



Complex Resilience & Sustainability: Transdisciplinary Perspectives

EDITOR
Gerardo del Cerro Santamaría

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About the Editor

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CHAPTER 1

Being Human: Rethinking Adaptation and Resilience

Roderick J. Lawrence

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Adaptability, resilience, and sustainability have become buzzwords that refer to notions about the properties of something, and an objective to be achieved and maintained, as well as human intentionality in processes of change. They are notions that were transferred between and beyond academic disciplines in the health and medical sciences, natural and physical sciences, and human and social sciences; and they are currently used in everyday language. How these notions are used regarding ecological hazards, financial risks, health threats, and social perils is influenced by numerous variables including individual and communal human factors. This article rethinks common interpretations of adaptability and resilience in the context of sustainability. It posits that human ecology provides a conceptual framework incorporating the diversity of their meanings and uses in a complex and heterogenous world. The article highlights that many contributions from authors in various disciplines have borrowed concepts and ideas from ecology, biology, and systems analysis but they have discounted the fundamental nature of being human, even when socio-ecological systems are studied. Then, the article explains the ingredients of an anthropo-logic, a core constituent of human ecology, which includes cultural and societal variables while recognizing individual and group differences. These variables can account for the diverse sometimes conflicting ways people perceive, understand, and respond to risks and threats to their lives and habitats. The article applies core principles of human ecology to comprehend contrasting responses to global change (including extreme weather events and repeated flooding in cities) in an increasingly polarized world.

Keywords: Adaptation, agency, anthropo-logic, culture, human ecology, resilience.

1.1 Introduction

Being human, we share the inherent characteristic of change with all living organisms, ecosystems and the biosphere. The origins and drivers of change involve both internal and external variables that nurture and sustain or threaten and eradicate life. History confirms that living organisms may or may not be sustained by the ways they interpret and respond to internal and external variables that influence their habitats and living conditions. Change can be either gradual and predictable,

or abrupt, radical, unpredictable, and perhaps disruptive. In recent decades, this approach has been associated with adaptation, resilience, and sustainable development.

Current and recent crises, including extreme weather events and repeated flooding in cities in several countries north and south of the Equator, for example, illustrate the incapacity of human societies, notably national and local authorities, to respond effectively to risks from 'natural' hazards. Emilio Moran [1] and John Bennett [2] agree that diverse responses to ecological, economic and health threats have highlighted the capability of different societies to respond to risks in both short- and long- term perspectives. This is illustrated by different sometimes conflicting responses to data and information about climate deregulation and the increasing frequency of extreme weather events in several regions of the World [3]. This case will be used to illustrate ideas presented in this article.

In this global situation, academic papers and policy briefs have championed resilience [4, 5]. A socio-ecological systems approach has often proposed that individuals, households and societies can respond effectively to global threats, such as climate deregulation, and also foster sustainable development [5, 6, 7, 8]. However, the underlying questions of 'why' and 'how' this occurs have often been overlooked. Academic researchers and policy makers have endorsed the concept of resilience without asking critical questions about causes of, and responsibilities for, persistent problems and risks to human and natural ecosystems. Therefore, authors rarely consider how shifts to fair, just, and equitable situations will be achieved in the future. Notably, resilience for sustainability rarely incorporates concepts of justice, democracy and redistribution, even though they are foundations of social sustainability incorporated in the first principle of sustainable development.

Researchers and policy makers should consider fundamental questions about why numerous initiatives intended to respond to the risks of climate deregulation and extreme weather events, or to threats of epidemics of contagious diseases, or to increasing economic, housing, and health inequalities between countries and within large cities, are not being implemented where and when they are most needed [3].

Some authors have assumed that changing individual and collective behaviors can provide effective responses to these hazards and risks [4, 5, 6]. These kinds of contributions have been criticized by social theorists who reject the way that biological analogies have been applied uncritically to human societies while discounting human agency and cultural predispositions, political authority, power structures and social injustice [9, 10]. Moreover, Joseph argued that arguments of some authors are aligned with neo-liberalism and particularly how principles of individual liberty should guide personal and collective behaviors rather than institutional change and societal transformations [11].

Despite criticism, resilience has become a normative concept for researchers and policy makers [12]. Collectively, both groups have ignored or rejected epistemic divergences and asymmetries of power that are the foundations of increasing polarized interpretations and responses to ecological, health, financial and social risks in a globalized world with rapid urbanization [9]. This article explains why a human ecology perspective is pertinent and necessary to critically rethink adaptation and resilience as cultural predispositions. It posits that core concepts of human agency, including choices, intentions, and fundamental values, provide a human-centred framework for reconsidering adaptation and resilience using a much broader conceptual framework than that delimited by biological analogies. The article posits that core ethical, cultural and political principles of human ecology provide foundations of a transdisciplinary conceptual framework to better understand the nature of being human in a world that is constantly changing in both predicted and unpredictable ways.

The article concludes that different, contrasting, and (sometimes) conflictual fundamental values attributed to people and nonhuman constituents of ecosystems have strongly influenced how individuals, groups, and societies make choices to ignore or respond to diverse hazards and threats. The article highlights that cultural predispositions and political dimensions of human groups have largely been ignored by scientific research including many recent contributions in sustainability science that are claimed to be humanistic. This shortcoming has been corrected by contributions in the field of ecological theology and political ecology that have challenged common interpretations of resilience and sustainability [12].

1.2 Method

This article is based on the author's theoretical contribution to human ecology and inter- and trans-disciplinary research over several decades. The sources for this article include personal research and practice, including contributions in human ecology and the documentary analysis of statistics and reports about people-environment relations. These documents have been analyzed; since the 1990s they indicate incidences of negative impacts of urban living conditions and lifestyles on urban populations, and growing inequality stemming from intra-urban differences. The research for this article includes the selection and analysis of numerous publications that record diverse disciplinary and interdisciplinary contributions about adaptation and resilience in the context of implementing sustainable development since the 1990s. Other official documents indicate ineffective societal responses to global challenges (including climate deregulation, loss of biodiversity, poverty, and malnutrition) at international and national levels, despite concordant empirical data and increasing scientific knowledge about them. In contrast, the author's collaboration with some international programs since the 1990s has documented numerous achievements at the level of local authorities. Moreover, the author's review of the Global Sustainable Development Report 2019 [13], on behalf of the Swiss Academy of Sciences, indicates that international diplomacy and national political agendas can provide contextual conditions for effective responses to societal challenges at the geopolitical level of cities and local authorities. Hopefully, linking these initiatives to core principles of human ecology, including adaptation and agency, can serve as a catalyst for moving forward.

The next section briefly describes the conceptual framework of human ecology developed from the 1970s, which preceded the socio-ecological frameworks proposed since the 1990s.

1.3 Conceptual Framework

Conceptual frameworks are representations of a real-world subjects, or situations, that identify and define their core components and the multiple interrelations between them using concepts, principles and rules [14]. Conceptual frameworks are applied in both theoretical and empirical research to improve understanding of complex subjects; for example, the Social-Ecological framework proposed by Elinor Ostrom [15] was derived from interdisciplinary research about people-environment-biosphere relations. This systemic framework facilitates a shared vocabulary of concepts and definitions about the basic components of social-ecological systems (e.g., the sense of community in animal biology can be contrasted with the meaning of this term in urban anthropology and sociology). Given that diverse conceptual frameworks of the same subject co-exist, convergence, communication and dialogue are necessary to develop mutual understanding about differences and especially why they coexist.

The term 'ecology', from the ancient Greek words *oikos* and *logos*, denotes science of the habitat. There is a large consensus that Ernst Haeckel (1834-1919), a German zoologist, used this term in 1866 [16]. The word ecology commonly designates a science that studies the multiple interrelationships between organisms and their surroundings. However, it has been interpreted in numerous ways including general, human, political and urban ecology [16].

The UNESCO Encyclopedia of Life Support Systems published in 2001, includes an entry on Human Ecology [16]. It explains why the contribution of the Chicago School of Sociology used an inappropriate biological analogy to discuss the life, habitats and reproduction of humans by comparing them with animals and plants. It also noted that the search for correlations between biological, economic and geographical variables that excluded fundamental human values (including ethical and spiritual values, worldviews, and political authority) could not explain the multiple meanings, geographical layout and social organization of urban environments, especially why different residential areas coexist in the same city.

1.3.1 Anthro-po-logic: Foundations of Being Human

The term anthro-po-logic denotes compound knowledge domain of human groups and societies, including their aesthetic, conceptual, ethical, and technical knowledge, as well as their technical and practical know-how, and other ways of knowing [16]. The term is derived from *anthropos*, which designates what is specifically human; logic is derived from the ancient Greek word *logos* and designates thought, reasoning, and discourse. The proposed anthro-po-logic is derived from a holistic and systemic conceptual framework of human ecology that includes the content and symbiotic interrelations between an eco-logic and a bio-logic in addition to an anthro-po-logic [16]. Anthro-po-logic is the primary focus here because, in general, sustainability research and policy has not attributed sufficient attention to core cultural dimensions of the themes or situations studied, including the diversity of cultural, social and personal interpretations of global change including climate deregulation and loss of biodiversity.

Culture, derived from the latin word '*colere*' (to cultivate), does not have a consensual definition among anthropologists. In general terms, it denotes the long-standing cognitive structures, communal norms, and behavior patterns of human groups that have been transmitted between generations by communication and learning as Clifford Geertz (1973) explained 50 years ago [17]. Culture traits include beliefs, knowledge and know-how; meanings, norms and rules; symbols, customs and values, as well as material artefacts. These physical and immaterial traits are applied implicitly and explicitly in everyday life. In recent decades, homogenous, monolithic, and static interpretations of culture have been challenged by processes of globalization, mass migration flows, and social media and telecommunications. Collectively, these trends have led some conventional interpretations of culture to be replaced by more dynamic evolving ones because the same ethnic group living in different local communities in the same country may have different culture traits. Therefore, these traits should be identified in precise localities.

The conceptual framework shown in Figure 1.1 represents the systemic interrelations between sets of biotic, abiotic and anthropogenic factors that are combined together forming a web of components and connections. It considers this synthetic whole as a referent for people-environment relations, and it acknowledges the function of each component and its connection to others. This systemic framework is applicable for different geographical areas (e.g. neighbourhoods, cities, and metropolitan regions). It is a synchronic representation of a dynamic human ecosystem that is a metabolism open and linked to others. This framework should be used at different times to explicitly address both short- and long- term perspectives, because it can identify change to

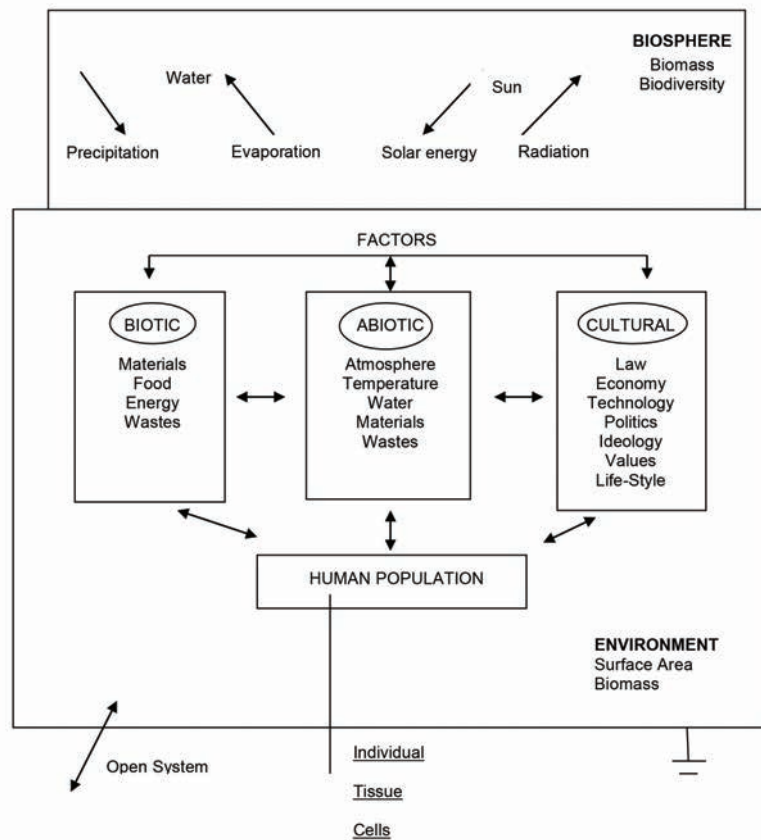


Figure 1.1: The holistic framework of a human ecology perspective which illustrates the fundamental principles of co-action between the core constituents including cultural variables. (Source: Author, 2001).

specific components as well as the interrelations between them.

Notably, anthropo-logic includes institutional, legal, and political frameworks [16, 18]. Environmental, health and other social problems are meant to be overcome by legislation, public policies and economic measures (e.g., taxes or subsidies) that are meant to change or regulate the impacts of human production and consumption patterns stemming from uses of resources and the discharge of wastes. This instrumental perspective has been complemented by an ethical one that has addressed property rights including the rights of Nature. Property rights are social arrangements between people that define the rights, entitlements, obligations and duties of persons, companies, or an authority (the right holder) in relation to a specific entity (for example, a forest or a lake). Property rights stipulate how the right holder and other parties (non-property holders) are morally and legally required to act [19]. They create interdependence between people and resources as well as addressing distribution and fairness.

Human ecology incorporates principles including agency, co-action, co-evolution, cultivation, and symbiosis [16, 18]. Agency is a concept used in our research to denote whether people are considered as active beings capable of making their own choices about activities, behaviours and relations with others. Agency has commonly been used in discipline-based research to study the influence of age, gender, socio-economic status on human cognition, behavior and opinions. Our research enlarges these influences to also account for fundamental beliefs, values and worldviews. These fundamental constituents of being human express mutual interactions between the ecological, biological and cultural constituents inherent in human habitats summarized in the next section on adaptation.

1.4 Rethinking Adaptation

Adaptation by human groups was discussed by Julian Steward (1902-1972), an American anthropologist who coined the term ‘cultural adaptation’ to denote how human groups adjust or change their subsistence activities to accommodate changes in local environmental conditions and resources [20]. His original contribution has been enlarged to include how adaptation is influenced by economic, social and political activities and technological innovation. Being human can be characterized by the kinds of regulators individuals and groups commonly use to define, modify, and control their behavior and living conditions [1, 2, 20]. Humans have several physiological processes that enable them to adapt to changes in environmental conditions. These mechanisms include thermo-regulation and circadian rhythms, that ensure and maintain vital needs, such as nutrition. However, fundamental needs are not only guaranteed by biological and physiological mechanisms; for example, food must be accessible and affordable because cultural rules and social practices (that vary between ethnic groups, within societies and across cultures) are also used to define what natural resources are edible or taboo, and when resources can be consumed [21]. After replacing local and national farming and food processing, the agro-industrial sector has eradicated food sovereignty and failed to provide food to all households in many countries [22]. Therefore, research on resilience and sustainability should consider the core reasons for local populations not having access to nutritious food; in sum, why should individuals and households adapt rather than change the root cause of the persistent problem? This kind of question helps explain why people must adapt or die from famine which is sadly the case for many vulnerable populations according to the United Nations [22].

Adaptation is a set of interrelated processes that sustains being human in the context of global and locality specific change [1, 2, 23, 24]. Evolutionary adaptation refers to processes of natural selection. It is only applicable to populations, and it is trans-generational. Innate adaptation is genetically determined and do not dependent on learning [25]. Cultural adaptation refers to adaptation by selective cultural customs and norms and that are not innate, such as legal measures, the built environment and infrastructure, institutional and organizational measures, and changes to lifestyle [23, 24]. Adaptation can occur before, during or after a shock. Preventive measures can be used before a predicted shock in order to mitigate impacts. The outcome of adaptation depends on a complex set of biological, ecological, cultural, societal, and individual human processes that evolve and are not always predictable.

Consequently, adaptation and resilience are complex and compound constituents of being human. Both may include purposeful proactive behaviors, not just reactive responses to risks or threats. A human ecology perspective does not borrow concepts that only refer to animals and plants. For example, successful adaptations to ecological, financial, or other kinds of constraints,

such as confinement during an epidemic, include different means and measures that depend on multiple variables prescribed by the anthropo-logic [16]. Although there are some genetic sets of adaptive processes that are similar among humans, animals and plants, the crucial role of human culture and social customs underlying human adaptability should not be underestimated. Dyball and Newell [18] noted that human ecologists have accounted for values, but they have often interpreted the term narrowly, referring to a numerical amount, magnitude, or monetary value of objects, or a quantity of material resources (e.g., the stocks of ecosystems). This is equally applicable to much research on socio-ecological systems (see later). Common interpretations of value should be enlarged to include aesthetic, cultural, moral, and spiritual values, because these are embedded in the core principles of sustainable development that endorses human rights, as well as environmental and social justice. Unfortunately, even anthropocentric interpretations of sustainable development and sustainability have discounted the primary role of culture, and thus ignored the influence of fundamental values, political authority and responsibility, and human intentionality [26]. These constituents of being human should be addressed in critical thinking about adaptation and resilience.

1.5 Rethinking Resilience

Resilience is an ambiguous concept with a long history that has been interpreted differently when transferred and used in different disciplines [27, 28]. Consequently, there are multiple definitions and interpretations of resilience that coexist [5, 29]. Numerous disciplinary domains have borrowed resilience from its origins in physics and engineering, including medical and health sciences [30, 31]; human development including psychology and psychiatry [32, 33]; ecology and environmental sciences [34, 35]; economics, political and social sciences [36, 37]; and risk and disaster management [38, 39]. This article is not meant to present a review of numerous contributions that coexist in these different domains. However, based on published critical reviews [9, 10, 11, 12], this article argues for an innovative transdisciplinary approach that incorporates core principles of human ecology.

In general terms, resilience is a concept used to study the response of human and other living species to global and changes in habitats, especially those having negative impacts on their sustenance. It is commonly agreed that resilience denotes the capacity of living organisms to overcome difficulty or negative experiences and to rebound or recover quickly from adversity, change, or threats to their sustenance. Both predicted and unpredicted changes that have consequences across diverse geographical and temporal scales have been addressed. However, resilience can also denote persistence and incapacity to adapt (see later), as well as much broader transformability of multidimensional people-environment interrelations. A social-ecological systems interpretation of resilience recognized that individual, communal and societal sustenance are embedded in human-centered barriers or obstacles to change.

The World Resources Institute defined resilience as “the capacity of a system to tolerate shocks or disturbances and recover” and argues that this depends on the ability of people to “adapt to changing conditions through learning, planning, or reorganization” [40]. This report also defined resilience as the capacity to thrive in the face of risks or threats, but it did not decipher and explain the roles and responsibilities of private enterprises, public institutions and government in contributing to achieving this fundamental objective, thus confirming the criticism of Joseph [11].

Power is the ability to influence or control the actions of others [41]. It can impact on the way actors and institutions participate in communal activities that support or hinder change.

Rosendahl et al. (2015) [42] challenge the lack of attention to the hidden agendas of stakeholders during projects that involve collective action, including those meant to implement sustainable development. Key issues about the power and control of elected officials and property owners, or other potentially dominant stakeholders, can be addressed using the core concepts of the theory of structuration. The theory of structuration proposed by Anthony Giddens (1986) [43] has been reviewed and enlarged by integrating the systemic and holistic principles of human ecology [44].

In contrast to homeostasis, socio-ecological resilience often posits a dynamic state of equilibrium in socio-ecological systems [6, 7, 8]. These systems are interpreted as complex adaptive systems that have an inherent capacity to adapt to change, but the precise ways that threats of instability are counteracted by processes including reorganization are rarely explained in detail. Unlike resilience of materials and structures in engineering and physics which emphasize how physical things return to a stable steady state, resilience often denotes an inherent property of human and ecological ecosystems that enables them to absorb external disturbances and, perhaps, even benefit from change. For example, fire is usually not always a short-term disaster for grass-land ecosystems; it can also become one means to maintain them by regeneration processes over the long-term [18]. The way that an ecosystem responds to a planned or unexpected external disturbance depends on the nature of the shock and its impact, and the internal properties of the ecosystem including its vulnerability. If the ecosystem is elastic, then accommodation processes will absorb change without modifying its initial state. If the ecosystem is plastic, then assimilation processes will deal with change by altering the initial state of the ecosystem. Examples in industrial societies include an explicit change in the local economy of a region, or the productive output of a factory in response to changes in the supply of raw materials, or a falling demand for the produced artifacts [18].

A common assumption of natural scientists is that ecological systems strive for a dynamic equilibrium state that results in climax [34]. This assumption is based on the idea that the carrying capacity of the environment defines viability limits for the optimal size of populations in a specific ecosystem. Disturbances and imbalances can occur through predicted or unforeseen changes either internal or external to the ecosystem. It is claimed that owing to efficient negative feedback processes an ecosystem will revert to its previous state once the agent of change has been removed, or counteracted, irrespective of the magnitude of that agent. A contrasting view argues that there is a high degree of instability in ecological systems, but that they are sustained by their diversity – (including many types of components, different kinds of non-linear relationships between them, and spatial variety and structure) – as well as their capacity to accommodate external resources.

These two interpretations can be related to ecological research in diverse disciplines of the natural sciences. A wide range of contributions confirm that ecological systems include two types of adaptive processes that are meant to deal with change [45, 46]. The first type is dynamic equilibrium processes that operate to maintain a system from rapid, disruptive change. The second type include resilience processes that are meant to sustain a system. In both cases a beneficial adaptive process is one that contributes to the solution of a problem or a stressful situation. These processes can only be understood in terms of the inherent characteristics of ecological systems, and the nature and intensity of the agent instigating change.

Responses to disturbances of ecological systems are varied and unpredictable because they depend on the type and intensity of the external impact (e.g., a small, single incremental disturbance in contrast to a large, enduring impact) and the internal properties of the ecosystems [34]. These responses include short- and long-term change, with or without equilibrium states and internal transformations. In principle, ecological systems are not static but dynamic and change continually in terms of their composition, the interrelations between their components and their equilibrium

conditions. The dynamic nature of ecological systems is partly related to their diversity and their variability. Some changes to ecological systems stem from external sources such as unpredictable climatic events (e.g., frosts, hurricanes, or droughts). Ecological systems must adapt to these events in order to survive by self-regulation. These internal responses account for the magnitude of the disturbance and the degree of variability that it has experienced historically.

1.6 Synthesis

The transfer of adaptation and resilience from biology and ecology to the field of socio-ecological systems incorporated a shift from mechanistic, linear thinking to systemic thinking. However, although humans were included, fundamental cultural and psychological variables were not considered as equally important as biological variables. The development of socio-ecological systems in fields of sustainability science rarely prioritized core principles of human being [26]. This is one reason why cultural and psychological dimensions of adaptation have been discounted even though they have been a core concern of many disciplinary contributions about resilience. This is unfortunate given that the variability of personal and collective responses to problematic situations has been documented [9, 47].

