions within the social system. A manifestation of an intersectional approach is Ecofeminism. Its basic idea is that women's liberation is intertwined with the liberation of the environment. Ecofeminism examines the connection between the oppression of women and the destruction of nature. It argues that both are consequences of capitalism, patriarchy, and white supremacy (Sandilands et al., 1996). The solutions to this approach can be found in numerous forms of women empowerment and promotion of female leadership. In a way, the approach shows that various possibilities of overlapping personal and social dimensions can be considered.

One very concrete approach to integrating an intersectional perspective into climate communication is to include indigenous perspectives. Indigenous communities are to be considered at being at the front line of climate change. These communities, who live strongly in harmony with nature, are not only heavily affected by the impacts of climate change but also carry a great deal of wisdom in dealing with nature. Indigenous knowledge is essential for biodiversity conservation and is increasingly under scientific investigation. The wisdom, knowledge, traditions, and practices of the people in the ecosystem provide important insights. Their knowledge is based in part on valid observations but also on beliefs that have no basis in reality. In any case, however, indigenous biodiversity management is urgently needed because it is the basis for the livelihood and well-being of human populations facing climate change and other ecological challenges (Gadgil, 2021). Through an intersectional lens, reparations can not only empower vulnerable indigenous communities but simultaneously integrate their substantive approaches to climate action.

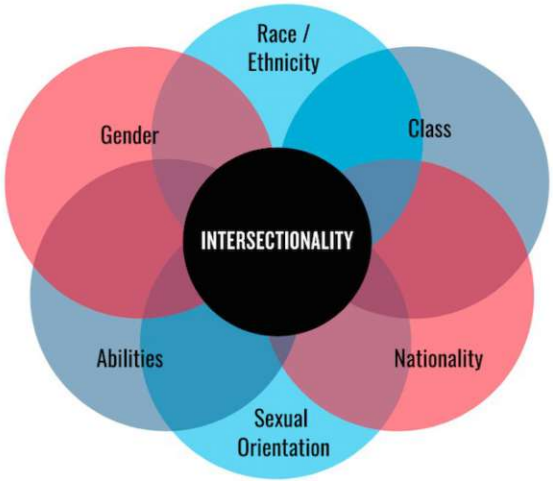

Figure 4) Intersectionality (Zimmer & Raja, 2021)

Promoting Nature-based Solutions

The disconnection of humans from nature and their environment is a significant concern in regard to sustainability efforts. There is an instinctive connection between humans and other living systems, and the goal is to learn from nature and build a new relationship with it to establish Nature-based Solutions in the built environment (Xing et al., 2017). The idea of strengthening this connection is, therefore, very straightforward. But it is not only about strengthening the connection but also about recognizing that many solutions can be found in nature. Nature-based solutions (NbS) is, therefore, an approach that finds the answers in nature. In that sense, NbS aims to benefit biodiversity and people by working with nature to address societal challenges. These challenges can include broad sustainability issues such as food security or disaster risk management. They further include reforestation, ecosystem restoration, protection, and overall sustainable management. It is an approach that cannot be summarized in a simplistic way because it reflects the complexity of the phenomenon and solutions found in nature. Thus, NbS has become accepted as an umbrella term that encompasses various concepts that involve working with nature for the benefit of society. This includes approaches such as the ecosystem approach, ecological restoration, ecological engineering, agroecology, forest and landscape restoration, ecosystem-based disaster risk reduction, and, more recently, natural climate solutions. Some terms are defined based on the intended outcome, while specific actions define others. Accordingly, these terms are not mutually exclusive, and the same NbS may be eligible for more than one of them (Seddon et al., 2021). Nature-based solutions offer, for example, a wide range of sustainability benefits in urban development. It is about finding the nature connection through a powerful driver for regreening cities. These include mitigating the urban heat, improving biodiversity, community pride and improving people's health and well-being (Xing et al., 2017). The approach that human well-being is also an aspect of the solution is worth emphasizing. It is the idea that people are part of the ecosystem, and their health plays an essential role. Only recently, the Corona pandemic has shown that health and our connection to nature are essential and need to improve in order to avoid major societal disruptions in the future. It is about the development of long-term embedding of nature in our way of life without the vital extraction and negative impact on natural systems. The so-called ecosystems approach would be a concrete implementation and integration of the NbS into thought processes. It promotes ecosystem thinking and other forms of incorporating ecosystem perspectives in our daily applications. The concept of ecosystem