This article posits the need to distinguish between proactive and reactive human drivers of adaptation and resilience, by deciphering personal and collective perceptions, intentions, motives, and values which may enable or inhibit human activities that respond to risks and threats, or undesirable situations [26]. For example, individuals and groups make choices regarding increasing risks to their lives from climate deregulation and extreme weather events, the propagation of infectious diseases, and access to affordable energy supplies which are influenced by a multitude of internal and external variables. Although individuals, households and local communities have little influence on external variables contributing to these exogenous changes, they do make conscious choices between optional responses to them. These choices are framed by their personal and shared position regarding each problematic situation, which has specific characteristics in precise societal, geographical and temporal settings. This has been explained regarding the diversity of responses to systemic risk from Covid-19 [48, 49]. It will be illustrated in the next section regarding predicted risks from more frequent extreme weather events using the case of hurricane Katrina in New Orleans in 2005. Unfortunately, the tragic case of New Orleans has not served as a warning to many other cities since then.

1.6.1 Lessons from Systemic Risks of Flooding since Katrina

Climate deregulation has increased systemic risks from both predicted and unpredicted extreme weather conditions that threaten the sustenance of long-established human habitats by flooding and landslides [50]. The dykes in the Netherlands are one example of how the risk of flooding by the North Sea has been perceived and dealt with by scientists, professionals, policy decision-makers and the general public over many generations [51]. The dykes were constructed as a protective barrier to sustain human settlements constructed on sites that are vulnerable to flooding. Today, approximately 27 percent of the Netherlands is actually below sea level. This area accommodates about 60 percent of the country's population of 15.8 million people. Although the perceived risk of flooding is omnipresent, actual incidences have been rare during the last century because the Dutch society have applied adaptation measures to reduce their vulnerability. The case of Katrina and its impact on New Orleans can be mentioned to show how societal responses to the same kind

of risk can vary considerably.

Cyclones and hurricanes are extreme weather events that are predictable in many localities, especially those in tropical regions including the Gulf of Mexico during specific periods of the year. When Katrina impacted on the state of Louisiana during the last days of August 2005, the negative impacts on New Orleans surpassed all estimates even though the strength of the hurricane had slightly diminished [52]. This catastrophe damaged natural ecosystems, agricultural production, tourism, buildings and infrastructure, while the consequences for human life and well-being were tragic (1833 deaths - mainly persons over 70 years – and over 250'000 displaced persons), plus widespread damages estimated at over US \$100 billion. These multiple consequences illustrate the vulnerability of people-environment relations in that region. Notably, meteorologists had predicted the intensity of the hurricane; doubts about the resilience of levees to retain the stormy sea were documented; the risk of flooding was known to decision makers employed by state and city authorities. More than a decade after this catastrophe, daily life in New Orleans, especially for the poorest groups of the resident population, has still not been re-established to its former state. Hence, it is not unfair to claim that the resilience of the city of New Orleans is low because adaptation was not implemented effectively even though the risks were known, and remedial measures remain incomplete [52, 53, 54].

The example of hurricane Katrina illustrates some key principles presented in this article that may be applicable in localities that are at high systemic risk from flooding. These principles enable critical thinking about widespread flooding in the wake of hurricane Ian in the state of Florida, USA, in September 2022; and flooding elsewhere, including the western suburbs of Sydney, Australia, in 2021 and 2022. Likewise, repeated floodings of some cities in England as well as the southern region of Tanzania, and Pakistan.

Examples of repeated flooding underline core principles of human ecology presented earlier in this article. First, the biosphere and the Earth are a unified whole that involves combinations of and complex interrelations between natural and human-made ecosystems that are capable of disruption at local, regional, and international levels. The multiple impacts of severe extreme weather events like Katrina are not simply 'natural disasters'; they are manifestations of compound human and nature-based conditions forming a systemic risk that is not solely dependent on the nature of the shock. Knowledge and information prior to the event, human perceptions of threats and risks from known and previous shocks, and the pre-existent vulnerability of low-income residents exposed to risk should be considered critically [52, 53, 54].

Second, both natural and human-made ecosystems are not closed, finite systems; they have permeable boundaries that are transgressed by external forces of an ecological kind (notably flows of water whether rain or seawater); and an anthropological kind (such as infectious diseases). This means that humans should be prepared to adapt to external conditions and processes that impact their habitat in predictable and unpredictable ways. The key issue is how these risks are interpreted by humans and what measures, if any, are used to mitigate plausible impacts. Collective responses to risks and threats from climate deregulation and extreme weather events have become more polarized but that trend should not negate the responsibility of elected officials and public authorities to promote and sustain the public good [9, 55].

Third, responses to risk and vulnerability should endorse moral and just principles of 'the public good' rather than self-interest and personal benefit. When impacts of extreme weather events are added to extant vulnerability, especially poverty, then there are systemic impacts including accidental injury, illness and death, loss of employment, housing and household income, and damage to local infrastructure and community services. Preventive measures in New Orleans included the construction of levees to prevent flooding from high level sea water but this infras-

tructure was inadequate to prevent extensive flooding loss of life and economic collapse. These multiple impacts raise the question why more resistance was not provided by these constructions [56, 57].

Fourth, cases of flooding illustrate that change is a fundamental constituent of natural processes on Earth from the micro-scale of organisms to the largest scale of the biosphere. Transformation processes have been a historical feature of living organisms and especially human history on Earth. They should be contrasted with misconceptions about stability, reversibility and willingness not to change. Unwillingness to adapt and to increase resilience is common despite of more empirical knowledge about climate deregulation and extreme weather events. This subject has become part of national and local political agendas and illustrates power and authority that may override sustaining ‘the public good’ [9, 57, 58].

Fifth, humans are distinguished from other organisms by cognitive processes they use to define, modify, and control their living conditions. These include adaptive processes that enable them to adjust or mitigate changes if they wish. Here intentionality and purpose should be highlighted because there is ample evidence of inertia even though risks are known [52]. This was precisely the situation in New Orleans when Katrina was predicted, estimates of risk were communicated to the public and both public officials and citizens acted in diverse ways, sometimes not ensuring greater resilience to vulnerability from systemic risk. Barriers to collective and social change will be discussed in the next section before concluding this article.

1.6.2 From Adaptation and Resilience to Social Change

Christian Berg stated that barriers to achieving societal change for sustainable development have rarely been studied systematically [59]. He proposed an actor/institutional framework to help overcome the inertia restricting or prohibiting programs and projects from achieving their objectives. These include ineffective institutional, legal, and political arrangements; growing neoliberal market economies with the subservience of politicians and public administrations to multinational corporations; and individual and collective lifestyles that champion consumerism and self-interest often at the expense of the public good.

Notably, the Global Sustainable Development Report 2019 acknowledges the need for intentional change but continues to propose current institutional, fiscal, and legal arrangements and mechanisms for implementation [13]. That report, written by an independent group of scientists, has followed the thinking of academic authors of many other documents that presented the major pressures that threaten natural and human-made ecosystems, health, and well-being without analyzing the root causes of these pressures thus sustaining the status quo.

Here we apply a different reasoning, by extending the contribution by Joern Fischer et al. on behalf of the Earth Stewardship Initiative [26]. Their contribution indicated why contributions of scientific research had not served as a catalyst for societal change towards sustainability. They concluded that the primary barrier to societal change was not lack of data, information, and knowledge about persistent problems; instead, inertia is grounded in human behavior, intentionality, preferences, values, and worldviews. Hence, societal change is dependent on “reflecting on deeply held value and belief systems, which fundamentally shape behaviour” [26, p.153]. We live in a value-laden world; therefore, it is the personal and shared experiences, perceptions, and values associated with persistent problems and global challenges that count, not just the addition of the number of people concerned. Until current fundamental values are identified, counteracted, and replaced, there will be no “social avalanche” [26, p.158].

We argue that until barriers to social and change are understood, they cannot be removed.

The case of inadequate adaptation and resilience to repeated flooding in cities confirms the need to combine and coordinate a synthetic framework for collective action that includes three key components of an anthropo-logic. First, multi-level governance at national and local government levels. Governance denotes the way that governments, public administrations, private enterprises, and community associations interpret and respond to societal challenges including climate deregulation and risks from extreme weather events. Understanding risk relies on public access to factual data and information from reliable sources in a post-truth world. Then, the synthesis of interdisciplinary information and knowledge, professional know-how and understandings, and public perceptions and values is crucial. This enlarged and shared understanding can be used to define the appropriate allocation of many types of resources required to implement effective adaptive actions. Cities have a major role and responsibility in responding to global challenges, but our research indicates many have not accepted this responsibility since 2005 for all population groups. This highlights extant inequalities, inequities, and vulnerabilities in many cities.

The second prerequisite condition for more effective adaptation to extreme weather events is the importance of communication and dialogue about specialized knowledge and professional know-how to create a contextual understanding of vulnerability and risk in precise sites within and around cities. The different impacts of extreme weather events both between and within cities remain largely unknown. The diverse unknowns about risk from extreme weather events, such as the increasing incidence of flooding and its impacts on population health urban infrastructure and economic activity, should be identified and publicized. Communication and dialogue are needed to improve awareness and develop a shared understanding about diverse plausible futures.

The third prerequisite condition that influences effective city and communal responses is individual, household and community adherence and respect for administrative and behavioral norms and rules regarding adaptation and mitigation in cases of flooding. Some interventions by governments and public administrations focus on regulating personal behavior, such as being displaced from home elsewhere before, during or after the shock. We know that public adherence to these social prescriptions cannot be assumed owing to cultural, social and psychological factors, including place attachment, group identity and the notion of individual liberty.

Collectively, these three key components of an anthropo-logic have been largely discounted by research on socio-ecological systems. They should be addressed more responsibly in the future to implement more comprehensive, ethical, and just adaptive measures to threats from extreme weather events before, during, and after they occur.

1.7 Conclusion

Adaptation and resilience are complex multidimensional concepts that have been interpreted differently according to diverse disciplinary approaches. There is some general agreement about resilience but, above-all, there is a lack of cross-disciplinary collaboration that could provide an enriched understanding of its meaning and purposes in precise situations. Our research of publications in diverse disciplines indicates that resilience lacks any compound meaning in relation to either the functioning of socio-ecological systems or the anthropo-logic of the human condition. The conceptual basis of resilience derived from biology, ecology and psychology is supplemented by descriptions of the sustaining human life and well-being in an a-political context of global change. However, approaches of this kind cannot advance the cause of promoting and sustaining human health and well-being until human perceptions, intentions, values are explicitly addressed. Future directions for transdisciplinary inquiry include how adaptation and resilience are defined

in different cultures, and by different human groups in the same country or city. More research is needed about individual and collective responsibility as key components of human agency. Finally, our research confirms the importance of defining the geographical (local/national/global) and temporal scales (immediate, short- and long-term biological or ecological time frames) of being human because experiential human time and space coexist at micro-scales in a world of meso- and macro- scales. The interrelations between climate deregulation and extreme weather events illustrate this global challenge.

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CHAPTER 2

Limits and Possibilities of Resilience as a Psycho-Sociological Strategic Game: An Interdisciplinary Approach

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The aim of this paper is to analyze the psycho-sociological complexity inherent in the exercise of resilience. The concept of resilience has become so popular that it is usual in academic publications, in popular self-help publications, and in everyday conversations. This monographic issue shows the variety of empirical studies of resilience in different fields. However, my contribution is fundamentally theoretical insofar as it tries to analyze the limits and possibilities of the very concept of resilience. Indeed, human society is inherently ambiguous and ambivalent. This requires a capacity for flexible adaptation in which risk and uncertainty are always present. However, resilience or the ability to adapt to adverse situations is a quality that can only be adequately analyzed within the complex etiological triangle of human behavior. Resilience is an exercise in which biology, culture, and environment establish the framework that enables or frustrates its success. Resilience is a relational and ambivalent dynamic process in which people are both passive and active subjects. Overcoming adversity means ceasing to be who we were and becoming different people. Therefore, resilience calls in question the sameness approach to human beings. This complexity of resilience always requires an integrated interdisciplinary approach that accounts for human reality. The most important conclusion is that resilience is a useful concept as long as it is sufficiently rooted in a realistic anthropological model such as the one I will try to develop throughout the article.

Keywords: Resilience, adversity, etiological triangle, social actor, ego multiplicity, sameness.

2.1 Introduction

Resilience is a fascinating ability. It is generally considered as the ability to overcome adverse situations. However, when a concept spreads, it becomes blurred, as do its boundaries. The simplicity of the concept of resilience hides an extraordinary multidimensional complexity that has been analyzed in specialized literature [1]. Resilience is always present in our lives. Adverse situations are not only radically dramatic events, such as the death of a loved one or the experience of a violent situation. Life is characterized by the fact that more or less adverse situations emerge every day that, to a greater or lesser extent, have the power to permanently or temporarily destabilize the subject. Risk and complexity are often seen as fundamental properties of contemporary societies. However, the human historical epic – reflected in the current *Big History* narratives — has always been fraught with risk and complexity [2]. Resilience is precisely the built-in capacity of living

beings to manage the risk and complexity of their lives. In humans, risk and complexity are particularly related to social life. Human sociality is ambivalent, complex, fractured, and tense [3]. Therefore, resilience is essential in social life. This forces us to think of resilience as a *psycho-sociological strategic game* and not as a simple biological ability or ontological property of individuals. Thus, resilience is at the same time a bio-psychological, sociological, and environmental dimension, which requires an interdisciplinary analysis. Hence, this paper aims to reflect on three aspects related to the theoretical debate about resilience as a "trait", "process" or "result". First, I review what I consider the general premises underlying the concept of resilience. Second, I explain the triple etiological constitution of resilience (resilience as a trait). Third, I develop the idea of resilience as a dynamic and ambivalent interaction (resilience as a process). Finally, I reflect on the consequences of resilience on the anthropological problem of "sameness" (resilience as an outcome). My objective is to insist on the complexity of the social actors, their actions and their identity.

2.2 Methodology

The methodology used in this paper aligns with the ontology of the object of study and with the objectives of the research. The ontological complexity of resilience is based on the fact that it is determined by the three fundamental etiological factors: biology, culture, and environment. For this reason, the first feature of the methodological approach we follow here is *interdisciplinarity*. Secondly, this paper is fundamentally a conceptual work following a *theoretical approach*, which is conducive to the objective of the paper, that is, the exploration of the limits and possibilities of the concept of resilience. Thirdly, since resilience is an anthropological, cultural, and environmental property, it is necessary to *integrate the micro-macro and subjective-objective dimensions*. The paper attempts such an integration. Finally, following the dramaturgical logic of the sociology of Erwin Goffman, we present situations in which resilience is put into play as a strategy for adapting to adversity. Thus, the fourth feature of our methodology is its use of a *situational description*. Therefore, this paper is an attempt at theoretically exploring the micro-macro and objective-subjective dimensions of resilience from an interdisciplinary epistemological approach through a situational description. In addition, elements of the philosophical debate about the human condition are introduced in the last two sections.

2.3 The Exercise of Resilience

2.3.1 Resilience as a Trait, Process, and Outcome

Since it spread in the study of human and animal behavior, three different ways of conceptualizing resilience have been distinguished [1, 4]: a) as a trait made up of a set of personal qualities that make a subject able to overcome adversity; b) as an *outcome* or as the achievement of overcoming adversity; c) as a *process* that reflects the dynamic complexity of the interrelationship between the subject and the adverse event over time. The three approaches are complementary. *Resilience is a strategic, relational, and ambivalent "exercise" or "game" in which all three aspects are included.*

2.3.2 Premises and Corollary of Resilience

Thus, the game of resilience can be analyzed as a set of five premises and one corollary.

PREMISE 1. *Resilience is a specific case of adaptive flexibility.* In a strict sense, resilience is a positive adaptation or recovery capacity that is possible due to the flexible nature of the living organism. The *aim* of resilience is an adaptation to *adverse situations* through *flexibility*. That is why resilience is not an exceptionality, but a universal and ubiquitous property in nature. However, resilience is not an "undifferentiated" capacity but "qualified", depending on various factors. Like any general capacity, it does not become effective in the same way or with the same intensity and fullness in each specific person. In fact, George Bonnano

[5] applied the label of “copying ugly” or “pragmatic copying” to those responses to adversity that do not fit what is considered a normal response (hate, self-aggrandizement, repression, or laughter¹). Thus, the generic potential of resilience capacity is realized in one way or another depending on many factors.

PREMISE 2. *An adverse situation produces a negative destabilization in the subject's homeostasis or virtuous balance.* This destabilization has different degrees of intensity and duration, but adversity is inherent in the dynamism of life. There is no life without potential and real destabilization. Evil is a by-product of an evolving cosmos [7]. That is why adversity always has an ambiguous and ambivalent quality: something apparently adverse can emerge as an opportunity for personal progress. Hence, adversity can be tragic or dramatic depending on its development. We are faced with a drama if the adverse situation has a hopeful end, but if it is constitutively impossible to overcome in a good direction then we speak of a tragedy [8]. *Resilience is a tool to make life a drama by escaping tragedy.* The person who has failed to adapt or overcome adversity (that is, has failed to be resilient) is precisely the one whose life has become a tragedy.

PREMISE 3. *The adverse situations that generate traumas can have an endogenous or exogenous source.*
1. *Endogenous.* A change in the subjects themselves that produces a destabilizing brake: 1.1. For example, people develop a disease (biological endogenous source) that prevents them from carrying on their life in the way they have until now. 1.2. For example, people may live a process of ideological conversion or a process of ascending social mobility (cultural endogenous source) that produces a maladjustment with their social environment. 2. *Exogenous.* A change in the configuration of the environment in which the life of a subject unfolds. 2.1. A change in the *physical* environment where the subject lived: from a tropical zone to a northern country or a climatic change that modifies the economic way of life of that subject. 2.2. A change in the *artificial* environment: an elderly person suffers the digitization of banks. 2.3. A transformation of the social environment: a person goes from living in a social structure that allows freedom to one with greater control, as in total institutions or in the passage from a democracy to a dictatorship. Therefore, resilience can be activated when people change and do not fit into their old circumstances or when circumstances change and do not fit the subject. The changing situations produced by endogenous and exogenous factors are adverse because they create a negative imbalance or destabilization. Resilience means regaining virtuous stability or homeostasis.

PREMISE 4. *The resilience capacity to overcome this negative imbalance can be active and/or passive.* The etiological triangle (biology, culture and environment) also provides the tools for overcoming adverse situations. There are specific biological, cultural, and environmental mechanisms that favor or hinder the subject's resilience and the recovery of homeostasis. Resilience, therefore, has both a passive and an active side. In a sense, resilience is the ability to maintain a balance by preventing adversity from damaging homeostasis (passive dimension). In another sense, resilience can also face up to adversity in a positive way, looking for ways to escape or to learn from it and integrate it into the subject's life through “cultural homeostasis” (active dimension).

PREMISE 5. *Resilience is a relational and ambivalent property.* In the same way as power and freedom are not individual properties but relational [10, 11], resilience is also relational. It is a neuro-psycho-sociological exercise and not simply a bio-psychological one. It takes place *before, beside, in front of* and *against* others. It does not occur in a social vacuum. The social structure itself enables and limits it. This supposes a continuous complex social game in which the resilience of one person can be the adverse situation of another, the resistance of one can be considered as the betrayal of another, and the resilience of one can be related to the impediment of the other, etc. For this, resilience is not only relational but also an ambivalent property.

COROLLARY A. *Resilience is equivalent to an ontological transformation of the subject.* This is the inevitable “output” of resilience. Of course, there will be other “outcomes” expected by the resilient subject. However, the most important result is that the person is not the same *before* and *after* overcoming adversity.

¹Viktor Frankl [6] highlighted the importance of humor as a way of surviving in the concentration camp. For him, “humor is another of the weapons of the soul in its struggle for survival”. In the concentration camp, humor allowed distancing from the adverse real situation and helped to imagine a different future.

For this to be so, human ontology itself must be open and plastic. The anthropological model that can account for this plastic opening is what I call the “uni/multi-selves psychic structure” that fundamentally disputes the usual way of conceiving human “sameness”.

2.4 The Triple Etiological Influence on Resilience

A very important limit of some usual scientific approaches is that they consider resilience to be a property (trait or state) of the psychological dimension of a person. However, resilience is a complex property that is determined by the three vertices of the etiological triangle. *This means that the effective resilience capacity of each subject is determined by the specific configuration acquired by the components of these three etiological factors in each individual person, which creates a certain "state" that may be more or less appropriate to face adversity.* I will now give some indications about each of the vertices.

2.4.1 The Biological-organic State

Biological mechanisms are the precondition for resilience. The biological-organic state is the mechanism that all living beings share to recover after an adverse event [12]. I would like to stress three of them.

The first is the stress mechanism. In a situation of physical or emotional stress, the hypothalamus triggers a hormonal release process through corticotrophin, which in turn triggers the release of cortisol (along with other substances) that influences the neurons of the hippocampus and the amygdala. This endocrine mechanism is a way of coping with adversity by preparing the body for fight or flight. However, a long-term uninterrupted flow of cortisol can have devastating effects on the parts of the brain associated with memory and emotion. In fact, the stress caused by comparative poverty can have a very important influence on the decision-making neural centers of the lower classes, creating a vicious circle of poverty that limits the recovery from the social adversities in which they are trapped [13]². However, biology itself has created mechanisms that interrupt the hormonal flow of stress to avoid these consequences. People with a higher biological capacity for resilience also have biological markers that counteract or limit the effects of stress hormones. Substances such as dehydroepiandrosterone, the neuropeptide Y or testosterone are stress modulators that prevent pathological responses favoring resilience. Genetic inheritance and epigenetic markers are fundamental when evaluating the specific response to the adversity of a subject [14].

In addition, from a neuro-psychological point of view, resilience is closely related to the way in which emotions are managed. Human beings have created a variety of emotional states that are at the root of their complex and ambivalent sociality. As a species, we lack biogrammers to build strong bonds. Emotions allowed the expansion of human sociality with positive and negative consequences [15, 16]. At any rate, the amygdala makes associations between primary and secondary reinforcements that create connections between events and emotions. However, sometimes these connections can be an impediment to resilience. For decades, it has been known that the orbitofrontal cortex is involved in the task of correcting or disconnecting these inadequate stimulus-reinforcement associations that generate frustration in subjects or make it difficult to recover after trauma [17]. The malfunction of this region can prevent this associative disconnection, making it difficult to exercise resilience. However, emotions or feelings associated with an event are stored in memory as symbolic and cold information. Hence, the real feeling that we experience is linked to the real experience that we live, but that link is purely *informative*. Feelings are not stored, only the information that those feelings existed is stored. For this reason, when a memory emerges along with it, “current” feelings arise regarding that memory, but not the “past” feeling that we experienced [18]. This means that it is possible to *decouple* the emotions and feelings that something produced in us in the past from what we feel now at a different age, through training and experience. Resilience allows us to provide new positive emotions to what aroused a negative emotion at another time in the past.

²The human being is possibly the only animal species that can live in chronic stress caused by “thinking” about past or even future adverse situations.

Finally, a biological mechanism that does not derive from natural selection, but from human technological capacity, is important. The previous biological tools play a passive and enabling role because people have little control over them. Nevertheless, this third biological mechanism can be actively managed. It is hardly noticed because it is considered a *cultural* factor, but its objective is to reform the organic equipment to overcome the imbalance generated by the trauma. Two types of reform can be distinguished: 1. Those that imply deep anatomical-physiological transformations (operations, chemical interventions in the processes of neurotransmitters and endocrine components, transplants, etc.). 2. Those others that are more superficial because they are additions that do not imply deep organic modifications (the use of glasses, contact lenses or hearing aids, wheelchairs, aesthetic modifications through pigments or technologies that superficially mask or conceal certain bodily aspects of the subject). These two types of reform aim to increase the control that people have over their processes of resilience and overcoming adversity.³ Treating them as insignificant or ridiculous means ignoring the psychological difficulty involved in the decision to use some of them. If people suffer an accident that has left them paralyzed, passive biological mechanisms are essential to reestablish the homeostasis and the vital balance with the environment. However, the possibilities of resilience are not the same for a subject without economic resources who suffers from the deterioration of multiple sclerosis and for the physicist Stephen Hawking. Surely, the underlying natural biological mechanisms are the basis for both of them to initiate emotional overcoming of their trauma, but Hawking has also managed to reform some aspects of his biology to be able to do it more efficiently. This mechanism is also useful for people who, due to a fire, have suddenly found themselves with a large part of their body disfigured by burns. The natural tools are reinforced if that person has the possibility of fixing the disfigurement through surgery. A psychological trauma caused by the removal of a breast can also be alleviated more efficiently through this active organic reform. An endogenous or reactive depression can be overcome naturally with more or less effort, but the use of anti-depressants or other types of drugs that act on the chemical mechanisms of the brain will help in this process. In the same way, the problems associated with more or less serious gender dysphoria can be overcome through a process of neuro-chemical, aesthetic and anatomical transformation, something unthinkable in past times or in other places in the world. For this reason, it should be taken into account that the potential for resilience will not be effective in the same way in those people who have the possibility of adding certain organic reforms (whether significant or superficial) that facilitate readjustment and overcome the adverse situation. Although they are not natural mechanisms, but rather technological ones, their objective is to transform the biological tools that have been damaged by the trauma or complement them to make resilience faster or more effective.

2.4.2 The Cultural-ideological State

There is another set of specifically cultural-ideological tools. In order to distinguish them from the environment and from the artificial reform of body, I consider culture here only in its *ideological dimension*. Culture is the set of empirical ideas (what is or is not), aesthetic (what is beautiful or ugly), normative (what is good or bad) and prospective (what we can or cannot expect) that people receive, modulate and internalize. These four sides of culture have a specific feature that makes them different from merely theoretical ideas. Culture has a “dynamogenic” character (*dynamogénique*). A feature that Durkheim attributed to religious beliefs and whose main function is to provoke acts [20]. Culture has a pragmatic character. They are ideas that are reflected in acts and behavior, which guide human action in two ways: (a) proposing ideas of the kind “Do X” or “if you have done Y, then do X” (*homo sociologicus*) or (b) proposing ideas of the type “If you want to achieve Y, do X” (*homo economicus*). If biology generates an organic state, ideas create a *cultural and ideological state* that can also help or limit the potential capacity for resilience. Hence, not only biology but also ideas play an essential role in recovery processes from adversity. Cultural ideas (religious,

³These transformations are the result of the technological capacity of the human being. The modern movement of transhumanism has proposed, in fact, through biological reform — therefore, neither cultural nor environmental — the enhancement and the overcoming of some constitutive adverse situations to nature: death, illness and unpleasant memories [19]. In some way, transhumanism aims to provide the human species with new biological tools to face adversity or, if possible, eliminate it.

philosophical, political, anthropological, etc.) act as a hermeneutic pre-understanding that conditions the way in which people interpret adversity and can face it.

For more than a century, sociology and social psychology have studied whether cultural ideas about oneself are different depending on various factors, including social class. The social psychologist Philip Zimbardo stated that the temporal categories of past, present, and future are linked to the socio-demographic features of the subjects. Giving up the future and focusing on the present are fundamental traits of the lower classes who have nothing to look forward to. Nevertheless, the future opens up bright and hopeful for the middle classes. Meritocracy is also an ideological idea fundamentally present in the elite. Beyond the macro-processes of legitimation through cultural industries, there are more subtle mechanisms —socio-psychological processes— through socialization, educational training, and the position that each subject occupies in the job structure. For this reason, the elite has integrated cultural ideas of excellence while the lower classes have assumed a certain fatalism in their lives [21].

Ideas influence the ability of a subject to face or resist adversity differently. Two possibilities may occur: those people who have assumed a world in which pain, misery, and suffering are constitutive of their lives since they were born may have a greater ability to overcome adversity than people who, having habitually lived in situations of comfort, suddenly find themselves immersed in the trauma of health, violence, economic crisis, etc. However, it could also happen that those people who have felt a world with happy experiences, in which there was love and support, have forged a strong personality that allows them to cope with traumatic breaks [22]. The ideas of a subject regarding his place in the world seen as a project are very important to resilience. For example, pro-social and altruistic ideas, a philosophy of life with a sense of coherence, meditation, more flexible and less dogmatic philosophies, or an active lifestyle in which exercise is important, are fundamental ideas for overcoming adversity. Although simple and deterministic causal links cannot be established, there are powerful correlations between these ideas, the configuration of the brain, and psychological well-being [23, 24, 25, 26, 27]. Even meditation and prayer are beneficial because they generate positive attitudes toward adversity. Regardless of the reality or not of the supernatural dimension, evolutionary biologists have considered religion as an adaptive ideological-pragmatic factor, precisely because it provides coherence, meaning, and the possibility of coping with adverse situations. These factors are connected to a biological endowment, but they are more than biological.

2.4.3 The Environmental-contextual State

The external environment — the intra-organic environment is excluded because it belongs to the biological dimension — is the board on which the organisms — with their biology and their culture — play their cards [28]. The external stimuli that constitute the environment can be of three types: natural, artificial, or social [29]. To biological-organic and cultural-ideological states, the environmental-contextual state must be added. While biology provides physiological tools and culture provides ideological tools, the environment provides a contextual configuration that can also favor or hinder resilience. In adverse situations, there are natural, artificial, or social environments that help people to recover and overcome or, in contrast, to suffer more hindrances.

The most important trait that can contribute to resilience is the *degree of elasticity or resilience* of the environments themselves. If rigid biology or an impoverished culture hinders resilience, an inelastic, rigid or impoverished environment also places limits on it. This is important. To consider resilience as a capacity solely of the individual is to misrepresent the problem. Two people can have the same potential resilience capacity from a biological and cultural point of view. However, one lives in a rigid, strongly authoritarian, stratified, and absorbing social environment, while the other lives in a more flexible, liberal, egalitarian, and elastic one. The possibility to overcome adversity is also influenced by the type of environment that is more appropriate to face trauma. Being resilient can mean that people, through their biology or their culture, are capable of managing a situation that harms them and that they cannot change. However, being resilient also means being able to flee from the environment that harms me, to transform it or to resist it. The resilience of a woman abused by her husband or a daughter abused by her parents not only depends on the fact that their emotions or their optimistic culture allow them to handle blows or mistreatment. In this situation, resilience

is also determined by the ability to flee, transform or resist their abusers. Here is where the type of elasticity of the environment takes on its full importance. If that woman is financially dependent on her husband, the possibility to escape offered by that social environment is inelastic. Another woman with the same biological and/or cultural potential but with economic independence would have greater elasticity. The same is true if a woman's social environment supports her decision to divorce or pressures her not to do so. In the same way, a socio-economic environment with high rates of youth unemployment would make it more difficult for the mistreated young daughter to flee, transform or resist the abuser.

Sometimes, in certain circumstances or adversities, the only possibility of being resilient is to create a bubble-environment where the damage is minimized in some way. A fascinating example is a concentration camp, a social environment structured with enormous rigidity and inelasticity, which is both the cause of adversity and the limitation for overcoming it. For example, Viktor Frankl [30] confirms an old intuition: that "people of greater sensitivity, accustomed to a rich intellectual experience" despite their suffering, experienced less damage to their personality thanks to the ability to "abstract themselves from the terrible environment and plunge into a world of inner richness and freedom of spirit". This was no exception. During the years of German occupation in Krakow, some people became "lice feeders" with their blood (to get a typhus vaccine) through boxes with a mesh on one side where there were 400-800 lice larvae that were fed on the blood of the thighs of some people. Many Polish intellectuals dedicated themselves to this task, avoiding being taken to concentration camps. Among them was the mathematician Stefan Banach who, along with other colleagues, had enriching conversations on topology and number theory while the larvae fed on his blood [31]. These are examples of bubble-environments that are created to overlap those real environments that are inelastic and do not allow flight or transformation. Her resilience is exercised through the search for a parallel environment that allows some resistance.

However, a "passive" resilience in which the full weight falls on the subject should not to be the *paradigm of resilience*. A more "active" resilience, favored by a more elastic environment, implies transforming the environment that harms us when possible, fleeing to another environment when it cannot be changed, or even resisting it through social processes in which support is essential. For example, people from a country where, due to their sexual, religious, or economic condition, live in permanent difficulty, are not obliged to "learn how to manage" that situation. They can be resilient by making the decision to emigrate to another country. If their environment is elastic, the flight will be easier for them than if they live in a country where migration is prohibited and persecuted. But they may also want to transform their social and structural environment through political activity to avoid discrimination. Only by taking into account this dialectic of resistance/transformation/flight with the environment, can resilience overcome adversity. If not, resilience would become cynical advice to accept adversity submissively, which blames people who are not capable of stoically assuming the damage that their environment inflicts on them, creating a kind of "sociodicy" or social justification for evil [32]. Resilience requires personal properties (both biological and cultural) that are sometimes the only ones that can help people not to destroy their life. Nevertheless, the exercise of resilience is always a dynamic process in which people interact with other people inter-personally or through social structures and institutions. Neglecting the social aspect can lead to considering resilience as a control mechanism of social elites over citizens. This is the background criticism of the well-known book *Happycracy* [33] that summarizes the arguments of a good part of the criticism that has been directed against the very concept of resilience: extreme individualism; neglect of the social conditions of the environment; resilience as unlimited flexibility in the face of the demands of the socio-economic system; resilience as a synonym of submission to harmful situations that do not change but must be assumed by the subject, etc. To assume stress, anxiety, and other "diseases of civilization" as inevitable and as the responsibility of people is to legitimize trauma as a *status quo*. Biology and culture allow us to deal with adversity, but we must also leave open the possibility that the environment must be transformed to avoid trauma.

In summary, the exercise of resilience implies the existence of fundamental qualities that, from biology, culture, and the environment, make a difference to the possibilities and ways of facing adversity. The three etiological factors are interrelated. For this reason, there is no room for purely *idealistic resilience* (only ideas allow one to face adversity), nor *biological resilience* (only biological traits allow one to face adversity), or *materialist resilience* (only a change in the environmental structure allows one to overcome adversity). In

fact, "learned helplessness" reflects this complex mixture of psychological and sociological, organic, cultural, and environmental elements, which create a mental state in which people feel overwhelmed by a painful or unpleasant stimulus and consider it impossible to avoid it. It is an extreme kind of resignation to pain. It is learned because it does not take into account the biological mechanisms that nature has incorporated into the organism. People abandon themselves to the tragedy in a resigned way. Although there is the possibility of fleeing from an unpleasant situation, people do not take advantage of it. They have been trapped in the tragedy. The experiences have been translated into defeatist ideas that have been neuro-psychologically wired. For this reason, analyzing resilience always means taking into account this triple etiological constitution of its basic properties, which will be conditioned by other factors such as age, marital status, previous pathologies, economic resources, etc. The differences in the way of coping with the Covid crisis, for example, between an adolescent and an adult, between a married person or a widower, between people with dependency or not, with a predisposition to anxiety, or with larger houses equipped with gardens, etc., shows that each specific situation is different in the way it helps or hinders resilience. For this reason, the response to the pandemic required a transdisciplinary effort [41].

2.5 The Relationality and Ambivalence of Exercising Resilience

Analyzing all these "traits" or factors is essential. However, we must not forget that resilience is also a dynamic and interactive "process" between the person, the adverse situation, and other people. This process is characterized by two qualities: relationality and ambivalence that make resilience a complex and strategic exercise or game. For this reason, resilience is not an individual quality, but rather a strategic exercise in the midst of a complex social configuration. The sociologist Norbert Elias coined the concept of "figuration" to refer to a network of interdependent people that adopts a concrete pattern configured by conflictive and cooperative relationships. Figurations are a "fabric of tensions" ("Spannungsgefüge") that acquires a shape of specific interdependencies. These figurations can be analyzed through game models of different types [34]. People "play" (they act) within those specific figurations that enable and constrain their actions, decisions and identities.

In fact, the individual-society relationship is ambivalent [35]. Human sociality is complex because humans are a social species while we maintain our specific individuality. Human groupings are always "half-societies" in which the links between individuals are braided with thick seams that never fit together in a coherent, perfect and harmonic way. Therefore, human sociality is inherently ambivalent and this conditions the exercise of resilience. On the one hand, due to our neurological wiring, the social brain is so constitutive of our well-being that one of the main factors that facilitates a subject's resilience is to have a social support network [36]. These networks act as a form of protection that buffers the trauma or helps to overcome it through emotional strengthening. For decades, empirical research has shown that there is no correlation between an increase in GDP and the "happiness" of people in a country. Once a certain level of economic prosperity has been reached, there is a decoupling between the trend lines of economic progress and personal well-being. The same has been shown by the sociology of work. When subjects feel well paid, successive wage increases fail to increase productivity or worker satisfaction. What is "missing" in the equation is precisely the social support network. That is why poor countries — where there is less individualism, more family and neighborhood support networks, and where personal fulfillment is not based purely on professional and economic success — usually score higher on happiness scales than rich countries. The dramatic increase in mental illness caused by isolation in young people, adults and the elderly is an example of this during the Covid emergency. In fact, this social network includes animals, which also belong to the emotional support group of people [38]. However, while these social relationships are essential to increase people's emotional well-being, they also generate the greatest number of traumas. Paradoxically, the most widespread social harm is that which comes from our family and friends. The very people who are support networks may become the ones inflicting harm or trauma. Interpersonal relationships can be at the same time — using the terminology of Randall Collins — generators of interaction rituals that increase or

decrease our emotional energy.

However, the interrelationships between people do not always occur at a level of co-presence and interaction. As the social psychologist Allport rightly pointed out, in addition to *physical* presence, people condition us as *imagined* presences (the image we make of others or that we believe others make of us) and as *implicit* presences (institutional, cultural or normative creations stemming from others). Both also have an ambivalent impact. Sometimes they facilitate resilience; for example, imagining my deceased grandfather can give me wings to overcome adversity or taking advantage of normative regulations against parental abuse of children can make it easier for me to flee from a toxic home. But sometimes they complicate our recovery; for example, imagining what my family will say if I stop talking to my father who mistreats me or if the legislation is benign with rapists and that leaves a woman unprotected. Therefore, whether through everyday physical interactions, through their imagined presence or their implicit influence, "society" and "others" create a complex figuration in which the exercise of resilience is not reduced to a simple decision of "I want to recover from this adversity". This ambivalent quality of resilience is like the dynamics of social transformation processes or the creation of public policies: in any transformation process, there will always be some actors who are beneficiaries and others who are harmed directly or indirectly. For this reason, resilience is not a simple "trait" but a true "process" or strategic game. Perhaps some brief examples can clarify what I mean.

Migratory processes can be seen as resilient processes. However, the migrants who seek to overcome adversity can find different scenarios. Sometimes their own country prevents them from migrating. Other times, the recipient country prohibits them from immigrating. On other occasions, even if they manage to settle in another country, they may face situations of economic, political, cultural, and social discrimination. Finally, although they have managed to integrate into the new society, they may find themselves emotionally torn by the imagined presence of those they left behind in their country. All of this, instead of allowing them to overcome adversity, creates new and deeper traumas. Can the failure of resilience be attributed to the subject or to the physical, imagined or implicit presence of others? The same can be applied to a woman abused by her husband or a daughter who wants to flee from the trauma inflicted by her alcoholic father since childhood. What for that daughter or woman is a *brave act of resistance* to adversity through flight or the transformation of her living conditions, for the father or husband is an act of *betrayal and infidelity*. The murder of the women who pretended to be resilient tragically demonstrates that resilience cannot be analyzed as a neuro-psychological property but as a strategic relational exercise. Processes of ideological conversion or social downgrading can be understood from this approach. The *Intimate Diary* of the Spanish philosopher Miguel de Unamuno shows in a dramatic way that a subject who intends to give an existential turn to his life can find resistance from his loved ones who do not accept the resilience of the one who seeks to live another way. Downgrading has also been widely studied in social theory: people who grew up in a lower class than they now belong to feel that others accuse them of not being faithful to their humble origins. The feelings of guilt generated by this type of "social control" of a subject's resilience can aggravate the trauma or create a new one. The cruelty of others toward the individual's resilient attitude can be personally assumed and convert these external social processes into internal psychological processes of cruelty toward oneself, "I should never have left my husband", "I should never have stopped talking to my father", "I should never have migrated to another country", "I should never have left my old job", etc.

In addition to these examples, another relational factor determines recovery from adversity. It is not the same processes or the same qualities that determine the resilience of an individual actor or of a collective actor. The ontological dimension that emerges from "groupality" constitutes a fundamental nuance: it is not the same for a person or for a family to overcome the death of a loved one. The sociological complexity of a resilient family is exponentially more intricate than that of an individual person. The resilience of a single parent who loses a child is also sociologically simpler than the same loss in a marriage. In these cases, it is not that an individual subject pretends to be resilient and finds himself with relational difficulties that prevent him from doing so. Now the group itself has to exercise resilience. The fact that specific people in this group face adversity in different ways (with tears or laughter, with hatred or tenderness, fleeing or staying, speaking or keeping quiet) and at different paces, can destabilize the exercise of resilience of each subject. All this shows that resilience as a "process" is fundamentally relational and ambivalent.

2.6 Resilience and the Anthropological Problem of “Sameness”

Finally, together with its “traits” and its “processual” nature, it must be taken into account that the ultimate meaning of resilience is an “outcome”: overcoming adversity and recovering homeostatic balance. Everything said so far has emphasized the factors that constitute resilience and its relational and ambivalent qualities. However, the final corollary shows specifically anthropological consequences. Resilience means *overcoming adversity*. In the popular imagination, resilience is often illustrated by the example of a bamboo cane (or a metal rod) that bends when a force is exerted on it but returns to its position once the force is removed. The cane is resilient because instead of breaking, it is flexible enough to adapt to that adverse force and recover again. This image corresponds to the very etymology of the term resilience, which is made up of the Latin words “re” (back) and “salire” (jump). That is, it is a “rebound” or return to a previous position. In a sense, this is true because resilience means “recovering” the homeostatic balance. However, this image, although poetic, is misleading and anthropologically false. The resilient human being is not the same before and after overcoming adversity. One of the accusations that others can make to resilient subjects is that they have changed and that they have stopped being who they were, seeing life as they saw it, defending the same ideas, or looking the same. That is, people cease to be who they were. Not metaphorically, but ontologically.

For me, a single/multi-selves psychic structure is the biological possibility condition that makes resilience possible.⁴ This multiplicity, dynamism and openness to change are what make a traditional way of understanding the “sameness” of the subject unfeasible. Sameness usually implies “uniqueness” and “permanence”. For this reason, we normally consider ourselves “unified” and “essentially the same”. These are the characteristic properties of the traditional concept of the “soul” of theology or the “self” of philosophy. But the “Self” and the “Personality” are changing neurological processes. Neither the self nor the personality can be the “sameness” of the subject that works as a factor of permanence through all the changes that are suffered throughout life. The selves are more dynamic and the personality more stable, but neither of them is “permanent”. From a metaphysical point of view, the pre-eminence of the Greek metaphysics of uniqueness and permanence has surely influenced the problem of the unique and unalterable essence that constitutes us as a person. However, it becomes increasingly more difficult for me to maintain a position of uniqueness and permanence with respect to human sameness. There is an interesting insight in Derek Parfit’s work about the concept of personal identity, in which the sheer identity of oneself over time is replaced by degrees of similarity. The important thing is the *degree of connection* that we perceive and feel between our different phases of life. The problem of sameness as uniqueness and permanence is now the problem of what temporal coherence exists between the different multi-selves of the subject throughout his life. Perhaps this way of understanding the problem of sameness makes it possible to explain existential and psychological experiences in a more realistic way, such as that of resilience.

The philosophical problem is deep. I do not intend to reduce the complexity of the problem to these brief notes that I have been able to indicate in the space of these pages. I simply wanted to insist that the concept of resilience destroys the self-understanding of people from the categories of “uniqueness” and “permanence”. Only if we are multiple and changing can we be resilient. Precisely for this reason, resilience becomes more difficult in those subjects who, like those on the autistic spectrum, have difficulties in managing change and social relationships. The restricted and repetitive behavior and interests of autistic people are a dramatic example of what uniqueness and permanence entail when it comes to overcoming adversity. Being resilient implies ceasing to consider ourselves from the sameness category as a unified and permanent self.

⁴In these pages, I cannot develop my single/multi-self-hypothesis [39, 40].

2.7 Conclusion: the Human Subject as Action and Passion

Everything said so far leads us to a final reflection on the exercise of resilience and on the underlying anthropological model. Resilience reflects the way in which human life swings between action and passion, between what I intend and what I get, between what comes from me and what comes from others. Thus, on many occasions, people act practically unconsciously. The life of a person is the automatic result of the *integrated tension* of the three vertices of the triangle (biology, culture, and environment). From a philosophical point of view, we could say that the person (behavior and identity) merely emerges from this etiological framework. A large part of what we do has this passive nature. Whether we like it or not, we must assume this dimension of passivity in our lives. We are what our biology gave us, what our parents and friends taught us, and the environmental context in which we develop and live. It is important to clarify that this does not mean that we are determined and condemned to what others have made of us. However, to reduce everything to this passivity would be to make people a simple puppet of their organism, their socialization, and of their environment. This is not true. The subject is also an active agent who tries to manage, balance, or modify the influence of the etiological triangle, choosing some ideas instead of others, weighing and analyzing them, transforming the environment or choosing another, and putting the means at our disposal to modify or resist our biological impulses. This is where rationality and the ability to reflect come in. In this case, the subject is not a puppet hanging from the three strings (biology, culture, and environment), but rather it plays a leading role in its construction. But rationality is never pure. When people at certain moments in their life act or create an identity in a deliberate, conscious, and actively reflective way, they always do so in conflict with what was already given to them. For this reason, their remodeling of themselves is not absolute, and they will never be able to create themselves in a total way. There is always a previous material base with a given biological, cultural, and environmental content. The current ideological approach in self-help books is based on a somewhat absolutely malleable anthropological model without limits as if the subject could be reconstructed from previous total destruction of what it is. However, this is an ideological fallacy with perverse consequences, because it makes people solely responsible for their life project, their achievements, and successes, their failures, and mistakes [40].