originated in the biological sciences. While there are countless definitions for the term ecosystem, one of the clearest was coined by a pioneer of ecology, Arthur Tansley. He. defined an ecosystem as the interactive system between a biocoenosis of a group of living things and their biotope of the environment in which they live. At the heart of the ecosystem concept was the idea that living organisms are constantly in a variety of relationships with every other element that makes up the environment in which they live. Therefore, ecosystems could be described as any situation in relationships between organisms and their environment (Walton, 2017, 86). We generate many benefits through our ecosystems. The inclusion of ecosystems and their so-called system services is an important approach which finds its origin in Nature-based Solutions. The concept of NbS is incredibly expansive, but it is also supposed to demonstrate how diverse solutions can be and how versatile they are already found in nature. In terms of communication, they are a helpful way to engage nature more fully and thus strive for holistic narratives.

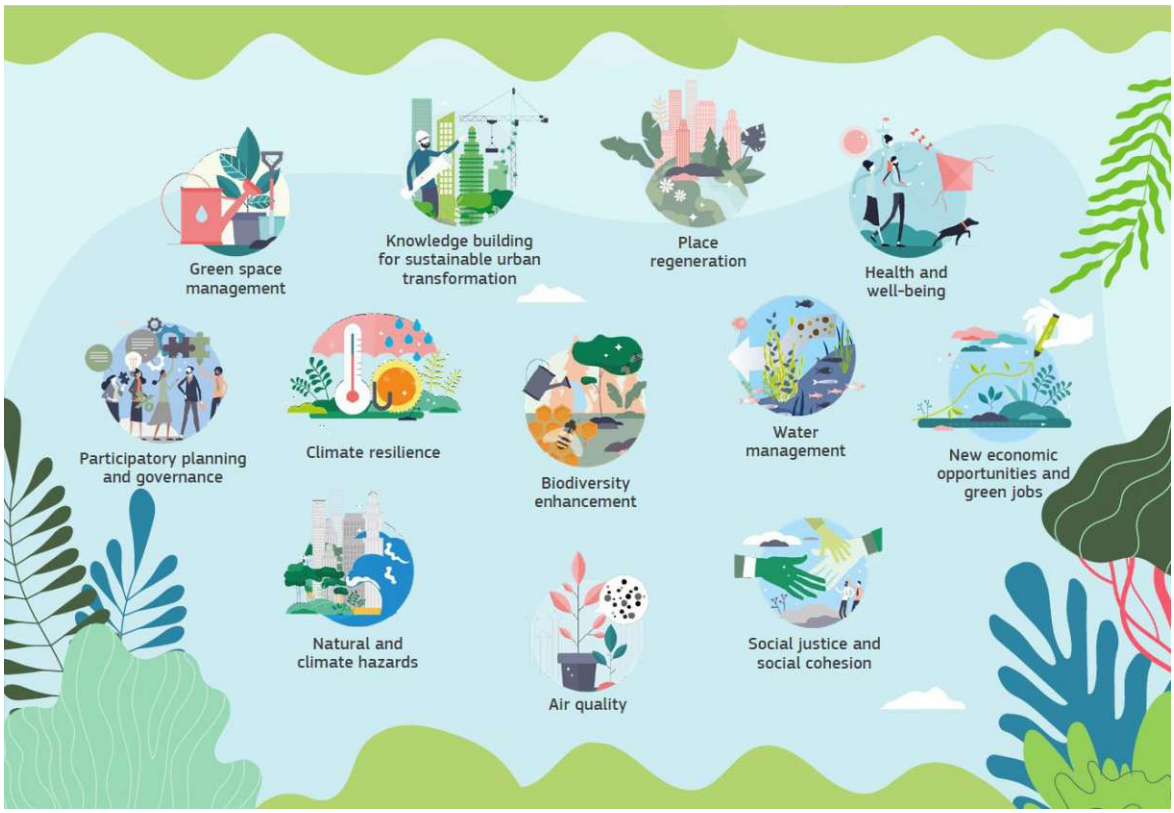

Figure 5) Nature-based Solutions (European Commission, 2021)