Therefore, not everything we are and do is the result of an active, deliberate and conscious exercise. Neither our successes nor our failures are absolutely our own. A realistic anthropological model must be prepared to integrate this ontological and psychological duality and ambivalence, in which human reality is both a passive outcome and an active project. The tension between the two is what often constitutes the ambivalent tear of the human being who sometimes wants but cannot and sometimes can but does not want to. The biological sciences have taught us that biology is both destiny and project, limitation and possibility, passive reception and active projection. In the same way, the social and human sciences have shown that culture and environment are also destiny and project, limitation and possibility, passive reception and active projection. The ontology of human reality is ambivalent because it requires assuming both traits. People manage their etiological triangle torn apart by this inevitable fracture between what they are and what they project to be. The project of "becoming" is always a management of the previous content of "being". Resilience is only possible in the midst of the anthropological tension that tries to find ways so that the drama of human existence is not trapped in a tragedy that prevents people from overcoming adversity.

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CHAPTER 3

Complex Resilience and Entropic Risks in Urban Megaprojects

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This paper explores issues of urban resilience and risk and presents some key conceptual and analytical elements to apply the notion of entropic risk to the analysis of urban megaprojects. The paper claims that the concept of risk needs to be understood together with that of resilience, and thus the paper starts by defining both urban resilience and risk. Entropic risks are defined as the disruptive and disorderly impacts of megaprojects in urban areas. The project management literature has been concerned with risks affecting megaprojects and has neglected the many kinds of risks and negative outcomes produced by them. This is due to their modeling of megaprojects as closed systems and to their focus on providing insights to contribute to megaproject performance improvement. The purpose of the paper is to shift attention from risks affecting megaprojects to risks produced by them for a better understanding of the damage produced by megaprojects. Urban systems and megaprojects are defined as complex adaptive innovation ecosystems, or networks of people in close proximity exchanging information and opinions, creating new knowledge, and interacting, in actor-networks, with matter as well as other forms of human and non-human life. Megaprojects can be characterized as complex systems (organizationally and scale-wise) embedded in complex urban, political and socio-economic systems.

Keywords: Complex resilience, urban megaprojects, entropic risks, contestation, disruptive complexity, disorderly complexity, urban systems.

3.1 Introduction

In 1973 Crawford Holling first introduced the concept of resilience in the ecological literature as a way to understand nonlinear dynamics as well as the processes through which ecosystems self-maintain and persist in the face of disturbance and change. According to Holling's definition, resilience emphasizes the conditions of a complex system far from equilibrium where instabilities can transform it so that it presents another behavior regime. Thus, resilience is measured by the magnitude of disturbances that can be absorbed by the system before it is reorganized with different variables and processes. Sustainability, therefore, is the ability of a complex system to maintain itself over time despite environmental volatility fostered by learning, transformation, renewal and evolution [1].

Van Meerbeeck, Jucker & Svenning (2021) argue that resilience increases the probability of avoiding unwanted changes to "stability domains", and also provides flexibility and the opportunity for developing sustainable systems. The idea of "stability domains" refers to ecology. Ecological stability is defined as the overall ability of a system to remain in the same domain of attraction and to retain its function and structure in the face of perturbations. As it relates to current socio-global events, avoiding unwanted changes to

"stability domains" will be one of the most important challenges in a world increasingly dominated by human beings in increasingly aggressive interaction with their environment. Another factor conferring resilience to ecosystems is diversity in biological communities. The reason is that diverse communities show a higher chance of including one or more species with traits that can adapt to a changing environment [2].

Resilience, then, means ability to adapt. It also entails for a system to retain its fundamental properties in spite of internal or external changes. Further, it involves systemic responses to perturbations and disturbances. Lastly, a resilient system is one that can recover quickly from such changes, disturbances, and perturbations (fires, flooding, windstorms, insect population explosions, and human activities such as deforestation, fracking of the ground for gas and oil extraction, pesticide sprayed in soil, and the introduction of exotic plant or animal species). If the ecosystem is affected by changes and disturbances to the point of reaching a threshold, then the system changes qualitatively and a different regime of processes and structures predominates. This new regime may constitute a critical transition if it is associated with "bifurcation points" [3], [4].

The concept of resilience can be seen as having three defining characteristics: (1) the amount of change or transformations that a complex system can withstand while maintaining the same functional and structural properties, (2) the grade in which the system is capable of self-organization, and (3) the ability of the complex system to develop and increase the ability to learn, innovate and adapt [5].

Jiangxi Gao, Baruch Barzel and Albert-László Barabasi (2016) have developed analytical instruments for multidimensional complex systems allowing systematically separating the role of system dynamics and thus understanding the behavior of each one of the elements of the system. They have determined the point at which a net reaches its critical point of resilience, whether it is an ecosystem (the interrelationship between plants and animals) or a technological system (the cascading collapse of servers on the Internet). This means that the resilience of the original network is predictable. Knowing the critical point of resilience allows to strengthening the resilience of the system (its networks, nodes, and flows) before little changes may provoke tipping points and damage may be irreversible – for example, total loss of biodiversity or significant population displacements due to infrastructure construction [6].

3.2 Methodology

This is a conceptual and interpretive paper that surveys the relevant literature and builds an analytical argument applicable to the empirical reality of urban megaprojects. The ideas of "robustness," "anti-fragility," and "panarchy" are explored in connection with urban resilience, which is connected to the notion of risk and leads to the idea of "entropic risks." The paper draws conclusions from its conceptual approach in order to analyze entropic risks as risks produced by megaprojects, an emergent property materialized in megaproject impacts. The purpose of the paper is to shift attention from risks affecting megaprojects to risks produced by them for a better understanding of the negative impacts produced by megaprojects.

The paper uses qualitative analysis of relevant sources in the field. Conceptual research is conducted by analyzing already present information in the literature with the aim of selecting key, driving ideas, and develop a new interpretative framework. As is well known, the logical structure of this methodological approach is as follows: (1) selection of study topic, (2) collecting relevant literature, (3) identifying emerging variables, (4) generating the interpretive framework.

Such a logical structure develops as follows. The paper starts by considering the concept of "resilience" as applied to urban settings. As such, resilience is closely related to the notions of "robustness" and "anti-fragility".

The particular conceptualization of risk we utilize in this scenario is critical, and we need to start by briefly discussing the contributions of German sociologist Ulrich Beck. In trying to refine our approach, urban systems are defined as complex adaptive innovation ecosystems, that is, networks of people in close proximity exchanging information and opinions, creating new knowledge and interacting, in actor-networks, with matter as well as other forms of human and non-human life.

Megaprojects constitute landscapes of disruption and such disruption is often the cause of systemic

disorder, or entropy increase. We characterize the entropic risks produced by megaprojects as the disruptive and disorderly impacts of megaprojects in urban areas. Given that, by and large, the benefits of megaprojects accrue to a small portion of the population in the urban areas where they are built, most residents need to come up with adaptation strategies as a consequence of the disruptions and disorder caused by large urban projects. We highlight resilience and contestation as the two most prominent adaptation strategies in urban settings.

3.3 Urban Resilience

Urban resilience can be an emergent property of the city-system, seen as a socio-ecological system, where it arises only through the interactions of its components. Thus, a strategy to increase urban resilience cannot rely solely on the individual resilience of its components but has to focus on the interactions. Resilience requires different approaches to explain the dynamic relationship between shocks and stressors and the outcomes of well-being. One such approach is through complex adaptive systems that exhibit historical dependency characteristics, discontinuous changes, multiple balances, and non-linearity [7].

Hopkins (2014) points out that resilience and a stronger local economy mean being more prepared for a future without waste, with greater self-sufficiency, and prioritizing what is locally produced over what is imported. They mention that there are three fundamental characteristics for a system to have the capacity to reorganize from disturbances: diversity, modularity, and feedback [8].

Along a similar line, researchers from the Santa Fe Institute (especially in the repertoire of works compiled by Erica Jen), have carried out various works related to the study and understanding of the "robustness" mechanisms in economic, social, and ecological systems (which are properly considered complex phenomena). The researchers at the Santa Fe Institute propose robustness as the magnitude of volatility that can be compensated by the complex system before reaching the collapse of its main characteristics, processes and functions. This research aims to identify and understand the dynamics common to these systems so that they can give rise to the formation of a theory in this new field that allows the complex systems of our world today to be increasingly sustainable in the future [9].

Going beyond robustness, Taleb (2014) proposes the notion of "anti-fragility" as a characteristic and disposition whereby systems – and, presumably, people – gain from disorder and benefit from stress, volatility, and turmoil. Further, what Taleb terms "antifragile" refers not only to systemic situations that gain from chaos but that need it in order to survive and flourish. Avoiding disruption for fear of the consequences of such a disruption is an indicator of fragility, and illusion of safety actually makes systems vulnerable to shocks. In this context, robustness means standing up to shocks without compromising the essential features of the system [10].

Most research efforts study how systems can develop, learn, adapt and at the same time persist over time based on the fundamental concept of organizational resilience, which is directly associated with that of sustainability in any complex system. As a result, "resilience" can be understood as a part of a conceptual set together with the idea of sustainability, and ought to be approached from a dynamic perspective depending on variations in time and space. Further, if a system begins to "lose" resilience, the "potential for change" increases, that is, the possibilities of moving to a different organizational state or configuration increase, even if the system is subject to small disturbances or disturbances that were previously insignificant or did not produce any adverse effect.

The concepts of resilience and sustainability are directly related to the long-term consequences of transformations and change, and their impact on the future profile of societies, economies and the human system as a whole. Urban systems are complex adaptive innovation ecosystems and, as such, they have the potential for both resilience and sustainability. Resilience is perhaps one of the most important properties to integrate when talking about sustainability. One consequence of this is that complex system transformation is inevitable. Different transformations in different temporal and spatial scales can take infinite directions. In this way, we can say that the transformations do not follow a logical, linear course. Quite the contrary, they can happen under different conditions: continuous, inevitable, gradual, abrupt, local, global, required

or not, promoted or unexpected. This leads us to the concept of panarchy.

Panarchy is a conceptual framework to account for the dual, and seemingly contradictory, characteristics of all complex systems – stability and change. It is the study of how economic growth and human development depend on ecosystems and institutions, and how they interact. The panarchy metaphor posits that socio-ecological systems operate at multiple geographic scales and that feedbacks operate both intra- and inter-scale [11]. Systems that operate on small scales can undergo changes in short periods due to the possibility that individual actors can exert great influence; while those that operate on larger scales may require long periods to experience changes considering that a greater number of interactions between a large number of actors will be required. Complexity theory suggests that properties in larger systems generally arise from interactions at lower levels [12].

In a resilient system, individual nodes (individuals, businesses, communities, and even entire countries) are able to draw support and resources from elsewhere but are also self-sufficient in meeting their essential needs in an emergency. However, in our race toward hyper-communication and the globalization of all economic and technological networks in the world, we have forgotten the second part of this postulate [13]. The great problem of a living organization, whatever it may be, is not only that of "functioning", but also that of being able to face errors, uncertainties, and dangers, that is, having strategic and evolutionary aptitudes. The important thing is not only to adapt, but to learn, invent, and create [14].

3.4 Resilience and Risk

The concept of resilience has turned from a purely descriptive one to one that includes a normative agenda regarding what should be done. Resilience must be seen by governments and organizations as a process, a state, and a quality. It ranges from the global, focused on food security; the national, related to critical infrastructure (energy and water) and the economic sector; and the local, in terms of climate change. Resilience sometimes focuses on individual entities and other times on the resilience of the system. This leads to the question of "resilience of what, to what, and at what scale," where geographers can contribute from their space-time perspective and society-environment systemic approach [15].

It is somewhat surprising that, despite decades of the concept of resilience being addressed in the social sciences, questions of power, governance, and social capital still do not play an important role in theoretical and practical approaches to increase resilience. Building resilience implies the opportunity to incorporate elements related to the historical and socio-political processes that create and maintains social vulnerability, as well as to develop intervention projects that guide cities and societies toward roads less vulnerable pathways [16].

An international policy effort has been undertaken to follow the Sendai Framework for Disaster Risk Reduction 2015-2030, by focusing on improving urban resilience through the planning and development of quality infrastructure. This effort goes hand in hand with the adoption of ecosystem-based approaches and integrated data-driven policies regarding disaster risk reduction and management.

The goal is to reduce vulnerability to disasters, particularly in marginal and disadvantaged neighborhoods. Obviously, the particular conceptualization of risk we utilize in this scenario is critical, and we need to start by briefly discussing the contributions of German sociologist Ulrich Beck.

In highlighting the significance of the idea of risk and the practice of risk management as fundamental components of contemporary society, Beck was ahead of his time. In his work on risk, he reflects on how the forces of globalization, individualization, the gender revolution, underemployment, and global hazards are interwoven and manifest in events like the ecological disaster and the collapse of global financial markets. Beck has examined the concept of "risk calculus," the sociology of risk (i.e., how some interest groups benefit from "manufactured uncertainty"), and the construction of guesswork in response to crises.

In his *Risk Society. Towards a New Modernity* (1992) Beck states that "risk may be defined as a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself" (p. 21). Later in the book he states:

"In contrast to all earlier epochs (including industrial society), the risk society is characterized

essentially by a lack: the impossibility of an external attribution of hazards. In other words, risks depend on decisions, they are industrially produced and in this sense politically reflexive” (p. 183).

Beck rejects the then conventional idea that risk management ought to be practiced as a merely technocratic and bureaucratic exercise where the views of civil society and citizens are treated with contempt. [17]. His analysis shows some overlap with the debate on "the limits to growth" that the Club of Rome undertook in the 70s of the last century. The mathematical calculations and probabilistic scenario of World-3 (the computer model with which the Club of Rome analyzed the multiple global interactions between population growth, industrial production, food production, and ecosystem limits) defied cultural definitions of current and tolerable standards of living. The perceived threat then spawned an ad hoc global risk community and study and discussion groups around the world that analyzed the Club of Rome report. Likewise, World-3's simulation of ecological trends challenged many taken-for-granted rules of everyday life; it was not for less, because what the simulation offered was an unprecedented dystopian projection of global decomposition.

Beck, for his part, proposes at the edge of the 21st century a reflexive and constructivist analysis, less mechanistic and adjusted to the parameters of complexity and uncertainty of the socio-political reality, and also to its ideological constructs. Indeed, neither the notion of "limits to growth" nor that of "global risk" can be understood without taking into account the capitalist project. Today capital is presented to us as a Schumpeterian force, quasi-revolutionary, and capable of resolving the antinomies of the global risk society through its hegemony over the future. However, this ideology of power has had to face a paradigm shift in future studies, from "forecasting" to critical analysis, since predictive and extrapolation tools were not effective in a global risk society.

Beck has defined risk analysis as "the modern approach to anticipate and control the future consequences of human action" as unintended consequences of radicalized and accelerated modernization. The so-called "systemic events" (geopolitical and financial crises, Exxon Valdez, the Challenger disaster, bovine spongiform encephalopathy, among many others), staged in the mass media, have paralyzed public consciousness and shown that modern societies were generating risks that they could not control and that threatened their survival.

The growing awareness of the reality of risk has also dramatically altered our perception of time. The future attack – something non-existent by definition – has been displacing the past as an obsession that has a decisive influence on the present, with the consequent distortion in the understanding of the problems of that present and their possible solutions. This change in perspective – from the historical perspective to the universe of projections – is reflected in international risk management, whose genesis lies in finance and insurance systems. The change in corporate planning models towards the construction of scenarios is today practically omnipresent. The popularity of Michael Porter's "Five Forces" and McKinsey's "7S" models are a reflection of these altered perceptions.

A risk society is a dappled world, to use Nancy Cartwright's expression [18]. No single elegant theory can account for a world that is not completely ordered: some features are precisely ordered, others are given to rough regularity and still others behave in their own diverse ways. This patchwork makes sense when we realize that laws are very special productions of nature, requiring very special arrangements for their generation. In this context, risk perceptions and materializations contribute to disorder and, on the other hand, warrant a transdisciplinary approach to the dappled world. In this paradigm, there is no longer any trace of the Newtonian universe of order and determinism of the Western modernist project.

The notion of risk and that of resilience are best understood as part of a conceptual set. As Davis has argued, the notion of risk permeates resilience strategies in a fundamental and unavoidable way, since it is essential to design any constructive action that mitigates or minimizes adaptive vulnerabilities instead of exacerbating them [19]. Risk is the essential and foundational element of human and non-human adaptive processes and, therefore, also of complex societies, as Ilya Prigogine persuasively explained [20].

However, the risk does not lie only in the realm of science and the "factual." Risk as a readable phenomenon or concern is informed by power and social issues, including who has the right or authority to define risk, how risk is distributed, and who pays for and who benefits from it.

It is therefore important to avoid the "tyranny of risk" as a defining principle of action, and understand that risk discourses can be abused to justify oppression, controls on citizenship, the appropriation of the right to territory and other forms of exclusion. This challenges the principles of fairness and justice that should guide civic and professional behavior, both individually and collectively [19].

Similarly, the notion of "resilience" can be misleading and can easily drift towards the ideological, either because the concept can offer an excuse to leave citizens to fend for themselves while governments and markets help each other, or because resilience refers to a desire to return to normality that has been and is the cause of the planetary problems we face, according to Davis. Focusing on resilience often means avoiding difficult questions of power, inequality, and the impact of limited resources on people.

The other way in which the notion of resilience can be ideologically misleading is that it can be conceived in terms of "getting back to normal" after a disaster, or as a means of restoring system balance after a shock. Thus, embracing resilience can translate into having faith that, with enough attention and adaptive effort, the future can be better, an expectation that needs to be contextualized or nuanced on some way.

3.5 Complex Adaptive Innovation Ecosystems

Resilience and risk are present in urban systems. Urban systems can be approached as complex adaptive innovation ecosystems. A complex system is made up of various interconnected or interlocking parts whose links create additional information not visible to the observer as a result of the interactions between elements. A complex adaptive system is these parts that generate information, but in turn have the ability to change and learn from experience. Urban systems are complex adaptive innovation ecosystems, that is, networks of people in close proximity exchanging information and opinions, creating new knowledge and interacting, in actor-networks, with matter as well as other forms of human and non-human life. As shown elsewhere,

"urban complexity can be said to emerge from the decentralized and self-organizing webs, assemblages and networks of transactions and interactions among a wide range of heterogeneous actors, agents and stakeholders that typically occur at multiple scales in dynamic, fuzzy, changing and uncertain urban settings" [21]

These transactions and interactions of cooperation and competition, informed by serendipity and randomness, highlight agents' perceptions, choices, decisions, and preferences [22], [23], [24].

Agents, actors, actants, and stakeholders can be individual, community, city and regional, involving social, economic, and political institutions. Their mutual interactions produce feedback loops that allow the adaptation of individual and group actors and the emergence of phenomena, patterns and outcomes (physical, behavioral, social, economic, ecological, environmental) that cannot be predicted by analyzing the particular webs, assemblages, networks and their constituents and components [25], [26], [27], [28].

A characteristic of life (both human and non-human) in these complex systems is that it is driven by an anti-entropic effort facilitating its adaptation and survival. Such an anti-entropic effort can be viewed as resilience or systemic energy: the ability of any urban system to maintain continuity after shocks or catastrophes while contributing positively to adaptation and transformation. As we shall see, urban resilience is one of the forces working against the entropic risks caused by urban megaprojects. Such a process of adaptation contains a transformative component of contestation against megaprojects. Some disturbances or destabilizations are critical in the transformation of complex systems.

For purposes of illustration, I would like to briefly focus attention on four essential characteristics of complex adaptive systems: emergence, uncertainty, self-organization and transdisciplinarity. Gunderson & Holling (2002) argue that the suppression of any of these factors will inevitably make the system unsustainable over time [29].

- **Emergence** refers to the fact that the properties of the system emerge from the interactions of the set of components without being attributable to a particular component. Emergent properties, therefore, are properties of the system and not of the individual components.

- **Self-organization** is a feature of complex systems also called spontaneous order; through self-organization, order arises out of the chaos of local interactions among the parts of the system. Characteristically, the process of self-organization needs not any supervision, design or control by any external agent. Self-organization uses the memory of the complex system transformations for the renewal and reorganization process. In this context, knowledge enables access to information, experience, and learning.
- **Uncertainty** means the range of possible values within which the true value of the measurement lies, and it is highly dependent on the degree of system complexity. This means that urban systems are undecidable [30]. The greater the degrees of freedom of the system, the greater its probability to generate variations and new interactions, that is, more possibilities. For example, diversity – which provides the sources for the adaptive responses – contributes to system resilience in human settlements and urban systems.
- **Transdisciplinarity** is a disposition of observers of complex systems, and an analytical consequence of complexity. It constitutes a strategy to approach and analyze complex systems that recognizes the necessity to open a breach in the territorial closures of the disciplines, multiply exchanges and communications across fields of knowledge. According to Morin (1984), the objective is to conceive not only the complexity of all reality (physical, biological, human, sociological, political), but the reality of complexity [31].

3.6 From Risks Affecting Megaprojects to Risks Produced by Them

In *Megaprojects and Risk*, Flyvbjerg and his colleagues identify a "megaprojects paradox": that more and more of these projects are being implemented, in spite of their dismal performance record, often with substantial cost overruns and market shortfalls. According to the authors, the reason for such poor performances is that many of the participants in the process have incentives to underestimate costs, overestimate revenues, undervalue environmental impact, and overvalue economic development effects. The authors argue that central problems are lack of accountability and inappropriate risk sharing, which can be improved by reforming the institutional arrangements of decision making and by instituting accountability at the project development and evaluation stages [32].

According to Flyvbjerg et al., innate human biases, such as 'uniqueness bias', undermine the standard assessment tools and processes utilized to evaluate megaprojects, such as Monte Carlo simulations. As an alternative, "reference class forecasting" – based on the work by Kahneman and Tversky [33] – proceeds by collecting data on past megaprojects so that future megaprojects can learn from those real-world case studies. Black swan events also affect megaprojects with devastating effects, due to the fact that megaprojects take very long to complete¹. Further, the scale and complexity of tasks involved in megaproject planning and construction mean that there are risks originating in a lack of effective communication among stakeholders.

The literature offers many different classifications of risks in megaprojects [34], [35], [36]. At a basic level, one could consider the following:

- **Task-dependency risks**, whereby Task P (predecessor) must be finished before Task S (successor) can start. In these dependent situations, a delay to one task will likely impact all future tasks, thereby disrupting the entire project. Modularity has been proposed as a possible solution to isolate and control task-dependency risks.
- **Communication-related risks**. Two typical features of megaproject construction are (1) a multi-layered organizational structure and (2) the existence of a significant number of dependencies. Communication risks come not only from the usual human cognitive biases but also from the complex

¹The statistics of complex systems is the statistics of power laws, where large and extreme events appear much more often than Gaussian statistics predicts.

picture created by these two typical features of megaprojects. Communication failures can be due to so-called “Rashomon effect”: the same event, process, task or need is described – and understood – in slightly or significantly different ways by different people who were involved.

- **Regulatory risks.** This refers to the threats to disrupt project progress derived from regulator requirements (including size of building, health and safety regulations or sanctions for non-compliance). Project leaders need to devise a comprehensive strategy to ensure compliance by staying ahead of regulations and paying close attention, through their entire megaproject life-cycle, to the regulatory framework and various policies.
- **Environmental risks.** Risks related to the environment are acquiring increasing importance in the megaprojects literature. There is a wide range of risks to be considered here: civil society protests in pre-construction, to issues of contamination or pipe discovery during construction, to problems related to maintenance and operations, to weather impacts, to ground conditions not conducive to construction, to bureaucratic problems related to licenses.
- **External risks.** These risks exist outside of the project team and organization and they’re often more difficult to predict and control. They include many kinds of events derived from political and socio-economic conflict situations, but also processes of policy-making and some of the other routine workings of socio-economic and political systems. External threats must both be identified and categorized before being placed within a risk breakdown structure, paying special attention to their impact on the project plan.

According to Li et al (2021), there are 22 sustainability elements and 75 risk factors in megaprojects, as shown through a survey and fuzzy set methodology. The hierarchy among those risks establishes the following order: (1) economic risks have a high probability, (2) social risks have a high loss, (3) environmental risks have an intermediate probability and loss, and (4) coordination risks have the greatest impact. The researchers found that the three most important risk factors are: construction and installation cost overruns, land acquisition and resettling cost overruns, and information sharing with the public. Let us note that these risks are still risks affecting megaproject planning, construction, and performance [37].

The project management literature has neglected the many kinds of risks and negative outcomes produced by them. This is due to their modeling of megaprojects as closed systems and to their focus on providing insights to contribute to megaproject performance improvement. The “external risks” category above works as a black box and a source of threats for projects, but it is not placed at the center of analysis.

All in all, the project management literature has been portraying an image of megaprojects as improvable and as necessary features in the process of development. In what follows, I’d like to focus on the kinds of risks and outcomes produced by megaprojects as a result of their embeddedness in the polity, economy and society. Megaprojects constitute landscapes of disruption and such disruption is often the cause of systemic disorder, or entropy increase. Let us see what this means.

3.7 Entropic Risks

One way to understand entropy is as the degree of disorder in a system. Put differently, entropy is a measure of the likelihood of energy and matter being arranged in a particular state. Entropy is inversely related to energy in that the higher the entropy of a system, the less energy is available in the system to do work. As we explore this idea in urban systems and megaprojects, we characterize the entropic risks produced by megaprojects as the disruptive and disorderly impacts of megaprojects in urban areas.

Entropy is a concept that links the microscopic world with macroscopic (systemic) phenomena and defines the degree of disorder in a system. It was first introduced in physics to relate the velocities of particles (microscopic world) with temperature (macroscopic property). The concept helps to describe and analyze large complex systems defined by macroscopic concerns by decision-makers related to the microscopic dynamics of individual elements in the system. In a closed system, entropy will always increase, while open systems, including all environmental and social systems, are able to manage the rate of entropy generation to some degree by maintaining a network structure [36]. Megaprojects can be seen as open systems that remain

embedded – networked - in the polity, economy, and society where they are built. The entropic risks they cause can thus be managed – or contested.

Other real-life complex systems are networked systems. Food webs, for example, are networks of species feeding on one another. Supply chains are networks of firms supplying intermediate goods to each other. Urban systems are complex adaptive innovation ecosystems - networks of people in close proximity exchanging information and opinions, creating new knowledge and interacting, in actor-networks, with the matter as well as other forms of human and non-human life. A characteristic of life (both human and non-human) in these complex systems is that it is driven by an anti-entropic effort facilitating its adaptation and survival. In systems where the number of network elements is large and the connections are subject to so many factors that they can be seen as random to some degree, the concept of (information) entropy becomes applicable.

In an analysis of global commodity trade (showing a complex network structure that arises from bilateral and multilateral trade agreements) trade using information entropy, Kharrazi and colleagues found that trade agreements can make commodity trade networks more efficient and lead to more rapid growth in the volume of trade. The research showed that gains take a toll on resilience levels, particularly to economic shocks, of which a prominent example is the 2008 financial crisis. Perhaps counter-intuitively, the results also showed that networks that had greater redundancies did not have to sacrifice growth [38]. This is an example of how compensatory mechanisms are present between forms and patterns of risk and resilience. As Davis argued, adaptive strategies in some domains may actually reinforce structural problems that create risks in other domains [19].

The notion of entropy can also be applied to systems that are both networked and path-dependent, as Turner and colleagues have done. This is an application of the concept to complex human-earth systems. In their study, the researchers focused on situations with a winner-takes-all dynamic. In these situations simple path-dependent systems can indeed be studied by means of developed generalized entropy. Winner-takes-all dynamics appear in many socioeconomic and environmental contexts, which show strong reinforcement and hence “fat tailed” distributions. This in turn implies that catastrophic events with high impacts happen more often than common sense suggests [39].

3.8 Disruption and Disorder by Megaprojects

Some of these features are present in the case of megaprojects. Megaprojects can be characterized as complex systems (organizationally and scale-wise) embedded in complex urban, political and socio-economic systems. They are certainly path-dependent and open systems, where entropic risks (as in fat-tailed distributions) happen often, particularly when we look at one of their emergent properties: the disruptive and disorderly impacts (materialized risks) they have in urban areas.

The question of impacts can be approached from the notion of unintended consequences, a term popularized by Robert K. Merton, as we know, and crucial to understand impacts and consequences of human action. Consider, for example, that almost all environmental problems, from chemical pollution to global warming, are the unintended consequences of the application of modern technologies. Unintended consequences are outcomes of a purposeful action that are not planned, intended, or foreseen. They can be considered emergent properties in a system.

We could classify unintended consequences into three groups: unexpected benefits (serendipity or windfall), unexpected drawbacks (detrimental to desired effects) and perverse results (contrary to intentions). However, a more relevant classification for our purposes is the duality disruptive/disorderly complexity, which can be aligned with perverse results.

Megaproject complexity triggers a substantial degree of disruptive capacity in a variety of aspects and dimensions. Thus, urban megaprojects, regardless of context, constitute landscapes of disruption and have an intrinsic potential (often realized) to elicit substantial controversy and criticism that fundamentally questions the parameters of the projects as envisioned and publicly presented by their promoters.

By highlighting the disruptive character of megaprojects, we specifically claim that megaprojects are

disorderly and contentious enterprises.

“They are disorderly enterprises in that they substantially modify the physical appearance of cities and their urban fabric, often triggering socio-economic imbalances and realignments in urban power arrangements in growth machines and civil society. Megaprojects also require substantial financial investments which, in practice, may drain out local budgets and substantially alter the priorities of local governments” [40].

Because of both their disruptive and disorderly complexity, megaprojects are contentious enterprises. As a result, one often finds in many cities a widespread perception among urbanites that these structures are harmful to their cities.

“The complex make-up of stakeholders with conflicting interests in their planning, construction, management and governance often triggers major obstacles for megaproject implementation, the strategic misrepresentation of costs and benefits, optimism bias among planners and promoters about megaproject risks and benefits, and a myriad of negative socio-economic, spatial and environmental impacts” [40].

There is substantial evidence showing the above features of megaprojects. The causes vary from case to case: autocratic rule (e.g., Istanbul’s urban megaprojects), erosion of intent (e.g., Sydney’s Bangaroo) or misrepresentation of targets (e.g., Hong Kong’s West Kowloon). In all cases, however, disruption and disorder are perverse results of megaprojects, contrary to intent. Disruptive and disorderly complexity are emergent properties of megaprojects, manifested in their impacts.

A better management of megaprojects, based for example on avoiding human cognitive bias among planners, developers and managers (as proposed by project management authors) could improve megaproject performance. However, it is unlikely that such a strategy cancel the disruptive and disorderly impacts that emerge after megaproject implementation. It is reasonable that any application of optimal rationality models that disregards contextual conditions as well as potential ecological, socio-economic and equity impacts would not prevent a megaproject from negatively disrupting the affected communities in major ways, particularly when communities and citizens are excluded from key stakeholder deliberations in the planning process.

3.9 Resilience and Contestation Against Disruptive Megaprojects

A. Resilience

Given that, by and large, the benefits of megaprojects accrue to a small portion of the population in the urban areas where they are built, most resident need to come up with adaptation strategies as a consequence of the disruptions and disorder caused by large urban projects. These can be considered resilience strategies. According to Davis, to the extent that urban, social, economic and environmental ecologies are interconnected, both at the local level and through territories linking cities with regions, mega-regions and other (economic and governance) units, any resilience strategy must be based on an appreciation of the entire urban ecosystem and its properties as an integrated system in a larger ecology. And this appreciation must start from the consideration of the systemic risks that determine the adaptive processes of the ecosystems [19].

This would lead us to examine the interrelationships and compensatory mechanisms between forms and patterns of risk and resilience as we consider megaprojects embedded in urban systems: not only between different residents or locations in the same city, but also in terms of immediate versus long-term gains in liveability, so that adaptive strategies in some domains (e.g. environment) may actually reinforce structural problems that create risks in other domains (e.g. inequality).

Davis argues that one needs to take into account the interdependencies between elements of the system and disaggregate adaptation strategies in order to understand when adaptive responses to vulnerabilities or crises will establish a path towards a better future. Put another way, under what specific conditions will

adaptations, whether made voluntarily by citizens, imposed by government authorities, or crafted by planners and designers, decrease rather than increase vulnerability?

B. Contestation

Grassroots efforts in community revitalization can reshape the public processes and institutional framework involving the design and development of public space. This would need to include urban megaprojects in the planning phase. Hou & Rios suggest that the current participatory model involving professionals and users needs to be expanded to take into account three sets of factors [41]: (1) mobilization structure (people's engagement in collective action), (2) political opportunity (likelihood of access to power) and (3) cultural framing (shared meanings and definitions). Some researchers have argued that consensus building creates three types of shared capital among the participants: social, intellectual, and political [42]. Social capital facilitates discussions; intellectual capital enables the transformation of information into actions; political capital makes it possible to transform urban reality.

Successful grassroots-based political action can modify the intent and plans of urban growth machines. These routinely favor megaproject construction as an allegedly beneficial strategy for urban prosperity while megaprojects instead trigger processes of gentrification, displacement, exclusion, and expulsion [43]. Besides grassroots political action, growth machines need to be ideologically confronted in a forceful manner with notions of degrowth, based on ideas from ecological economics, political ecology, and environmental justice. By questioning development – and megaprojects as privileged particles in the development process – degrowth theories emphasize the need to reduce production and consumption globally. The intellectual predecessor of this movement is the “limits to growth” argument put forward in the 1970s by the Club of Rome, which questioned the possibility of unlimited or infinite growth in a planet of limited resources and a growing population.

3.10 Conclusion: Towards Sustainable Megaprojects

This paper has defined urban systems and megaprojects as complex adaptive innovation ecosystems, that is, networks of people in close proximity exchanging information and opinions, creating new knowledge and interacting, in actor-networks, with matter as well as other forms of human and non-human life. Megaprojects can be characterized as complex systems (organizationally and scale-wise) embedded in complex urban, political and socio-economic systems.

They are path-dependent and open systems, where entropic risks (as in fat tailed distributions) happen often, particularly when we look at one of their emergent properties: the disruptive and disorderly impacts (materialized risks) they have in urban areas. A characteristic of life (both human and non-human) in these complex systems is that it is driven by an anti-entropic effort facilitating its adaptation and survival. Such an anti-entropic effort can be viewed as resilience or systemic energy: the ability of any urban system to maintain continuity after shocks or catastrophes while contributing positively to adaptation and transformation. Urban resilience is tied to sustainability in that it is one of the forces working against the entropic risks caused by urban megaprojects.

Similarly, contesting urban megaprojects would work towards a sustainability goal by integrating communities into the megaprojects' planning process. Vojnovic (2014) argues that the three pillars of sustainable development, namely society, economy, and environment can be equally promoted through the concepts of inter-generational and intra-generational equity [44]. The first is concerned with maintaining the quality of natural ecological systems and their services over time, while the second is based on promoting the equitable access to resources within current generations, providing human populations with basic needs.

Human settlements can be defined as sustainable if they are planned and executed to take into account the capacity, suitability, resistance, diversity and balance of their surrounding ecosystem. We consider sustainability as an organic process that includes the environment, the economy and the community: form and efficiency – environmental factors in design, architecture, engineering and construction – as well as policies – urban plans and practices that explicitly aim to maintain and improve the economic well-being of citizens.

Even if environmentalism is receiving significant attention, also from the perspective of urbanism, it is just one of the components of any comprehensive strategy for sustainability. As an illustration of this argument, let us consider the fact that green and high tech capitalism claim to contribute to environmental sustainability, while neglecting sustainability's socio-economic dimension. In order to plan and build sustainable megaprojects we need a multidimensional systems approach, based on transdisciplinarity, and a new knowledge generation agenda vis-à-vis the urgency to understand the challenges and opportunities in a rapidly urbanizing world. This effort would need to factor in the idea that both "cities" and "nature" belong to the realm of organized complexity and thus the notion of an "urban ecology" would deal with the emergence and self-organizing power of complex adaptive systems. This, in turn, would entail developing a non-anthropocentric notion of sustainability, a task that goes beyond the objectives of this paper.

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CHAPTER 4

The Resilience of Researchers from the Perspective of Sustainability in Times of a Pandemic

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The purpose of the article is to understand the importance of resilient attitudes in the course of drafting, developing, and completing research projects related to academic processes of graduate students. Considering, however, that all humanity and all systems were affected by the Covid-19 pandemic, the role of science deserves to be highlighted, once it was daily required to seek solutions to face the virus, as well as to point towards ways of minimizing its effects. Thus, research centers were heavily demanded and had to put resilience into practice in the daily routine of research. Therefore, in the context of the transdisciplinary dynamics, research data were generated through a semi-structured interview, through which 7 (seven) student researchers, linked to two higher education institutions in the Federal District - Brasília, were interviewed. Accordingly, the objective was, through content analysis, to identify the actions students relied upon to remain resilient in their training processes, as well as the initiatives that revealed a component of resilience in research projects that could provide greater sustainability. Then, the analytical perception, through the research results, allowed us to perceive that “research” is one of the ways to make students feel like protagonists and create favorable conditions to move forward in terms of knowledge. The search for answers to research problems, by researchers, goes beyond their competences in the cognitive dimension, also involving the intuitive, emotional, and spiritual dimensions. Thus, academic contexts are favorable spaces for the development and practice of resilience. Therefore, mediators should be careful so they can face the setbacks arising from the research process together. On the other hand, research students managed to successfully complete their research journey and move forward in their knowledge construction processes, because they practiced resilience. This is because resilient people remain productive, even in the midst of vulnerable and uncertain contexts. And they can stay focused, carry out the activities that must be done, and know how to take advantage of the time and circumstances in favor of their goals. In this sense, it is perceived that resilient people always find possibilities, hitherto unimagined, to transform the emerging problem into an opportunity because they linked their personal project to an academic-social dimension, thus demarcating its concern for sustainability. Healthy resilient attitudes are necessary in order to achieve this as research projects are drafted, developed, and completed, a fact that became more evident because the researchers had a transdisciplinary perception of life and academic projects. Finally, the engagement with transdisciplinary projects whose references were existential plenitude and social sustainability strengthened resilience, put into practice as adaptation and growth, both internally (personally) and externally (socially).

Keywords: Resilience, training, research, sustainability.

4.1 Introduction

Humanity, in the context of this new millennium, is challenged to overcome a systemic crisis, considering that we are dealing with a multiple contexts of crises, that is, it is no longer a moral, economic, or political crisis but a set of trends that affect all social strata and all cultural manifestations. In this sense, in a global and longitudinal approach, this crisis affects everyone and everything.

Despite this more horizontal understanding, it is advisable to realize that crises are also manifested vertically, that is, they are specific expressions of a culture or peculiar samples of social order. Therefore, while the crisis assumes a planetary scope, affecting all civilizations, at the same time it is possible to infer that each culture or each social context reacts in a peculiar way.

However, beyond the more comprehensive or specific characteristics, it is clear that the civilizing process is at a crossroads, a fact that requires a deep discernment to effect a new horizon of human experience and environmental coexistence, focusing on the dynamics of existential improvement of social sustainability. Therefore, insofar as more significant dimensions are aimed, which overcome individual competition, material accumulation and ideological polarization, a more cooperative, participatory, and solidary humanitarian sense can be envisioned.

Based on the premise that almost all social segments and cultural manifestations are being affected by the crisis, education is also a victim of this procedure. Although educational entities were, for many centuries, protagonists of crises, in the sense of breaking established paradigms, they are now becoming hostage to the economic, social, and cultural crises. In other words, the educational area is being strongly affected by the diversity of crises and is at a crippling stage, because instead of being an educational leader, it has become, to a large extent, an instance commanded by the dominant systems of society.

It is in this social and educational context that the Covid-19 pandemic breaks out, strengthening, on the one hand, the structures, and dynamics of the systemic crisis and, on the other hand, presenting itself as an opportunity to rethink human relationships, social dynamics, and connections with the environment. In this sense, on the one hand, the civilizational crisis aggravates and, on the other hand, it reveals itself as an opportunity for the emergence of more sustainable humanity.

The scenario described above could be enriched with other arguments and other data, but to understand the underlying aspects of resilience, we must assume it is essentially linked to the reasons that foster the stage of civilizational crisis, mainly by questioning these principles and, at the same time, resisting the daily demands for their implementation. On the other hand, it is opportune to consider resilience as an opportunity to advance projects that are more sustainable, for the present and future of humanity.

Therefore, in order to exercise resilience, instead of reaction we propose a proactive action, in the sense of energizing the leading role of individuals, qualifying the processes of overcoming adversities, and indicating sustainable horizons, understood as transdisciplinary processes aimed at a project and a policy of well-being and living well. Assuming such an approach, we can agree with Lenoir [1], because their perception of resilience is mainly a process of resistance, adaptation, and growth, therefore passing through localized dynamics, resisting; mediating procedures in an adaptive way; and expanding horizons, growing aspects that demand the understanding of the human being, both in its uniqueness, coexistence, and sociability. In this perception, resilience is a transversal dimension that would be linked to the notion of sustainability, because according to Acselrad [2], "there is no sense in thinking separately about the technical relationships with the environment and the historical configuration of societies". Sustainable is the social forms of appropriation and use of the environment and not natural resources!". Therefore, resilience needs to be sustainable, as sustainability needs to be permeated by resilience, qualifying these concepts from a personal and social perspective. In the words of Pasquier and Nicolescu [3], "we have to focus simultaneously on scientific knowledge and humanities, and the key for this is 'consciousness'.

So as to build a sustainable educational process based on personal and social procedures, the Oikos (house) can be placed as a symbol of understanding, which integrates, among other manifestations, ecology, economy, and eco-path. Such a perspective could be anchored to the proposal of Moki and Lukyanova [4], when they indicate the transdisciplinary approach of systems, a methodology that enables a change that is configured, primarily, through the imperatives of sustainable development, involving the economy, ecology,

and social dynamics.

These dimensions indicate that education can no longer be guided solely by disciplinarity, but should incorporate the paradigm of complexity, a configuration which, according to Morin [5, 6, 7, 8], would be the result of great and profound transformations seen in many different areas, particularly in the epistemological, technological, and philosophical fields.

In order to understand this new worldview, we must understand that “the complex concept of the human genre is composed of the individual/society/species triad” and that such terms “are not only inseparable, but they are also co-producers of each other. Each term is both the means and the end of the other terms” Morin [5]. This understanding thus enables a holistic, systemic, transversal reading, or, according to the author, a “self-eco-organizational” approach, which combines subjectivity and sociability in the context of sustainability.

Under this argument, Síveres [9, 10, 11] proposes a transversal dynamic that integrates the natural (ecology), social (economy), and personal (ecopathy) houses, establishing a relationship of principles rather than objectives; of purposes rather than functionalities; of policies rather than plans. Thus, the objective of this approach is not to point out a list of suggestions to make the educational process viable, but to indicate a new system of values to provide an ethical option and a political decision that can contribute to sustainable education, for the present and the future of humanity.

The concept of sustainability follows, therefore, a trajectory that culminates in a vision that encompasses the human person as a whole, society in a systemic way and the planet in an ecological way. Education for sustainability, based on this three-dimensional relationship, has as a reference the environmental context, the social process and personal conscience. Capra[12], Pasquier and Nicolescu [3].

Pointing to this texture, the present study seeks to understand, in the academic processes of graduate students, the importance of resilient attitudes in the design, development and conclusion of research projects and the respective training of researchers, given that the training process of researchers in academic contexts is permeated by numerous adverse phenomena that must be understood in the context of the current crisis. Therefore, cognitive, emotional, and social dynamics need, in unfavorable situations, to be transformed into opportunities for personal and professional development, for a sustainable way of life, especially in academic contexts of human and social education.

4.2 Methodology

The comprehension of resilience as a resistance, adaptation, and growth processes, and sustainability as procedures of ecology, economy, and ecopathy; aspects that are interconnected by the social and personal dimension; allowed the attainment of this study, thus, the exploratory research by the qualitative approach was chosen. The corpus of this research is made up of graduate students in master’s and doctoral programs, at the end of 2021 and the beginning of the semester of 2022. Seven students were interviewed, five of which from public institutions and two from private- community institutions and they are identified by the letter “R”, standing for the researcher.

Four of the students that participated in the research were one of the author’s advisees. And the others were guests. All of them were from, one public and one private institution. Both follow ethical criteria in the research field. All the students are from the educational field and were at the final stage of their research.

The instrument used in this research was an online interview (electronic survey) with five closed questions related to profile characterization and six open questions for students/researchers to reflect and elaborate on. This instrument was created using Google Forms by the authors themselves. And the structure in form of tables has the following sections: Sociodemographic data related to the profile of interviewees; Routine of the research process in the pandemic; Difficulties designing and producing research; Social dynamics of researchers: emotional, intellectual, and social aspects most affected; and Resilient attitude.

Data diagnosis was based on content analysis, as proposed by Bardin [13], and below are the tables with the data produced, the analyzes and interpretations, the results, and discussions, as well as some conclusions, although provisional, on the resilience of researchers in times of pandemic from the perspective

of sustainability

4.3 Results and Discussions

The analyzed data collected through interviews indicate that, given the contemporary social context, marked by multiple crises, has affected different spaces of social life, leading humanity to a process of constant challenges in the face of uncertain moments and unprecedented contexts. At the same time, from within the tangle of crisis our world is facing elements emerged, often minimized, such as resilience, which concerns the ability of human beings to reorganize themselves in adverse situations, through adaptation, for new growth.

Resilience is, therefore, a phenomenon that allows the subjects of an experience to expand their perception and vision of reality and everyday life, considering multiple possibilities of reading the world and adverse processes in times of crisis. In this context, the setbacks experienced by students/researchers during the production of their research, in a pandemic situation caused by Covid-19, are the object of this study.