6. Research: Analysis and Findings

In the following, the research results on the presented research question will be addressed. By collecting findings from literature and interviews and the resulting analysis, conclusions on possible answers will be discussed and presented. The goal is a comprehensive presentation of findings related to system-based climate communication. Interviews were conducted with experts in the diverse fields of physics and complexity research, system change, and environmental psychology. The experts help expand unique ideas, such as developing new perspectives on progressive future narrations

6.1 Analysis

A precise examination of communication theory indicates that there is no one way of modern climate communication. We communicate through all aspects of human behavior and thus cannot avoid integrating the climate issue directly or indirectly into our behavior. Climate communication is, in that sense, to be understood as part of many complex human system interactions and, therefore, about aspects of human behavior but much more about societal patterns, structures, and those manifestations through established institutions. Further, climate communication has a specific goal: to bring people into action. This concerns all types of human relationships, communities, groups, institutions, political decision-makers, and people who hold power. Mobilizing them and bringing them into societal action can be a challenging goal. Since there is no one way of communicating, it is the interaction of a wide variety of actors and their various behaviors that may lead to action. Further, different actors within the social system hold different interests and, as a result, also different storylines for communication. One can derive from these so-called narratives. They are formative for the perception of climate issues within society. The basic building blocks of narratives include a logical and compositional structure, but it is also important to emphasize that climate narratives shall be based on scientific facts. The fact content derives from results of scientific research over the last decades. In the field of climate research, the goal of a scientifically based argumentation and narrative is thereby considered a central aspect. However, any type of climate narration can be understood as a relevant factor since it promotes intentional developments of coherent storylines of climate challenges within public opinion. The weakening of disproven facts and oriented narratives by climate change deniers has been increasingly removed.

Besides the public, science and its findings plays an important role here. Science has already gained clear insights into climate change and has been able to reduce uncertainties over the last decades significantly. Earth system science provides essential insights into overall changing earth processes. But also other versatile policy recommendations are drawn from several scientific findings, such as the PB concept, which derives clear boundary conditions of the earth system. What becomes clear is that climate change is part of a more considerable challenge. It is about widespread issues of complexity, which are often addressed under the term sustainability. The term sustainability is considered to be an effort to create human structures in harmony with the environment. Thereby, the mitigation of global warming plays a role, as well as the conversation of biodiversity and species or the reduction of toxic pollution in the environment. However, also the consideration of economic mechanisms and many other areas of human life are to be considered. Sustainability challenges are not just about the environment and not just about the individual, their own actions, and changes. It is also not to be understood as being just about societal structures, like institutions, governments, and policies. One can argue that it is precisely about all of these actors, their perspectives, and interactions within the system as a whole. In addition, climate communication is usually not only about communicating scientific findings but also about the necessary understanding and change in society. Promoting climate action, in turn, is part of a much larger narrative than simply reducing emissions. It is about overall societal narratives of systems change and, therefore, society's adaptation in alignment with changing external circumstances.

"We need the systems perspective because everything is connected. So this means looking and trying to solve one problem and trying to solve that one problem alone, without looking at everything that its connected to, we very likely will cause other problems. It is something that we've been seeing because we have been compartmentalizing things a lot. Even in science, fortunately now we see a little bit of a trend trying to integrate a little bit more, but just this tendency to compartmentalize everything and make people have very deep knowledge about one subject, so they cannot even understand how it integrates with others and thus causes a lot of problems we are dealing with now. So that is why we need to acknowledge this and then, once we try to address a problem, we need to look at the system that it is embeeded in." (System Change Alliance Activist, Carolina Carvalho)

The system perspective is critical because it takes a comprehensive view of the multiple climate change issues and the "global sustainability" challenge. System considerations can be applied to all levels of social and environmental issues. Accordingly, the social system and its interactions and the earth system and its dynamics have to be considered. The

systems perspective is a scientific consideration and concept, but it is preferentially used in complexity questions. It encompasses multiple aspects of the social and earth systems and holds an enormous complexity depth.