This pandemic context gave rise to a focus on planetary consciousness and collective life, as individualism would need to give way to collective existentialism. That is, despite the emerging problems, it was possible to conceive new learnings, confront uncertainties Morin [5, 6], and brave uncharted and hostile waves. A new unknown world emerged, prompting humanity to learn to relearn from the new, the emergent and the unexpected, diverting intentions, without a defined or familiar course, being completely at the mercy of what was to come. In the perspective of complexity, humanity is experiencing, according to the author, an “ecology of action”. Any action may trigger other uncertain actions, it escapes the intentions of the person who initiated it, going ways that may be even contrary to the initial intention, with unpredictable consequences.

Therefore, when pointing in this direction and in order to know how research students resisted the pandemic crisis, in the beginning of the second decade of the 21st century, from a sustainability perspective, with resilient attitudes, we initially present the sociodemographic data related to the students/researchers participating in the research and, subsequently, the data produced from the routine established by them, especially regarding the difficulties encountered in the development and completion of their research, describing the aspects (emotional, intellectual, social) affected, as well as the initiatives to overcome the adverse situations through resilient attitudes.

4.3.1 Sociodemographic Data

Sociodemographic data reveals that all participants are research students from private community institutions (57.14% - 04) and public institutions (42.85% - 03). Among the participants, 57.1% are female (04) and 42.8% are male (03). They are in the age group between 31 and 40 years (28.5% - 02), 41 to 50 years (28.5% - 02) and 51+ years (42.8% - 03). As for ethnicity, 05 (71.4%) declared to be brown and 02 (28.5%), white. All 7 (seven) students/researchers interviewed, even in times of pandemic crisis, managed to complete their master's or doctoral degree, as shown in Table 1.

Table 1 shows that the demand for education at the master's and doctoral level is among experienced people who are at a certain level of maturity in relation to life and knowledge. In this sense, it is possible to infer that they are people who have already gone through different experiences, both in their personal and professional lives, with regard to training processes and who, possibly, seek educational institutions to remain in a constant process of knowledge acquisition and learning by means of research.

4.3.2 Context of the Daily Routine of Students/Researchers

Regarding the daily routine of students/researchers in the face of a pandemic context, Table 2 shows that resilient people remain productive, even in the midst of vulnerable, uncertain, and crisis environmental contexts. They are able to stay focused, carry out the activities that must be done, with commitment, and produce effectively. In addition, they know how to make good use of time and circumstances to meet their goals.

Table 1: Identification.

<i>Students/Researchers Gender</i>	Male - 03	42.8%
	Female - 04	57.1%
<i>Age</i>	31 to 40 years - 02	28.5%
	41 to 50 years - 02	28.5%
	51+ - 03	42.8%
<i>Ethnicity</i>	White - 02	28.5%
	Brown - 05	71.4%
<i>Academic Degree</i>	Master's Degree - 03	42.8%
	PhD - 04	57.1%
<i>Institution</i>	Private - 04	57.14%
	Public - 03	42.85%

Table 2: Daily routine in the face of the pandemic reality.

<i>Researchers</i>	<i>Answers</i>
R1	I think the pandemic helped a lot, because I was able to dedicate more time to my studies.
R2	In addition to reading several articles, dissertations, theses, and books for my theoretical framework and bibliographic references, I'd often contact my training professors by phone for a more effective and methodological understanding of the project.
R3	Every day was a new expectation as the greater good of "life" was threatened, but the search for achieving a goal kept me focused on work, a lot of reading, and production flowed well in spite of the vulnerability imposed by the pandemic on everyone.
R4	In addition to remote classes, some reading and daily studies , with reduced time due to the complexity of the routine of working from home.
R5	I was involved in research all day.
R6	I continued my studies after changing the objectives and focus of my research.
R7	I established a daily routine that included at least 5 hours a day for the development of my doctoral research.

Resilient people, as shown in Table 2, take advantage of conflicting situations and transform apparently unfavorable circumstances into favorable contexts. They know how to take advantage of a crisis, transforming it in an opportune time; in this case, their time was adjusted to reconcile research with other activities of daily life. However, with the pandemic and being forced to stay at home to maintain the required social distance, these students/researchers were able to organize it better to accommodate the planned academic activities and produce, dedicating more time to their studies (R1, R4, R6), establishing a routine (R7), getting involved with research all day (R5), and reading (R2, R3, R4).

It is worth emphasizing that in the research production process knowledge construction involves the participation of the advisor and the protagonism of the advisee (research student), each exercising their role without dissociating one from the other, even if through restricted autonomy. Araújo [14, 15]. However,

Table 3: Actions undertaken to maintain a minimally sociable life.

Researchers	Social dynamics
R1	<i>I did not maintain social relationships during the critical periods of the pandemic, as recommended by the WHO.</i>
R2	<i>I used some technological tools and, of course, some phone conversations.</i>
R3	<i>My haven was God, being with my family and, even in insecurity, being supportive of those who suffered from the loss of their loved ones. The commitment to the development of my dissertation took up my entire time and this kept me from having exaggerated fears.</i>
R4	<i>Online contact with family and friends. After some time and with a lot of care, I started meeting with a friend family in our homes or on a farm, to socialize and leave the house. Attention to food, consuming foods from agroecology, as well as attention to physical and mental health.</i>
R5	<i>Physical activity and online conversation with friends and family.</i>
R6	<i>I kept in touch via WhatsApp messages, phone calls and video calls via WhatsApp and Google Meet.</i>
R7	<i>My social dynamic was characterized by restricted social contact. My wife and I decided that our contact would be restricted to our children and a few people outside the family circle, in terms of physical contact. On the other hand, I took advantage of technology to keep in touch with friends, co-workers, and other family members.</i>

despite the unfavorable circumstances caused by the Covid-19 crisis, which prevented students from meeting their supervisors in person, they were still able to take advantage of the available time, dedicating themselves to the studies that should be carried out (R1, R5, R6, R7), as well as reading (R2, R3 and R4), for knowledge acquisition and successful completion of their master's and doctoral degree.

4.3.3 Sociable Actions

In relation to sociable actions to maintain a minimally sociable life, the responses show, on the one hand, a setback in the constructive process of knowledge through relationships with physical presence, where exchanges of knowledge occur in the relationship with each other through face-to-face dialogue. On the other hand, technologies were the support instruments that helped to maintain the bond, albeit virtually, and subjective exchanges of knowledge took place through telephone, WhatsApp, and Google Meet. Thus, through the support of these technological instruments, sociable processes were gradually resumed through telephone conversations and technological tools. In this sense, technology was the bridge that allowed the continuity of dialogues, virtually, for the continuous exchange of knowledge between students/researchers and their families, friends, work colleagues and academic supervisors (R2, R3, R4, R5, R6 and R7). And there were also those who (R 1), in compliance with the social distancing protocols during the critical periods of the pandemic, chose not to maintain any type of relationship, even by technological means. In other words, they completely isolated themselves from social life, as we can see in Table 3.

Social interaction is proper to human beings. Even in situations of non-sociability, the human species finds other technical and cultural ways to establish contact with the other, to communicate, relate, and coexist minimally, even without the physical presence of the other, using the cultural and technological advances of the time.

Table 4: Situations that hindered knowledge construction and performance of activities to complete the research.

<i>Researchers</i>	<i>Difficulties</i>
<i>R1</i>	The greatest difficulty is the fact that private higher education institutions are uncooperative and refuse to participate as the object of studies, also denying access to relevant data for educational research.
<i>R2</i>	Surely the impossibility of face-to-face meetings .
<i>R3</i>	The greatest difficulty was carrying out field research, the time was not conducive to physical contact . Those who were willing to be interviewed were insecure because of the tragedies seen on the news every morning. Fear was our constant companion, but with perseverance we managed to have in-person or virtual meetings. Throughout this stage, listening was a key factor. The professors interviewed were overcome with anxiety, so they wanted to take their time, to vent out before addressing the proposed subject.
<i>R4</i>	Increased volume of work because of the remote work dynamics; mental health affected by the pandemic context; and need for family time because of the challenges of the pandemic.
<i>R5</i>	Anxiety and insecurity for knowing that we were all at risk and I was working on a research project.
<i>R6</i>	UCB does not have a line of research or professors with a degree in my area of interest . To corroborate my study, I sought help from researchers in the area and participated in events and online courses.
<i>R7</i>	Difficulties: interpretation of texts in philosophy and the field of research . Another difficulty was related to access to publications that could provide counterarguments to those in the field of education. To mitigate these difficulties, I sought help from work colleagues and watched several videos on the internet. For the development of my research, I read several scientific publications (articles, dissertations, and theses).

4.3.4 Personal Awareness - Difficulties Faced in Completing the Research

As for the situations that hindered the construction of knowledge and the activities that the researchers performed to complete their research, Table 4 shows that lack of cooperation (R1), lack of face-to-face contact (R2, R3), increased volume of work (R4), anxiety and insecurity (R5), lack of professors with training in the student's field of interest (R6), and interpretation of texts in philosophy and the area of research (R7) were described as elements that hindered the constructive process of the research. That is, the process of knowledge acquisition and knowledge production occurs by building relationships with each other. Culture is only possible if there is contact and dialogue, and if the other is willing to interact; learning takes place in the relationship with one another, through intersubjective exchanges. Thus, there is knowledge only if there are exchanges, relationships, and interlocutions, because learning is a deeply human activity, according to Vigotski [16, 17]. This finding is related to the evolution of the species, as it is an essentially

social and cultural process, promoting the most different forms of development by the interdependence between the individual who learns and the surrounding reality.

4.3.5 Emotional, Intellectual and Social Aspects Affected

The emotional, intellectual, and social aspects of resilient people who are in conflict situations, because they know themselves, are able to find the best solutions without allowing themselves to be strongly affected. Resilient people seek to maintain emotional balance, even when facing tragic situations — such as the loss of family members or friends —, personal conflicts and despair, or difficulty in concentrating or organizing and harmonizing their time to study and research. Because they know themselves, they can come up with ways to focus inwards and find balance, by seeking support from family, friends (R2), using trust and self-awareness techniques, and adopting strategies to maintain emotional control (R3, R7), believing in better days and taking care of their physical, mental and social health (R4, R5, R6), and entertaining themselves with series, movies and reading material not related to research (R5). Table 5 shows some of the paths found by students/researchers to overcome the pandemic crisis during the research process.

Table 5: Emotional, intellectual and social aspects affected and initiatives to overcome them.

<i>Researchers</i>	Emotional, intellectual and social aspects
<i>R1</i>	Once the object of my research was defined, I had no difficulty conducting my study.
<i>R2</i>	I've lost family members and friends to heart attack, stroke and COVID-19. At times I felt like giving up, but I managed to overcome it with the help of family, mutual friends and colleagues who gave me encouragement and advice on how to develop my project, so that I could persist. That is what helped me be resilient and finish my dissertation.
<i>R3</i>	My sensitivity has stirred some personal conflicts , at times feelings of despair , but I tried to use trust and self-awareness techniques to find emotional self-control , as an incentive for a perspective of better days.
<i>R4</i>	Difficulty concentrating, organizing and harmonizing time for study and research. Consistent exchanges limited to known researchers. Initiatives focused on personal, family and community organization to improve integral health.
<i>R5</i>	Physical distancing from my peers, uncertainty. I exercised daily, watched series and movies, and read texts not related to my research.
<i>R6</i>	Although I adhered to total self-isolation, I didn't feel bad about not seeing people. I kept my regular routine of healthy eating, exercising and studying. I was more concerned with controlling pre-existing diseases to avoid having to leave the house and run the risk of being contaminated.
<i>R7</i>	Regarding the emotional aspects, because of the uncertainty we met at the beginning of the pandemic, I feared I would not be able to finish my research. I was afraid of losing family and friends and at times I couldn't gather the discipline and focus required to do scientific research. Therefore, one of the decisions I made was to no longer access news about the number of people infected with Covid-19. Regarding the social aspects, I made plenty of use of technology, trying, minimally, to maintain emotional balance.

Throughout the research process in academic contexts, researchers go through several adverse situations such as, according to Table 6: changing the object of research initially planned (R1), the physical absence of the advisor (R1, R2), loss of friends and family members (R3), difficulties in finding research participants (R4), conflicts with the advisor (R5), and receiving unexpected news regarding the health of family members (R6 and R7). However, despite these unfavorable circumstances, life goes on and resilient people survive and remain focused on their goals, even in the face of various conflicting situations. They know how to deal with the avalanche of problems, without being overwhelmed, giving up, or being affected emotionally, intellectually, and socially. It is in life, in the complexity of life, that everyday uncertainties are faced, through resilient attitudes.

Table 6: Adverse situation in the process of development and conclusion of research and overcoming attitude.

Researchers	Adverse situation
R1	At the beginning of my research, which coincided with the beginning of the pandemic, I had to change my research object , because the initial object required access to face-to-face courses for assessment. As all courses migrated to distance learning, it was not possible. But once I defined a new object, everything went well.
R2	Many. One of them was the physical absence of my advisor , but we managed to have a quality advising session by videoconference. It helped a lot that we had a set time only to start, not to finish. So all my questions were solved!
R3	Yes, losing friends and relatives . I experienced grief and tried to focus on my objectives to finish my research, as well as give support to the professionals who contributed to my work and were facing the same challenges of survival by listening.
R4	A certain difficulty in having student participation (high school students from private denominational schools) in questionnaires. We decided to reduce the number of students and work with the answers we already had, without further requests for responses
R5	Yes! Conflict with my advisor . I sought support from colleagues.
R6	My father's stroke . I took 50 days off to take care of him and then resumed my research as usual, because he moved in with someone else.
R7	I remember two specific moments. One was learning that my brother was in hospital in a serious condition and that he had been with my mother before he knew he was infected. The other is when I heard of the death of someone I knew.

4.3.6 Resilience and Resilient Attitudes by Students/Researchers

Regarding the concept of resilience, research students were asked if they considered themselves resilient, and in what situations, in the process of developing and completing the research, they demonstrated resilient attitudes. Of the 7 respondents, only 1 of them (R7) said to have difficulties overcoming adverse life experiences. He was emphatic in saying that he does not consider himself resilient enough to help someone who needs to be resilient, as we can see in Table 7.

Resilient people find innovative circumstances to do something differently, to go through adversity, overcome it and move on. They are not afraid of new situations, even when they get into states of intense tiredness and depression. Faced with the unknown, the unusual, and the unexpected, resilient attitudes are activated to help them solve the problem and get out of that conflicting and embarrassing situation, victorious

for having achieved their objective. Proof of this can be seen in the account of Researcher 2, where even when her body showed signs of extreme tiredness and depression, she says:

Then I thought: Now it's time to pick myself up and start over to meet the deadline. So, I improved my self-esteem, focused on my work, and managed to deliver it in time, even if unsure of the result... I believed and it worked! (Table 7 – R2).

Table 7: Academic resilience and resilient attitudes.

	Resilience and resilient attitudes
R1	Yes, as stated in the previous answer, the need to change my object of research because of the pandemic could have been a definitive breaking point and prevented me from completing my degree, but I quickly sought alternatives and defined solutions to solve the problem and carry on with the project.
R2	Yes. With the loss of loved ones and friends, I fell into depression and my performance dropped as the deadline neared due to the overwhelming fatigue I felt. Then I thought: Now it's time to pick myself up and start over to meet the deadline. So, I improved my self-esteem , focused on my work, and managed to deliver it in time, even if unsure of the result... I believed and it worked!
R3	Yes, even in adversity I managed to face the challenges of field research, act on the advice I was offered, and meet my research objectives.
R4	Yes, by understanding that hope remained a daily companion, even in such an intense, delicate, and dismal time. Hope that my study could contribute to human existence, starting with my own, with an educational practice that could contribute to the transformation of people and collaborate with new social constructions
R5	Yes! I spent two years ignoring that I was a victim of harassment and managed to write a dissertation.
R6	Yes, because I had to change my research object due to travel restrictions, I had family problems because of my father's health, and I have several chronic illnesses. Even so, I finished my four-year doctorate on time, submitted 39 articles to scientific journals, attended events, wrote book chapters, and also organized 4 books that were published.
R7	I have trouble overcoming adverse experiences. I don't see myself as resilient enough to help someone who needs to be resilient.

Resilient people, even in the face of tense and stressful situations, are able to think and choose not to give up and persist, pursuing the proposed objectives, in the certainty of achieving the purpose. Thus, people considered resilient do not back down when faced with a new and emerging problem. On the contrary, they face it, resist, persist, do not get afraid, and manage to find solutions amidst the tangle of uncertainties and different bifurcation points, and muster the strength to overcome them.

It is a characteristic of resilient people to find, in the midst of the fabric of problems, innovative solutions to problems that arise. They are creative and, based on their experiences and knowledge, they transform the unusual, the problem into an opportunity to transcend, moving from an apparently hopeless situation to another, even if it is not the best answer, or even the most efficient solution, as researcher 2 says: "I managed to deliver my work in time, even if unsure of the result". Therefore, giving up is not part of a resilient person's repertoire.

In addition to resilient people, Lenoir [1] suggests resilient processes based on a three-dimensional logic, consisting of resistance, adaptation, and growth. To configure this procedure, the author suggests evoking memories of a love experience, and the willingness to acquire resilience. And in the dynamics of acquiring resilience, one should learn to adapt to the permanent and unpredictable movement of life, cultivate pleasure and positive emotions, strengthen bonds and relationships, and develop the ability to give meaning to life.

4.4 Discussion

The analyzed data, under different perceptions, can be discussed under many approaches, but considering the study subject, connected to the resilience concept, both had this focus. This is because “resilience” is a term borrowed from engineering and physics and refers to the ability of a physical body to withstand pressure and return to its original state unaltered. Although, in contexts of social life, the concept of resilience is translated as the ability of an individual to deal with adverse situations, overcoming pressures, obstacles, and problems, reacting positively without feeling discouraged or overpowered by the psychological or emotional conflict. Sabbag [18, 19].

According to Polletti [20], the term is used and defined as the ability to “resist shocks”. However, studies indicate that the concept of resilience goes beyond this ability to overcome problems. It is composed of two dimensions: the ability to protect one’s integrity under heavy pressure and one’s ability to live with dignity, resolve problems and conflicting situations, despite adverse circumstances.

In the humanities area, according to Sampaio [21] this concept was reinterpreted to mean:

the ability that an individual has, when going through a certain painful situation, either in a group or individually, to manage to come out well. In this case, they would not return to their previous state but improve. Resilient people can overcome these difficulties without despairing or losing their minds. They can think even under enormous pressure and find solutions to their difficulties.

This is shown in Table 7 above, when our researchers/students report several obstacles they had to face, such as the need to change the research object due to the beginning of the pandemic (R1, R6), loss of loved ones and friends, states of depression, tiredness (R2), finding hope in times of intense human suffering (R4), harassment (R5), family problems and chronic diseases (R6). In other words, resilient people, as described by Sampaio [21], manage to overcome heavy situations, though they may leave marks in their lives, such as the death of loved ones, friends, psychological pressures, and political or professional persecution. These people, despite the pressures, go on with their lives, and their projects, independently and often in a positive way. Such disposition is manifested by creativity, intelligence, perseverance, and compassion, as they can anticipate and deal with the emergence of these elements, in the tangle of the process of knowledge construction in chaotic contexts, also present in academic life.

This manifested energy is the result of a resilient attitude that can be translated as self-awareness, based on the knowledge that their life project under construction and development can contribute to the good of humanity. This is overtly expressed by R4 (Table 7) in an account that is imbued with a hope that her research could contribute to human existence, starting with hers, fostering, above all, new social constructions.

In the case of educational contexts and specifically with regard to the training of researchers, through the development of research projects under an advisor, for the production of master’s and doctoral dissertations on specific topics, it is important to consider resilient attitudes throughout the process of designing, developing, and delivering research projects. It is through actions and reactions that resilient individuals will emerge, resist and adapt to circumstances, in accordance with the *zeitgeist* (spirit of the time). This adaptation is what Freire [22, 23, 24] describes as one’s ability to withstand adversity, without losing emotional, intellectual, and social balance, constantly adapting and rebalancing

The training process of researchers in academic contexts is permeated by numerous adverse phenomena which must be understood so that, in the face of crisis contexts, as experienced by these researchers interviewed here, they do not give up, but persist, pursuing their goals, so that the cognitive, emotional, and

social dynamics in unfavorable situations can be transformed into opportunities for the development, both personal and professional, of students/researchers.

Some important elements were also considered in the resilience process of the responding students/researchers (Table 7), which, in a way, favored their evolutionary continuity processes, both cognitively and socially. Among them we can mention finding solutions (R1), self-esteem and faith (R2), facing challenges (R3), overcoming (R4), hope (R5 and R6), and self-awareness (R7).

In this sense, the University, as a space for research and knowledge production, must be a sustainable place where students feel comfortable creating, producing, be themselves, under the attentive and careful eye of an advisor. As students get involved in the research process and feel secure in the academic supervising process when they are faced with difficult, uncertain, and conflicting situations, they will be able to count on the support and find, even in chaotic situations, the necessary conditions to overcome the “important problem” Morin [25], Mariotti [26], that is, the unexpected elements that may emerge in their research path, without giving up or feeling insecure, thus managing to overcome them with autonomy and confidence, as they feel supported in their constructive processes of knowledge through research, exercising resilient attitudes and living the training process as proposed of Aguilar [27] in a more sustainable academic perspective and self-transformation of the researcher subject.

Research is one of the ways for students to feel protagonists and to create favorable conditions for advancement in terms of knowledge, in addition to favoring growth, both personally and professionally. However, despite always being a path full of surprises and unexpected processes that fork all the time, it must be permeated by pleasure and love, constituted by an energy and life field.

In the construction of this vibrational environment of education and training of researchers, from a sustainable perspective where they can exercise academic resilience, the development of a sensitive look on the part of advisors is extremely important. So that, by placing themselves in a position of attentiveness, they can perceive the difficulties of students during the process of production and development of research. This sensitive and attentive posture allows the advisor to organize actions (strategies) that can show students/researchers ways not to interrupt their knowledge construction processes, helping them, above all, to build their own knowledge in a meaningful way, encouraging them to move forward and meet their research objectives to successfully complete their training journey, in a healthy and sustainable way.

Finally, the training of researchers, from a sustainability perspective, is a process that implies the creation of learning circumstances that enable meaningful experiences so that learning can happen, based on the effective actions of learners, who must be seen as the central agent of the entire process, focusing on reconstructive learning, with possibilities to exercise resilient attitudes in the course of design, development, and conclusion of research projects. Learning, in the sense of acquiring and making the content taught on one's own, is the process by which behavior is originated or modified, by which the knowable object is assimilated and given meaning, whether provisionally or not, according to Mallart [28]. That is, learning that takes place through the relationship between subject and object, through constant interactions, under the mediation of advisors who sometimes distance themselves, sometimes approach, with awareness of their role and the role of their advisees, would be a possibility to experience resilience in the educational environment.