"Complexity is dealing with the real world, where you have circular causation. There is no universal definition of complexity. But the kind of standard textbook definition of a complex system is one, that has many interaction components and it has system level behavior which cannot be understood only by understanding the properties of the components. So, you have to understand not just the components but also the interactions between them and the interactions between the components and their environment." (Physicist and Complexity Scientist, Andrew Ringsmuth)

It can also be stated that characteristics observed within the earth system, such as feedback loops, tipping points, and coherent causal effects, are central to systems and their complex dynamics. The general sustainability subject is consequently also deeply characterized through these dynamics in the environmental spheres and societal aspects of disruption. Originally as typical systems mechanisms, they can be applied to the interrelationships between humans and natural processes. There is complex circular causation between different actors in society that are part of the sustainability challenge. In addition, systems approaches can be understood as an emerging field in interdisciplinary science. This is because the approach deals with the ability to understand the relationship between the parts of the system and the whole. The integration of the earth system with the social system attempts to understand the totality of our human activity in relation to the planet, that is, our environment. Thereby, partial aspects of the individual sub-sciences are considered holistic phenomena, a so-called wholeism. The integration of environmental systems or ecological systems with social systems is highly significant. In the scientific language, one speaks of a so-called socio-ecological system. It describes a system that has social components and ecological components of high complexity. Also described as a complex system, the socio-ecological system is not about preservation but about its changing and adapting mechanisms. In addition, it should be noted that it is then about the eco-evolution of the systems. The adjustment and adaptation processes of the systems can also be described as a so-called co-evolution. It is precisely in these processes of co-evolution that the solutions and narratives for climate action are found.

6.2 Discussion

Although a holistic narrative is an aspirational goal of climate communication, research indicates that the currently used concept of sustainability needs to be challenged. The analysis shows, that there is indeed a tendency of moving away from the narrative of sustainability. Although the term sustainability considers a holistic approach, it is increasingly seen as an inflationary and highly generalized aspiration. It is perceived as an often too broad or unconcrete concept. While the concept of sustainability already has in its term to "sustain" something, this can be misleading in the sense of actual climate efforts. In terms of the application of system dynamics, the holistic goals are not necessarily to be considered about preserving something, but about making adaptation possible. It is about organizing adaptations in our social system and thus creating resilience. Therefore, research in particular pushes the conceptualization of resilience. Resilience is the ability of a system to withstand purtubations or disturbances from the outside. And a measure of resilience in that sense would be the speed of return to the initial state. It refers to the whole as a system and its ability to return to a state of conservation through change. But the concept of regeneration is also worth mentioning. Regeneration means the renewed formation, emergence, natural restoration of the damaged. It can be understood as a holistic and realistic approach to heal the scars of the planet.

„The only effective and timely way to reverse the climate crisis is the regeneration of life in all its manifestations, human and biological. It is also the most compelling, prosperous, and inclusive way. Biological degeneration has brought us to the brink of an unimaginable crisis. To reverse global warming, we need to reverse global degeneration."(Hawken, 2021, 30)

In any case, the need for a more holistic systems picture of societal and environmental development is being recognized. It seems that these concepts are initially relevant mainly in research and that public opinion still needs to develop in this regard. Although debates on climate change and sustainability are increasingly taking place in the social center, for example through activism or other grassroots movements, there is still a lack of orientation towards holistic concepts. It can be argued that there is a need for more approaches and guidance for holistic concepts that define the core of sustainability and resilience.

The narratives of sustainability further seem to increasingly and most effectively center around long-term orientations of a harmonious life for people in harmony with nature. And this seems also precisely where one of the greatest challenges lies: people are out of balance with nature. The human relationship with nature is hardly existent; this seems to be

also reflected in all our spheres of life, institutions and personal actions. It means that humans must fundamentally find new ways to improve their relationship with nature and integrate those into the social system and its structures. However, demanding this of individuals or people in politically unstable or undemocratic spheres poses a problem. It seems clear that when people do not have their basic needs met, their interest in global and climate issues is not paramount, for understandable reasons. In addition, personal involvement in these issues is also strongly dependent on personal privileges and the political environment. In many political structures, there is simply no room for activism or for individuals to demand compliance with internationally agreed upon climate goals. Consequently, climate communication is also strongly dependent on personal circumstances and political conditions. This is exactly why it is important to include the structures, actors, interests and multiple reinforced inequalities within the social system when fostering climate communication. Only by addressing these other aspects, can system barriers to climate action be tackled and overcome.

In addition, meaningful narration is to be found within the framework of resilience. It is about addressing the adaptability of systems. These are precisely the components that must be incorporated into narratives of the climate crisis and sustainability efforts as well.

"So there is complex circular causation and there is not one only thing that you can change to fix a systems problem. You have to change everything. You have to change everything in a way that coordinates, so that the whole system can slowly transform."
(Physicist and Complexity Scientist, Andrew Ringsmuth)

The goal can be seen in looking within systems not only wihtin its parts, but also at the totality and its mechanism. Adaptive capacity and resilience can be derived from these mechanisms. Resilience is an important and noteworthy orientation. It should be emphasized that the concept of resilience is also applicable to other aspects of adaptaion, human adaptation. Many other aspects of the body, such as the brain or cellular processes, contain complexity dynamics and the concept of resilience can also be applied to the human mental system.

"It is time to take a psychological perspective, because resilience can be learned by everyone. Self-healing and natural healing are intertwined. It is about rediscovering and cultivating forms of inner strength that we may not know are already within us, and growing beyond our comfort zones." (Environmental Psychologyst, Leslie Davenport)

Individuals have to deal with psychological barriers like cognitive dissonance or eco-anxiety, by intregrating resilience. Again, it is about a holistic perspective that also

recognizes human mental adaptabilities. In a simplified way, it seems that by working on ourselves personally and working through and resolving inner conflicts, we can also contribute to the greater whole. However, this approach is certainly needs further research in the field of psychology as well as other interdisciplinary disciplines. However, system theory shows that interdisciplinarity is a fundamental characteristic of the systemic approach. Our way of economic activities, global inequalities, up to psychological predispositions lead to systems, which prevent us from taking action. Climate communication and consequently climate action is, as all the research shows, a systems problem. Systems problems have in their nature that there is no single solution, but rather multi-layered interconnected parts of the system that impose barriers but are also part of the solution. System approaches are diverse and consequently three progressive ideas for promoting addresing system barriers have been presented previously.

The consideration of the three approaches of complexity thinking, intersectionality and NbS offer a meaningful framwork of holistic narration. All of the three approaches partly take up important content that can address overcoming societal barriers. When it comes to systems thinking, the approach can be seen as a valuable contribution to narrative shapings since the systems approach can help to better understand complex issues and put them into proper context. For this, education in system thinking must be fostered but there is little point in learning systems thinking as an extra subject. It is much more about applying the ideas and aspects of the complexity approaches to existing knowledge and thus changing current perspectives. Thus, transdisciplinarity is a fundamental property of systems thinking and is what makes it possible in the first place. However, an educational initiative for systems education does not provide enough progress for the necessary adjustments of the societal systems. It can again be considered as only one part of a solution. In principle education must be promoted at all levels, including education on social inequalities and other various barriers. Here the approach of intersectionality is helpful in the sense that it shows that individuals, who for structural and historical reasons face different challenges, have different ways of acting in the world, in their society, and in their ecosystem. Consequently, historically empowered groups are usually able to do more harm and have more agency than people who were historically less empowered. As a result, marginalized groups are more systemically oppressed and less likely to access and contribute to societal change. This is also manifests in the social narratives, which still find little involvement of vulnerable groups and their perspectives. Pointing out these inequalities in society is

extremely important. Inequalities need to be addressed and still need a lot more scientific research and societal discourse. Even further, it can be argued that it is precisely in the voices of unheard or oppressed groups that many answers could be found.

"I think any voices that have not been heard, that is the power. Like imagine the wealth of knowledge that you have there, that just have not been heard or put at the forefront. Imagine the things that we are not even considering what kind of solutions could be out there that we do not even know about. That goes a lot towards indigenous people and their knowledge of ecosystems." (System Change Alliance Activist, Carolina Carvalho)

In that sense, an intersectional lens can be an important catalyst for discourse and inclusion. The incorporation of power structures is enormously important in revealing power relations such as race, gender, and other forms of discrimination. However, one can argue that it distances itself from a scientific approach that aims to establish thinking about the world beyond power structures. So the problem is not necessarily in addressing the dynamics, but often in the way they are framed. The lens of identity perspectives and power structures can fuel a narrative of division rather than an aspired collborative approach. Therefore it is necessary to carry sensitivity in the outlined narration of identity.

Lastly, Nature-based Solutions are an important approach by redirecting the perspective on nature. It addresses one of the fundamental problems in the sustainability challenge, namely the disconnection from humans to the planet. In that sense NbS can be a powerful ally in addressing climate change, especially when combined with other strategies. However, NbS is not without controversy and can also be used as a greenwashing measure by polluters. NbS can be used as a distraction from other important solutions. For example, NbS can only create a resilient system in conjunction with the phase out of fossil fuels. However, including only the greening of cities and reforestation in climate action narratives distorts the real need for the need for diverse action. Therefore, it is critical that NbS are addressed in conjunction with other solutions.