In this process of knowledge construction, through research, which involves the triad advisor – knowable object (research project) – advisee, the advisor acts as a mediator of processes, the one capable of approximating students to their object of desire, for the development of an intellectual, emotional, and spiritual formation of the learner, in dialogue with the advisees' life experiences. This evolutionary process can help students/researchers to reach other levels of knowledge in their journey, and, above all, gain the transcendental experience of knowledge beyond reason, as suggested by D'ambrosio [29], Nicolescu [30, 31], and Moraes [32].

Thus, since the research process reintroduces the knowing subject (student/researcher), through their leading role, to their own process of knowledge construction, the lost link between the subject and life itself is established, bringing them closer together and reintegrating them through a “complex thought” Morin [25], where the subject assumes themselves as author and builder of their own story, as well as collective stories, through learning and through a commitment that involves all human wholeness, enacted by the inner strength that inhabits each being, through their own forms of knowledge about knowledge itself.

In other words, the set of resources or forces inside a person is what Steve and Sybil Wolin apud Polletti, R. & Dobbs [20] describe as resilience. They argue that resilient people have the necessary skills to cope with the most tragic and difficult situations. They leave scars without any doubt; however, these marks will always remind them of their struggles and victories, because of an important element in the whole process of resilience: self-knowledge. Knowledge of oneself.

According to Leal [33],

It is believed that the search for self-knowledge and the strengthening of human values, as a basis for the development of inner strength, can enable man to overcome the difficulties that life presents. This strength, resilience, brings in its essence, among other things, harmony between reason and emotion, and introspection.

Thus, the search for answers to research problems, by researchers, goes beyond their competencies in the cognitive dimension; it includes other dimensions such as intuitive, emotional, and spiritual, which require, above all, other dimensions in relation to knowledge. When the student/researcher sees himself in the face of the problem to be investigated and at the same time being affected by it, he will be able to find, in the order applied, the favorable conditions that will help him out of a situation, getting him to ascend to other levels of perception and knowledge of reality. In this sense, as argued by Sampaio [21], “resilient people seek in self-knowledge the necessary balance to transform negative emotions into positive ones”.

Finally, all of us humans, at some point in our lives, have felt pressured by problems to be solved and unveiled, as well as motivated by the possibility of overcoming, making us transcend, reinvigorating our being and driving us to a new place in terms of perception and understanding of reality. And, according to Boff [34], the feeling of self-esteem and the ability to overcome difficulties, almost insurmountable, are inherent to the human condition. We can consider this type of behavior as a constant exercise of resilience

4.5 Closing Remarks

Considering the process discussed, it is possible to conclude that the training process of researchers in academic contexts is permeated by numerous adverse phenomena that must be understood in the context of the current crisis. And the cognitive, emotional, and social dynamics need, in unfavorable situations, to be transformed into opportunities for personal and professional development. In this sense, academic contexts are favorable spaces for the development and exercise of resilience. Therefore, it requires support, care, and mediating processes so that research subjects can face the adversities arising from the research process and, thus, overcome emerging and unexpected crises, advancing in their constructive processes of knowledge. Considering that the research process is a journey full of “surprises” and, in the words of Morin [25], full of “important problems”, uncertainties, the researcher must make decisions to overcome them.

And what researcher, faced with so many paths, has not felt pressured, and even, in the face of so much information, has not felt undecided about the best path to be taken at the moment when the problem, in the research process, is established and with very few resources and time to think, decide and make choices? However, resilient people, or rather resilient students/researchers, in the midst of academic pressures, are able to think and make decisions without losing control of the conflicting situation. And, above all, they manage to find answers to emerging problems while maintaining their own integrity.

In the context of the complexity of reality, it is relevant to emphasize that we are all resilient because in some aspects of life we all use resilient attitudes. However, not all of us exercise the attitude of resilience on a daily basis, because being resilient requires wisdom to transform any problem of daily life into a solution, being able to turn the complex and emerging problem into an opportunity to transcend, going beyond.

Thus, in academic spaces, a place for research and also for the exercise of resilience, it is essential that this driving force be awakened in students, which is characteristic of every human being, as well as academic resilience, pertinent to the academic social context, seeking to understand the emerging and circumstantial problems in that context, so that, when faced with problems that arise in the academic context and that will certainly arise, students do not paralyze, but face and overcome them. Since being resilient is to pursue,

insist, and not give up when encountering the many forks on our roads, resilient people always find ways, often unsuspected, to move forward, transforming the emerging problem into an opportunity for personal and professional advancement. Resilient people, therefore, are very intuitive and trust their intuition. That is why they do not give up because they believe that for every problem there is always a solution, even if it is not apparent and immediate.

Resilient people rely on other forms of knowledge, in addition to reason, because they are also driven by emotional and spiritual forces that strengthen them. Therefore, they are always ready to solve unexpected, unusual, and emerging problems, not giving up, but resisting.

The objective of this research, therefore, was to identify the actions taken by students to carry on with their training processes that revealed a component of resilience, as well as sustainability indicators that the research projects could provide to humanity. Our studies allow us to draw the following conclusions.

All students/researchers, even when faced with unsuspected difficulties, managed to successfully complete their research path and advance in their knowledge construction processes, completing and obtaining the much-desired masters and doctoral degrees.

Resilient people remain productive, even in the midst of vulnerable and uncertain contexts. They are able to stay focused, carry out the activities that must be done, with commitment, and produce fluently, forgetting about the outside world and its inherent problems. They know how to take advantage of time and circumstances to meet their goals, even in vulnerable times and uncertain contexts.

Resilient people do not allow themselves to be overwhelmed by external stressors, especially in the context of the pandemic, and find ways out of emerging problems.

Students part of a research project that dedicates themselves to the respective orientation tends to develop processes of resilience lined in life projects that contribute to sustainability, on the personal or social dimensions.

Students excited with their research projects, making use of resilience, can finish their academic path in a healthier and balanced way.

The training of researchers through scientific rigor, openness and dialogue, the constitutive triad of the transdisciplinary methodology, can contribute to the strengthening of more resilient and sustainable attitudes.

Therefore, the space of institutional research potentiates the processes of knowledge building. It's the place to be welcome and to meet people. Place favorable for researchers, in dialog with their advisors, put in practice the academic resilience, with sustainability, aspiring to grow the knowledge of the local community through access and spread of the social-historical culture of humanity.

So, is it possible to say that every researcher is a resilient being? This question remains as a suggestion for further research.

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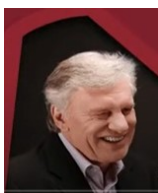
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CHAPTER 5

Collective Consumption and Food System Complexity: Citizen Mobilization, Territorial Rescaling, and Transformative Change

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Focusing on consumption as key to managing complex food system dynamics has drawn controversy from scholars and activists who argue that a focus on consumption obfuscates the social and ecological consequences of the larger transnational food system. We argue that these concerns, while holding merit, are grounded in assumptions about food systems that fail to grasp the importance of agency as much as structure. Starting from an appreciation for the transdisciplinary fusion of knowledge and concepts across governance, political economy, and urban complexity, we utilize the concept of “collective consumption” as a way to rethink how a consumption politics can help transform the larger system through collaborative governance at the local or regional scale. We take Food Policy Councils (FPCs) in the United States as our subject to explore how experimental governance arrangements can reshape the way political organization around food consumption can drive longer term transformation. Our paper proceeds in four parts. First, we dive into Castells’ use of collective consumption as it relates to urban politics, which includes a close assessment of how both “consumption” and “collectivity” are relevant to urban food systems governance. Second, we offer a view of how collective consumption can be utilized to promote a justice-based perspective in urban food governance, which promotes socio-natural transformation of the current agro-industrial food system. Third, we develop a framework for imagining the possibilities of FPCs as part of new collaborative state-society relationships, offering a distinct reterritorialization of urban food politics tied to a socio-natural politics of urban metabolism. Finally, we conclude by offering comments on future challenges and opportunities in realizing the radical governance potential of FPCs.

Keywords: Sustainability governance; collective consumption; urban metabolism; food justice; Food Policy Councils.

5.1 Introduction

Policymakers and environmental activists who focus on consumption as key to coordinating complex food systems are drawing controversy these days, particularly when they come head-to-head with scholars and activists working in the fields of political ecology and/or organizing around a ‘just transition.’ [1–5] Academics working in these traditions increasingly argue that using consumption practices to build more sustainable

and equitable food politics can obfuscate the food system's globally relevant and ecologically disastrous consequences, including its many social inequities and ecological externalities.[6] They further argue that even if food consumption is framed through an understanding of global capitalism, and even when unequal impacts in distribution and pricing are taken into account, other factors such as class and race will mediate food supply and affordability in ways that provide food security unevenly, and often at the expense of justice for food production workers. In this scenario, enhancing food security for some will not produce food justice for all. For these reasons, changes in food consumption patterns tend to be conceived of as mere tinkering that will do nothing to challenge larger food systems dynamics. This partly explains why scholars concerned with the just transition of food systems have turned their attention to production more than consumption. And in this regard, the study of food systems parallels the research undertaken by political ecologists who prioritize the study of complex system dynamics – related in large part to capitalism – at the global or territorial scale rather than grassroots activism at the local or urban scale.

This is not to say that all scholars interested in making food systems more sustainable ignore consumption-driven strategies. In the US, adherents to the Alternative Food Movement (AFM) and other highly visible food advocates, like Michael Pollan, have argued that individual consumption decisions are a means through which food systems can be altered.[9] Yet such approaches to food security also hold the potential to leave others in the food system more vulnerable, even as they can extend ecological devastation, primarily because they appeal to privileged consumers with flexible buying power and ignore the lack of options for low-income households. [7, 8] As such, despite being embraced across farmer's markets and among plant-based health food activists in the Global North, Pollan's "vote with your fork" adage has generated a fair amount of criticism, precisely because it tends to generate activism that is both racially and economically exclusive.[1] Likewise, even the more radical urban food movements that openly argue for a justice-based politics of individual food consumption – and who in the US use activist agendas to reveal and reverse histories of racial and socioeconomic oppression – have been critiqued for the detachment of urban food issues from production dynamics, including labor exploitation of farm workers as well as ecological resource depletion associated with certain types of agriculture. Some have gone so far as to argue that focusing on consumption, even if framed within a food justice perspective, will only produce workarounds to the agro-industrial system at best, and may even extend that abusive system at worst. As Herman et al argue, the "industrialization and institutionalization of food has acted to fetishize our relations with it, meaning that food justice movements, at least in the US, tend to focus on local and urban issues of consumption and distribution . . . rather than overtly confronting the political economies of food production." [9]

5.2 Production vs. Consumption in the Study of Food Systems

We do not necessarily disagree with these criticisms. We also are fully cognizant of the ways that global corporate hegemony in food production and the political power of the agro-industrial sector make it difficult to advance more equitable patterns of food distribution, even in the face of concerted struggles to guarantee food security in an increasingly precarious environmental context. Even so, we want to argue that linking food production and distribution to food consumption through collective mobilization may offer ways to create locally operational and vibrant food governance systems that hold the potential to reconfigure the territoriality of supply chains, advance food justice, and may even achieve larger sustainability aims – despite the fact that moving the needle on all these challenges has remained elusive in most global food activism.

In making this argument, we build on insights drawn from the literature on urban metabolism, which offer the conceptual foundation for understanding how food systems operate "organically," that is, through networked connections and processes of production and consumption that can be either destabilized or stabilized through social and ecological disruption or constructive action. Broto et al's survey of interdisciplinary approaches to urban metabolism highlights that, across many different disciplines, this concept has "inspired new ways of thinking about how cities can be made sustainable and has raised criticisms about specific social and economic arrangements in which some forms of flow, or of 'being in flow,' are prioritized and/or

marginalized within the city.” [10] Our particular usage of urban metabolism relates not only to material and energy flows, but more broadly situates food production, distribution, and consumption as embedded within particular socioecological relationships related to urbanization. While this is not itself a novel concept [11], our aim to apply a transdisciplinary lens that brings together a political economy, governance, and complexity framework is novel. The approach moves beyond a scientifically descriptive notion of urban metabolism to inspire interventions promoting more just transitions in the urban metabolism of food.

In re-imagining how to disrupt supply-chain and ownership dynamics in complex food systems, we argue that a focus on collective and not individual consumption is critical. This is so not just because individual decisions about what food to consume will never transform a tightly structured system in ways that collective action might. This also owes to the fact that mobilization around collective consumption concerns has long been considered a key element in the production of socially just governance arrangements [12], with the argument being that issues categorized under the ‘collective consumption’ rubric – such as housing and transport – require some sort of state oversight, whether through direct provision or via planning regulation. Although scholars have suggested that commodities like food are not considered collective consumption goods because they are purchased and consumed individually in ways that transportation for example is not, the reality is that since these arguments were originally developed in the 1970s and 1980s, many services that in the past were considered collective consumption goods, like housing, have now been privatized, owing in no small part to the global embrace of neo-liberalization.[13] More significantly, some authors are now arguing that in the contemporary moment of growing ecological crisis, commodities like food are in fact worthy subjects for designation as collective consumption goods.[14] What is not up for debate, however, is that food politics is on the contemporary political agenda both for citizens and for governing authorities. Taking the growing interest in and struggles over food as our starting point, we ask whether it is possible to bring citizens and authorities together in the production and coordination of a complex network of food production, distribution, and consumption that responds to local food priorities rather than corporate food logics.

In considering the extent to which organized collective action and/or new governance arrangements hold the potential to challenge the larger political economic dynamics of food production in ways that address food inequities and help produce a more just ecological transition we have a secondary aim: to focus on the scalar conditions that are necessary for the realization of these aims. Specifically, we ask whether and how citizens might collectively mobilize on their own or with authorities at the urban scale, and under what conditions or with what collective consumption mandates will they also engage citizens, authorities, or food producers organized in other locations and territories, ranging from urban periphery to the regional and beyond. In this regard, we build on the widely recognized opportunities and urgency for cross-mobilization of rural food movements, such as Food Sovereignty in the Global South, with those of urban food justice in the Global North.[2, 3, 5] Thinking about food consumption patterns as embedded in scales of production and distribution that may operate within but also extend beyond the locality may also lead us to consider the problematic of scale in both food activism and food governance. Our larger aim is to determine which scale(s) of action around food consumption will be most likely to produce a food system that is both equitable and sustainable, and which narratives, operational dynamics, or supply-chain logistics must be transformed in order to link local food activism to a more globally organized challenge to the contemporary food system.

By using the notion of collective consumption in the framing of these originating questions we both return to age-old debates about the role of the urban in social movement activism associated with the seminal work of Manuel Castells, yet also move beyond them. Decades ago, Castells proposed the concept of collective consumption to highlight the unique role of the urban within the broader political-economic system of capitalism, seeking to prioritize the city as a space of collective claim-making for social justice. While his original formulation was critiqued for its narrow focus on the territory of the city, which subsequent scholars argued was ill-defined if not ideological, his original intent was to introduce the possibility that capitalist dynamics could also be challenged by a focus on consumption matters and not solely production relations. He thus argued that basic elements of reproduction – ranging from housing to transport and other services that attend to human needs – were equally critical to the advancement of equity and justice. Since originally making these claims a much broader definition of the “urban” has both materialized and has also been tied

to a politics of collective consumption, and it is this understanding that we use in this paper.[15] Given that the urban remains a unique space for social action[16] as well as the fact that the increasingly globalized networks of food production have not prevented citizens from suffering through local food scarcities or making local claims about food consumption and food justice in their everyday lives, it would be an oversight to disregard the opportunity to determine whether a localized, urban politics of food can indeed contribute to wider transformation.

The threat of climate change and the growing possibility of armed conflict emanating from ecologically driven food insecurity both underscore the urgency and the immense challenges ahead in forwarding a just transformation of the international food system, which billions of people, spread across localities far and wide, depend upon for their basic needs. The social and ecological complexity that underlies these challenges require nothing less than the type of bold fusion of disciplinary knowledge that transdisciplinarity offers.[17] As we and others see it, transdisciplinarity involves the “loosening of theoretical models and the development of a new conceptual synthesis of common terms, measures, and methods that produce new theories and models.”[18] It is characterized by a search for a unity of knowledge beyond disciplines.[19] Our intent in engaging a transdisciplinary approach is to imagine new theories and models with which unjust metabolic relations of food systems driven by contemporary urbanization might be transformed.

While processes of urbanization may extend far from the city and link sites of production to those of consumption,[20] some scholars have argued that consumption built around profit-making motives tends to drive these expansive material networks. In this paper we consider whether a consumption-production nexus built around food must necessarily reproduce such dynamics, as opposed to lay a pathway for transformation, particularly when social movement activism at the scale of the city aims to recalibrate these territorially extensive food system networks. For example, regionalizing food systems in the service of linking cities to their hinterlands represents an increasingly popular proposal to offer food system resilience and equity. Such attempts both derive from and reinforce a new territoriality of governance that incorporates but also extends beyond the urban in ways not initially addressed by Castells. And even though such innovations embrace a new territoriality of extended urbanization, it is also true that their underlying logic remains consistent with Castells’ claims that social mobilization around collective consumption – in this case around food – remains key to both social justice and government accountability. This is not to say that unpredictable ecological conditions, socio-economic challenges at the urban and regional scale, and the relentless efforts of capitalist producers to protect their food operations will not be barriers to extended territorial mobilization efforts, particularly in regional contexts where either political alliance building or food growing capacity are limited by climate change, land ownership patterns, or fragmented political authority. Still, we start from the premise that across all locales, bottom-up governance innovation may still be marshalled by citizens and authorities alike to advance a more sustainable and equitable food system. Building on the recent growth of food justice movements in the US in particular, we suggest that collective mobilization around urban food holds the potential to strengthen the radical nature of urban food justice by tying food consumption to production and distribution in a collective project with global implications.

5.3 The Case of Food Policy Councils

Building on this ambition, and wary of the many critiques given to consumption politics in the food justice scholarship, in what follows we examine the conditions under which organized collective action structured around food consumption may enable potentially transformative changes to the politics, practices, and territorial operation of complex food systems – changes that may also challenge existent political, economic, and ecological aspects of the wider agro-industrial food system. We take Food Policy Councils (FPCs) as our key subject of study. FPCs are an increasingly popular form of ‘innovative’ governance that, by virtue of their bottom-up dynamics and commitment to collective action, may offer a potential venue to more radically transform food systems. Today, FPCs are the most popular typology of collaborative governance in the US. Between 2000 and 2011, the number of FPCs in the US expanded from 50 to over 150.[21] By the end of 2017, 341 FPCs were either active, in development, or in transition in the US and Canada,

and there was at least one FPC in all but three states in the US (Arkansas, South Dakota, Wyoming).[22] While the make-up, strategies, geographical territory, and degree of institutionalization within existing local and regional governments is diverse, FPCs share a broad objective to bring food systems planning to the local or regional level by assembling collective insights that incorporate place-based experiences of food. FPCs are interesting because their particular activities or priorities are not in any way defined; all that is shared amongst councils is a commitment to experimentation in addressing systemic food inequalities at a local or regional scale. In addition to paralleling the embrace of experimentation as the cornerstone of knowledge and/or problem-solving in the science and engineering professions, actions of FPCs mark a significant territorial departure from the food policy dynamics set by the US's federal history – themselves regime-specific conditions which have also been instrumental in shaping the international food regime.[23] In the face of the contemporary transnational regime's racist, class exclusive, and ecologically destructive nature, the notion that local or regional actors could co-produce governance arrangements intended to make food systems more equitable, by *planning* and territorially reconfiguring the food system, is a relatively new idea on the systems complexity literature.

The emergence of food justice movements as form of grassroots mobilization spanning across the neighborhood, city, and regional level has helped lend FPCs legitimacy as a new governance form. While some Councils adopt existing borders of municipal jurisdictions as their site of governance, many scale-up or articulate their action at to the regional level, incorporating semi-urban and rural land of the immediate hinterland. Nearly all Councils assemble a group of stakeholders across government, the private sector, and civil society. There are wide disparities in the degree to which FPCs institutionalized within municipal or regional governments. In many (though not all) cases, FPCs adopt a food justice framework, which discursively reimagines cultural, economic, and ecological relationships with food. Typically, this involves both policy work and program development to foster “new relationships and interconnections between food system initiatives at municipal and state/provincial, regional, and tribal/First Nations levels.”[24] Some of the more popular goals of FPCs include the alternative procurement of food (such as local food sourcing), new agricultural initiatives (such as regional land preservation and urban agriculture), and improving access to healthy foods.[21]

We understand it as pivotal that FPCs continue to build on food justice values. As a case of collaborative governance, however, it is important that a clear distinction is drawn between food justice as a form of grassroots mobilization and FPCs as a form of local governance innovation. This separation is something Castells' formulation of the distinct relationship between urban movements and the state offers in clear theoretical terms. As of yet, FPCs are primarily a form of governance experimentation, and some seem more successful and/or radical than others. None, we acknowledge, have effected what we might consider to be radical system transformation and it would be naïve to assume they have the organizational power to do so alone. FPCs will not be the panacea to agro-industrial, system-based oppression and hunger. That does not mean they do not present one interesting collaborative pathway that, through a politics of collective consumption, can harness urban politics in interesting ways, and potentially effect some material change in the urban metabolism of food.

We have chosen food systems as our focus not only because of this recent governance experimentation, but also because it offers an urban subject with an overtly ecological foundation. While this is true of all urbanization processes involving any process of material transformation, the undeniableity of this fact across disciplines is one important reason it has been widely approached in urban complexity and ecological sciences, as we explore. Yet these scientific paradigms, even when drawn on in a policy context, consistently lack a political economy dimension and avoid engaging with justice-based discourses that acknowledge socio-natural and trans-scalar inequalities produced by the current global food system. This is where we believe a collective consumption perspective offers a more radical approach.

Our paper proceeds in four parts. First, we dive into Castells' use of collective consumption as it relates to urban politics, which includes a close assessment of how both “consumption” and “collectivity” are relevant to urban food systems governance. Second, we offer a view of how collective consumption can be utilized to promote a justice-based perspective in urban food governance, which promotes socio-natural transformation of the current agro-industrial food system. Third, we develop a framework for imagining the possibilities of

FPCs as part of new collaborative state-society relationships, offering a distinct reterritorialization of urban food politics tied to a socio-natural politics of urban metabolism. Finally, we conclude by offering comments on future challenges and opportunities in realizing the radical governance potential of FPCs.

5.4 Collective Consumption Meets Urban Food Politics: Theoretical legacies

With the intent of focusing on an urban political economy of nature-based systems, we first turn to the foundational work of Castells.[25] Castells first proposed the concept of collective consumption to highlight the unique role of the urban as a space of consumption within the broader political-economic system. Cities were territories of consumption because of their concentration of urban populations and were therefore organized spatially such that consumption was a key political concern and source of mobilization.