In summary, not one of the three approaches represents the one adequate solution to reframing narratives of climate communication. Each of them, applied in the right context, can be helpful to better outline the complexity of change efforts. Just like the system itself, the narratives must also be adapted continuously. Probably the most important existing challenge, however is to be found in the actual definition of these adaptation processes. As long as society does not redefine how the economy, equity structures, global governance and other elements shall evolve in line with climatic changes, communication will remain challenging.

6.3 Findings

The interviews and literature insights described above indicate the following results on the presented research question: *How can we overcome barriers and reshape narratives of environmental communication towards societal action?*

There is not only one approach that addresses the complex issues of climate change within communication. It is more important to connect different approaches and thinking methods to overcome barriers and find interconnected solutions. Furthermore, it is increasingly important to find better narrative frameworks for addressing interrelated complexity issues to communicate the holistic perspective to the public more clearly. Environmental communication efforts need to be built towards finding a holistic whole and a consistent strand of narration. Multiple elements of the earth and social system and its structural problems and inequalities must be addressed to achieve this narrative. Consequently, humans can overcome broad barriers within the systems only by addressing them entirely.

It is about seeing climate challenges as various systems problems to address them in the most comprehensive way possible. It concerns issues that can be traced back to various collective challenges. This means connecting topics with other global challenges and outlining collective possibilities for solutions. Both the individual and the collective society and the system as a whole are part of this solution. Further, societal action can only occur if individuals feel addressed within their societal values and beliefs. Therefore it can be helpful to find aspects in the narrative to address specifically relevant aspects for addressed actors of society. Often narratives of broad meaning and purpose trigger a shift towards action for the individual. Nevertheless, this can vary greatly and is also dependent on the inner, that is, the psychological setting of the respective individual. Also, society must find a way to be mobilized and targeted by utilizing environmental communication. For this reason, it is necessary to have the broadest possible communication applications in terms of narratives, strategies, and related topics. This implies that communication must be as broad as possible. The more actors that address the topic and the more links can be established, the better the communication. Diversity of communication, different modes, and media can help promote effective climate communication. Overcoming narratives in the future shall take an increasingly holistic perspective to reflect the complexity of the challenges. At the same time, the holistic perspective can promote aspects of improved coexistence within society, like well-being and collaboration. It is a matter of using the system perspective to

address the complexity of the challenges in the narratives and, at the same time to, connect them with solutions and perspectives of hope. Collaboration, well-being, and empathy are possible narration strings that can be found increasingly in the holistic and authentic narrative of societal change. What this means in detail is brought to society in new thinking approaches. Critical approaches can be encouraged in the three rethinking ideas outlined before. Nevertheless, these represent only a tiny part of the narrative structure needed for the future. Many ideas need to be further explored and discussed in the broader society in the most democratic way possible. Through the research and its findings, the following key principles for holistic environmental communication have been elaborated and address the last sub-question:

1) Addressing the systems perspective and highlighting systemic challenges
2) Promoting polycentric communication
3) Knowing the audience/ actors
4) Centering fact-based, logical, and compositonal communication
5) Connecting communication to societal values and beliefs and connecting the message to meaning, purpose and empowerment
6) Talking about it!

Applying these principles shall help foster effective environmental communication that promotes systemic change and societal action. The principles are merely recommendations derived from the findings and should not be considered in isolation. Instead, an integrated consideration is to be urged that forms a systemic, complex, and coherent narration of climate communication. The principles neither serve as an all-encompassing solution but rather as a guideline for narratives that promote systemic rethinking approaches.

7. Recommendation: Helpful narratives

There is no one type of climate communication, nor is there one narrative that fits best. However, the findings show that it is crucial to tailor communication to actors and interests within narratives that incorporate multiple aspects of sustainability. These aspects ideally revolve around addressing system issues and keeping solution-oriented, collaborative, and encouraging strands of narration. Following narrative strands can be identified as relevant:

Personal and collective well-being: This narrative addresses the fact that our personal and collective well-being is strongly related to our systems. Approaches to a new economy that promote well-being can be mentioned. However, new measurement tools for societal well-being beyond GDP can also be addressed. Finally, in the sense of a "one health" narrative, health is also an engaging narrative that addresses the fact that incorporating nature into our systems can also reduce or prevent health risks such as pandemics.

Resilience and healing: Adaptive capacities are a component of system theory and our social and natural systems. Human mental resilience is critical too. Mental adaptation can be seen essential in the processing of climate-related facts and overcoming cognitive dissonance. Even if individuals cannot solve the ecological crises alone, it seems to come down to the mental resilience of individuals. Consequently, the more inner work we do, the more mental resilience we can develop – it also helps individuals to align with values and purpose. A narrative that follows this principle is characterized by collective and individual healing. It addresses the healing of wounds that emerged in us humans or other systems.

Shared global responsibility: While there are people who have more power than others in this global system, we must recognize that each individual holds too. Especially people that carry certain privileges and access to education hold the opportunity to promote social change. This narrative needs to be promoted in the way of empowerment. The given responsibility can therefore be embedded within a encouraging framework. The goal can be to package global responsibility in a narrative of opportunity of renewal.

Social-ecological system perspective: An essential narrative is found in the manifold interactions between nature and society. In science, this concept is referred to as a socio-ecological system. But it can also be applied outside of science within narrations. The goal is to develop a societal understanding of the system perspective and consider a multitude of actors in their entirety. This means addressing interconnection with nature regardless of the social context we refer to, whether the economy, institutions, social relationships, or personal context. As a sociology-ecological system, all aspects are intertwined with nature, which shall also be reflected within narratives.

8. Conclusion

Climate scientists have greatly reduced the uncertainties about climate change within the last decades. There is not only enough knowledge about changes in the earth system but also enough recommendations for climate action. However, climate communication remains a significant challenge even after decades of scientific efforts and findings presented to society. Further, insights of the thesis indicate that climate change, as often defined by temperature rise, represents only a rather small part of the global challenges. It is much more about complex systems within society and the way they disrupt natural systems, as well as our way of life. The collective concept and pursuit of global sustainability is widely understood among these complex challenges. To understand and grasp the depth of it, however, it is helpful to take a systemic perspective. System theory provides diverse frameworks for complex dynamics that affect various parts of society and nature. From a systems perspective, it is possible to bring together diverse elements of the earth and social systems as they prevail in reality. It is about mapping challenges interdisciplinary and therefore defining sustainability efforts as profound as possible. The systemic approach, in addition, identifies not only important mechanisms but also barriers that make it difficult for societal structures to implement climate action and broad sustainability. A variety of barriers can be identified in our social system, which reflect the difficulties of climate communication. They can be ovsereved at multiple scales, including systemic, social, and individual levels of society. However, the main challenge lies in the differentiated consideration of the various processes, perspectives, and interconnections of these barriers. Barriers manifest in the narratives of current climate communication. Consequently, narratives are shaped by our systems and thus can be considered flawed, yet socially consolidated. Barriers can and should be addressed to achieve changes and reshaping of narratives.

The change of narratives includes new definitions of sustainability that help to better understand adaptation processes and provide a picture of the so-called sociology-ecological system. These scientific insights need to be increasingly incorporated into communication. They can help to orient climate communication not only towards scientific facts but also to promote a storytelling approach that aligns with sustainability research. This research increasingly brings together different areas of the sciences such as natural sciences, social sciences and psychology, and can thus provide holistic perspectives. Ideally also these interdisciplinarity contents are reflected in the narratives. Further, to

overcome the barriers, new approaches must be introduced that incorporate systematic thinking and reflect complexity. These approaches are diverse and range from the promotion of systems thinking to the consideration of inequalities and the inclusion of nature in our systems. However, not one approach can be considered the complete solution. Here, too, the variety and interconnectivity of systemic solutions must be considered. The ultimate destination can be seen in a holistic alignment and orientation towards one interconnected narrative. Further, the goal of climate communication lies not only in promoting societal action but firstly in addressing and mobilizing as many societal actors as possible.

In conclusion, our social system imposes barriers that constrain the promotion and action towards authentic sustainability. Action-oriented climate communication must therefore be promoted actively. It will remain challenging to overcome and promote authentic climate action without the active integration of new rethinking approaches. This can further only be brought to society through continuing, broad climate communication within the coming years. The narratives are crucial and should not only form a positive vision of the future but also integrate encouragement for societal improvements. Consequently, it will be essential to continue shaping and discussing hopeful narratives to create a sustainable future characterized by the values of cooperation, empathy, and well-being.

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