In earlier accounts, Castells argued that urban collective goods were provided by the state for the purpose of labor reproduction, with the aim of maintaining and stabilizing capitalist class relations. Yet as Saunders describes, Castells later moved away from this functionalist approach, putting greater emphasis on class struggle and urban social movements as the causes of state intervention, by virtue of the urban policy claims being made on the state by citizens.[15] Urban social movements came to be understood as specific articulations of collective concerns towards satisfying everyday needs in the city. Though the state was never neutral and was always in some way tied to the interest of dominant classes, the provision of collective consumption was nevertheless a more direct response to the actions of collective movements, giving more agency to political mobilization.

Since its first foray in the literature, collective consumption has been adapted, critiqued, and reformulated both by Castells and others. The core of the concept we find fruitful, however, is the political opportunities to problematize consumption as a collective concern, which finds its expression in the relationship between urban movements and new objects of urban governance. In specifying our interest more precisely as it relates to food systems and FPCs, we address the concept via its two key elements: a) thinking about food consumption and its relationship to production as territorial political practices and b) conceptualizing the collective struggle over food networks as a potentially radical and just endeavor, particularly in the context of climate change and other global challenges to capitalist logics of food production.

5.4.1 Consumption

The focus on the consumption-end of food policy is a relatively new concern as a matter of policy, as well as a controversial one. Food has a long history of federal and international intervention by the US government. Massive industrial-developmental programs promoted by American imperialist policies quickly transformed the global food system during the Cold War period.[26] Within national borders, US federal agricultural policy has focused on subsidizing food production for national consumption and exportation, underselling local farmers in developing regions has devastated many rural areas, in combination with American-led restructuring policies that led to large-scale land seizures and the industrialization of food production. Until the policy discourse of food security later became popular, state intervention in food systems was focused on the production and was definitively rural.

The explicit emphasis by Castells on consumption as an organizing principle of urban politics thus offers a clear alternative. Although food systems would not, in his original formulation, be considered a problem of collective consumption because Castells primarily focused on spatialized goods that had particular relevance within the territorial bounds of the city: public transportation, housing, and the like. In addition, these were considered socially produced goods and were understood to have little relationship to natural systems. State involvement in food systems, moreover, did not typically focus on consumption but rather on production. With governments involved in promoting agricultural production through supportive policies and subsidization, the distribution of food was left to marketized practices, and consumption was considered an individual

matter built on cultural and income preferences in ways that housing or transport were not.¹

The fact many of these same urban goods would be privatized under neoliberalism or delivered via private-public partnership suggests there is no longer any obvious reason why areas like housing and transport should be considered collective while others, like food systems, should not. Rather than assuming, then, that collective consumption no longer has self-evident relevance to the urban sphere, we argue instead that many contemporary concerns over food supply in fact parallel original preoccupations with housing and transit activities, including their relationship to sustainability and the unequal distribution of access to food via race or class-based biases. Instead of confining collective concerns as those related explicitly to the local state, we argue collective consumption in fact has greater relevance in scholarship than formerly defined.

Saunders' assessment of Castells' urban question and the role of collective consumption focuses on two critiques: the notion that this definition makes the city irrelevant to political-economic processes other than consumption, and the implication that the "non-city" becomes irrelevant to consumption politics. The first of these critiques he saw as dubious. Castells never assumed that only consumption was important to the urban, but rather that collective consumption is a uniquely urban process, despite the presence of many other important processes including those related to production.[15] Saunders is more convinced of the second. He argues that Castells' particular spatial focus meant he addressed only specific in-kind, collective goods in his study of collective consumption, infrastructures that rely on a certain population density and thus are logically found within cities. This unnecessarily limits the definition of what urban consumption politics might entail. For Saunders, collective consumption can be easily expanded to include that which is aspatial (provisions in cash, rather than in-kind form) or else organized at a spatial scale beyond the city.[15] These critiques, however, are precisely what informs our desire to re-introduce the concept of collective consumption into the study of food networks and food supply. Not only do many provisions of support in the case of food systems take on cash form, but the spatial organization of food can also occur at a range of scales and rarely matches the territory of the city.

Approaching food through a politics of urban consumption does not, importantly, imply a disarticulation with production. Again, the focus on consumption as severed from production was a critique levelled at Castell's original work, one that did not accurately represent his intentions. Castells understood the relationship of the urban as a space of consumption but still tied this to the political-economic system at large: his argument was that production did not necessarily have primacy over consumption. We suggest, similarly, there is still political opportunity in reshaping the larger system via a more explicit politicization of consumption. In fact, the creation of a just food system requires that a politics of consumption remain tied to a politics of production, but that there remains opportunity for a collective politics focused on the consumption end driven by a new urban politics.

The existing policy paradigm of food security offers an example of why a politics of consumption cannot be isolated entirely from production in promoting transition towards a more just and sustainable food system. Food security first emerged in the early 1980s, with this nomenclature bringing the issue of food to the consumption end of the supply chain through urban-specific policies and planning strategies. Food security advocates continue to emphasize access to reliable, high-quality and affordable food sources. Yet these urban solutions have typically involved corporate supermarket expansions, often facilitated via municipal land incentives.[27] Rapid expansion of food retailers has come at a cost, not only to producers but in placing vulnerable, low-wage employment in many poor urban neighborhoods as well with the support of governmental incentives. Extending the contemporary agro-industrial food regime also goes hand-in-hand with continued ecological destruction.

In underemphasizing historical and cultural relationships to food, policy framings like food security are imagined as one-size-fits-all.[28] The paradigm assumes that food possesses a flat, undifferentiated meaning

¹Much of Castells' work on the topic of collective consumption has already been critically interrogated within the period of neoliberal transformation of the state and globalization. The focus on the city as a distinct territorial organization of consumption suggested urban politics was merely reactive to global economic relations, and the dissolution of the Fordist state beginning in the 1980s put into question many elements of Castells' argument as it related to the state's role. Many goods and services formerly provided by the state have now been privatized or are delivered via public-private partnerships.

to individuals, and ignores historical trauma of racism and oppression relating to food inequality that extends across the system. As a top-down approach organized at the urban level but bolstering the global food system, food security policies often seek small regulatory interventions or corporate interventions with food distribution as its focus.[29] In prioritizing distribution equity and the crisis of food deserts disarticulated from their capitalist context, food security policies often help extend the existing agro-industrial food models. While food security planning, then, might offer rapid solutions, as a policy paradigm it can also contribute to “depoliticizing the socio-environmental configurations and associated governance structures that create poverty and inequality in the first place.”[30] In contrast, the potential of FPCs rests in their capacities to promote new forms of politicization within the urban realm. Compared to the neighborhood-specific and top-down focus of food security, FPCs offer the opportunity to realize more flexible practices of territorial organization. At their most innovative and radical, they link an urban politics of consumption with food production justice by promoting a collective approach.

5.4.2 Collective

What Castells meant by the use of collective is not only a topic of debate, but also clearly evolved through the course of his own work. Again, Saunders highlights that early definitions by Castells saw this type of consumption determined by the scale of its organization and management. He later referred to it more specifically as related to the state. This latter understanding has posed obvious challenges to scholars since the late 20th century who have observed the privatization of many former state-managed goods and services. Thus, an understanding of what made consumption collective wavered for Castells: was it collective because it was “communal” (and thus could be still be delivered by the private sector) or because it was “socialized” (state-provided, but not necessarily consumed collectively)?

But the binary itself in understanding the privatization of state goods and services is also too simplistic: privatization has been “rolled out” on the back of state financial incentives and in-kind support.[31] Nevertheless, a focus on communal rather than simply socialized presents an interesting opportunity to rethink the collaborative governance of food systems.

This is not an argument against the state’s important role in organizing more just food systems. Rather, it suggests a nuanced approach to how communities, alongside state institutions, can collaboratively organize the scale and politics of food system interventions more effectively and justly—a more realistic, if not optimistic, account of the contemporary governance context.

The related though distinct idea of collaborative consumption has already been adopted in food studies.[32–34] Present across a range of disciplines, collaborative consumption has adopted a wide spectrum of definitions. For instance, it is often used to describe the so-called “sharing economy” in which businesses either facilitate sharing to consumers that can access a good or service through renting or borrowing (eg. Zipcar) or a third party facilitates sharing between individual consumers for a fee or for free (eg. Uber).[35] But collaborative consumption has also been used to describe community and peer-to-peer sharing without the involvement of a third party, oftentimes non-monetized.[36] Grassroots action in the production of collaborative consumption networks and a transition to more sustainable consumption practices is an important focus of this literature.[37, 38]

Collaborative consumption in food networks offers many helpful insights. Not least is the focus that has been given to the importance of building “active trust” in the success of the New Food Economy or Civic Food Networks.[33] This type of trust is distinct from the “system trust” that has traditionally undergirded the development of global agro-food networks, and which has broken down significantly in the new risk society and under contemporary climate change politics.[39] Yet this collaborative focus can also be limiting in its typically community-centred approach that can divert focus on the continued participation of the state in securing food justice, as well as the support of the private sector, in what might be called the collaborative governance of food networks.

While a sole focus on the state is clearly limiting, expanding the notion of collective consumption to embrace a wider panoply of actors is important in extending its contemporary relevance. This also means embracing an understanding of grassroots action as the potential cause of state support, and not simply

assuming that the state acts to extend and stabilize existing capitalist relations. A politics of consumption can be more than just the satisfying of need, but the creation of new needs through radical innovation in local politics and alternative management systems.[15]

5.5 Collective Consumption in Nature-Based Systems: Towards a Justice-based Perspective

The above discusses the potential in organizing a consumption politics of food systems that, while specifically promoting new collaborative governance experiments through innovations like FPCs, at the same time embraces the notion of collectivity in producing more just food systems. Food systems are only one of many nature-based systems that have become popular topics of analysis in urban studies. These systems are frequently engaged through new frameworks that focus on socio-natural complexity. This turn towards socio-natural complexity cannot be abandoned in shaping the new collective consumption politics, but it should still be foregrounded as part of a shift towards more sustainable consumption. Yet from a governance perspective, existing sustainability and complexity management frameworks that have been drawn from scientific origins present obvious shortcomings.

Recent policy attention to the Food-Energy-Water nexus is one example. The FEW nexus emphasizes the inextricable natural linkages that exist between these three domains such that cross-sectoral coordination is understood to be most effective, if not necessary. Although the FEW nexus is a primarily scientific management framework, the idea of the “urban” in this framework is also becoming a critical conceptual and action space. The FEW nexus is being used as a powerful metaphor to conceive of the interdependencies on which urban life depends.[40] As trends in urbanization have increased, integrated approaches are said to offer new management frameworks to address complex inter-sectoral relationships.[41] As a policy frame, the FEW nexus aims to produce transformative knowledge of complex and interdependent systems that drive urbanization, viewing integrated management as the “panacea to problems of availability, access, and provision of essential human resources.”[42]

The FEW nexus is closely related to more mainstream resiliency frameworks associated with urbanized nature-based systems, particularly in the context of climate change. Like the FEW nexus, the concept of resiliency has a precise scientific definition, yet its use in policy contexts has been far more imprecise. It has often been likened to the concept of policy metaphor or way of thinking that can guide and organize thought in ways that promote new approaches to sectoral interdependency through experimentation, discovery, and innovation.[43, 44] Thus beginning as a descriptive term in the natural sciences to describe a systems’ inherent capacity for self-transformation,[45] it has become a normative concept in the policy world that focuses on shifting thinking towards flexibility and adaptability.

Yet in adopting scientific concepts such as the FEW nexus and resiliency as policy frames, a distinct political economy dimension is likely to be abandoned. While premised on the idea of interconnected and inter-scalar system complexity, both the FEW nexus and resiliency approaches can overlook, in practice, how resources intrinsic to urbanization connect issues of the city with socio-ecological conflicts in other places. As Newell et al argue, in the urban FEW literature one of the clearest gaps is the “lack of sufficient focus on issues of institutional structure, governance, equity, resource access and behavior.”[46] Despite its progressive insights, the nexus approach can promote the reproduction of the status-quo, often adopting neoliberal management models as the means of dealing with complexity. Given the rapidly shifting context of climate change, building resiliency of food systems is a highly logical priority from a scientific perspective.[47–50] For policymakers, resiliency can act as a helpful heuristic to shape responses to socio-natural risk and climate-related challenges.[51] But as a scientific metaphor, the adoption of resiliency frequently avoids a clear position on the power relations that shape resource networks. This can paradoxically empty the local level of agency despite typically reverting to localist analyses of environmental risk.[52, 53]

In mainstream discussion, the politics of sustainable consumption is, comparatively, wholly individualized, and exists on the far end of the management spectrum from a complexity perspective. Many of the mainstream AFMs in the US focusing on eating locally or “voting with your fork”[54] and offer a vision

of local and sustainable consumption that is itself considered a form of political action amongst typically wealthy consumers.[1] Systems are thought to be made more sustainable through more conscientious individual consumption. The rise of farmers markets across cities in the US is perhaps the most obvious example, where purchasing decisions are understood to effect a shift towards more just food systems through market exchange alone. While the food justice movement often also adopts and organizes at the local scale, the development of similar activities like farmers markets or urban agriculture within these movements are not themselves understood as a social project: rather, a social project is constructed in tying sustainable agriculture and consumption with justice frameworks, including racial, cultural, and socio-economic identity formations.[55]

The goal should be towards building innovative governance structures that can respond to these challenges with the explicit vision of constructing more just food networks. We offer collective consumption in this effort. But there is still a need to move beyond collective consumption understood only as a socially produced good, to explore how it is also constituted by expansive socio-natural networks that exceed the territory of the city and the lexicon of social goods. For this, we believe concepts like urban metabolism can be valuable frameworks to promote a more expansive view of urban processes that are tied to a consumption politics across a range of socio-natural scales and material transformations. Amongst a host of disciplines,[10] urban metabolism has become a core critical concept in the Urban Political Ecology (UPE) literature. This particular approach foregrounds the political economy of resource flows, and addresses power relations implicated in the production of specific metabolisms that has direct relevance to imagining more just food planning. In UPE, the domain of food[28] has accompanied other resource flows like water[56, 57] as quintessential subjects of research. This framework highlights that urban ecological processes extend beyond the jurisdictional territories of cities. Focusing on rescaling the governance of natural systems can itself offer an avenue of political action, and opportunities for more democratic governance of food systems.[58]

Food justice, as already stated, is not only an urban (consumption) issue. Rural peasant movements across the Global South have demonstrated how a politics of food production can also form the basis for radical mobilization against the agro-industrial system.[6] But while arguing that production and consumption are intrinsically networked together, we also see a potential for a politics to emerge from efforts to shape new norms of sustainable consumption—from a collective rather than individual perspective. How can place-based approaches to food consumption create new socio-ecological needs around which the food system might be transformed? How can a reterritorialization of food system governance via new collaborative institutions respond?

5.6 Food Policy Councils and the Reterritorialization of Food Governance

In this section, we explore more closely the opportunities of FPCs as a project of reterritorializing the collaborative governance of food systems in productive and potentially radical ways. We find FPCs interesting as a subject because of their unusual success (at least in terms of their growth in number) within local and regional settings in the US and Canada as a form of collaborative governance. Perhaps this success speaks to the fact both the ecological and political complexity of food as a policy matter is already widely recognized, particularly under the mounting stress of climate change—as is the inadequacy of current governance structures to manage that complexity.

A new governance context since the 1990s has shaped governmental efforts to enroll civil society in its own self-management, part of “good governance” reforms. This transition has been tied to the neoliberalization of Fordist state arrangements, and critiqued for the burdening of civil society with responsibilities formerly assumed by the state.[59] While FPCs is situated as part of this history, we argue they offer potentially more radical routes. Taking seriously the idea of collaborative governance means viewing this civil society–state relationship in different terms. New collaborative governance arrangements like FPCs offer a unique conduit through which state power might become a resource for communities, rather than the other way around.

This section focuses on three important dimensions of how collective consumption can be made relevant to the ecological and political complexity of food systems governance by focusing on FPCs. First, we highlight more specifically the way through which FPCs are designed to facilitate collaborative approaches to food management. While there is wide variance in the design of Councils, and thus a wide disparity in the degree to which Councils actually deliver on radical aims, still we see an important normative project in the development of Councils themselves as opportunity for constructive state–civil society engagement based on food justice values. Second, we discuss challenges related to the territorialization of food system governance and speculate on how the more flexible territorial organization of Councils, which are not bound by existing jurisdictional borders, can similarly be seen as an opportunity for governance innovation responding to nature-based systems. Finally, and closely related, we highlight what it means to contend with the urban politics of food systems through a socio-natural approach to collective consumption.

To what degree movements like food justice can or should become institutionalized as part of more radical transformation aims is a key question that shapes both the opportunities and limitations of collaborative governance. While the discursive identification of racism and oppression in food systems is regularly invoked in FPC frameworks, for instance, typically this translation to policy addressing structural causes of food-related disparity, or even discussions about institutional racism and anti-poverty work, is rare. As Horst’s study of the Puget Sound Regional Food Policy Council and the City of Seattle Food Policy Council highlights, there is clearly a desire to redirect from emergency responses to forward-looking strategies that engage with the complexity of the injustice produced through food systems by adopting a food justice framework. Yet given the limitations of realizing some of these aims within such a semi-institutionalized setting, there is clearly good reason to maintain some degree of separation between food justice as an urban movement and FPCs as a collaborative governance arrangement, particularly because there is a risk of movement appropriation and de-radicalization.

As the location of one of the most “radical” FPCs, the City of Oakland has drawn from its deep history in food justice organization.[55, 60–63] This food activism dates back to the community work of the Black Panthers, whose community-based context enabled food to emerge as a “salient and necessary tool for the movement-building capacity.”[64] The Oakland Food Policy Council (OFPC) was founded in 2008, following a report commissioned by the Mayor’s Office of Sustainability that recommended the creation of an FPC to review the food system.[65] The unanimous passing of funding for the FPC by City Council underscored the deep impression food justice organizers had made on local officials.[66] The OFPC centers its approach on racial equity, drawing from local movement frameworks. At its creation, the radical organization Food First, already located in Oakland, was chosen as the OFPC’s incubator, setting early agendas, securing funding and putting other basic systems in place.[67] Members included underserved community residents, food sector professionals, elected officials, and city staff. The case of Oakland highlights both the opportunities and risks of alliances between radical urban movements and innovative governance institutions like FPCs. Some local activists remained opposed to integrating their work with government because “they view the task of nourishing their communities as being inextricably tied to a project of decolonization.”[66]

Of course, there are also obvious challenges in translating food justice ideas to policy work at this scale. Since the 1990s, participatory planning and policymaking has become popular in local level governance, with the promise of democratic expansion. Participatory planning is already well established within FPC strategies.[68] Yet there is a tradition in scholarship recognizing the many obstacles to true participation, particularly in the limiting way participation is designed into such platforms.[69] In the case of FPCs, Horst’s study suggests that many resulting strategies exemplify technical, top-down visions of planning more aligned with the food security paradigm, despite association with food justice values. The same study also revealed that not only is diverse representation within councils themselves a thorny issues in many cases, members still often do not engage deeply in anti-racism and anti-oppression when it comes to food. While some Councils, such as the OFPC, are certainly more radical than others, in general many policy and planning solutions have been limiting, and many strategies promote workarounds to a dysfunctional, unequal, and racist agro-industrial regime, rather than situating their work as a direct challenge to that regime.

Despite these limitations, we remain optimistic that FPCs might act as new collaborative governance venue that can begin to shape a new politics of food consumption as it engages with urban food movements.

Far from promoting a solely localist perspective, we acknowledge that the success of these arrangements relies on the political and legal context within which they are situated, including at the state, federal, and international level. However, this does not also mean political power cannot be territorialized in strategic ways that take advantage of the local and regional level as well.

The relationship of FPCs to the larger national and international food regime is of course critical. Given their diversity, FPCs have been territorialized at a range of scales, from the sub-municipal to regional level. The latter has the advantage of defining a new governance territory which might incorporate both consumption and production by incorporating semi-urban and rural hinterland as part of a coordinated localization of the food system. Still, given the size of many population centers, urban consumption requirements are unlikely to be fully addressed at the regional scale and will realistically involve much more expansive material food networks to match levels of production with these requirements. While coordinating a localization of production and consumption at the regional level can certainly be one contribution of FPCs that could help buffer food supply crises brought on by climate change, for instance, the contribution of FPCs might be more importantly their production of new territories through which urban food consumption politics becomes territorialized. The regional scale of many FPCs can thus act as both an ecological opportunity to support localizing the food system, but also offers distinct political opportunities that may be at least equal, if not more, important.

With regards to localization, the domain of urban agriculture has also become a popular area among FPCs, reflecting the broader transition in planning and governance that has focused on reforming zoning laws that traditionally restrict such activities. Heynen et al emphasize that urban agriculture can be a radical, local agenda that responds to the “loss of producer and consumer agency in the food system . . . with a focus on developing ‘alternative’ markets.”[28] Urban agriculture is attractive as part of the FPC agenda because it presents a local and alternative means of growing food at a localized scale, and thus represents a more straight-forward action agenda than challenging agro-industrial food networks. The OFPC’s ongoing collaboration with City Council to reform zoning laws for urban agriculture has been particularly successful, involving a long process of working with City staff, the local planning office, and community engagement groups to support local farming.[70]

The association of alternative food growers in low-income and racialized communities with food justice values certainly resonates with the choice of FPCs to focus on legalizing urban agriculture through zoning amendments. Yet not only do ecological limitations in local food production capacity limit the expansion of local and regional farming. The challenges in competing on the market with agro-industrial products that benefit from land and labor exploitation also limit the expansion of locally produced food. Relying on market mechanisms to solve food poverty is a central failure of how the provision of food systems in modern society as a necessary and collective good is treated.[71] Despite urban agriculture’s political branding, the use of market mechanisms to coordinate this localized food network mean that “even the projects that explicitly articulate a politics of food justice find the confines of neoliberalization hard to escape.”[72]

What we mean to emphasize is not that FPCs cannot or should not provide a venue for experiments related to the localization and regionalization of food networks, with opportunities for local food systems to operate as critical stopgaps in moments of system stress. Rather, the argument is there is a distinct political opportunity beyond thinking of the FPC as merely a means of coordinating food systems at this scale. This is why we offer a focus on collective consumption, as an expansive and ecologically founded concept, and a critical entry point where power and resources (ecological but also political and economic) can be organized. As an urban issue, we focus on the politics of consumption as one with the potential to drive more sustainable and just food resource networks.

But this cannot occur without critically engaging the socio-ecological complexity of these networks. Scientific frameworks like the FEW Nexus and resiliency contribute to this common-sense view, which we agree with in many ways. But a more intentional political ecology of food is needed as well.

Moragues-Faus and Marsden, for instance, argue a political ecology approach to food would foreground how interconnected ecologies are connected to issues of social power across scales.[30] Work on urban metabolism similarly sheds light on the production of racial and class inequality through processes of material transformation. The focus should be on how “these metabolisms create socio-ecological conditions that are

beneficial to some and detrimental to others,” highlighting the social inequalities and ecological destruction produced by the food system across scales of analysis.[30] Grounding a politics of food consumption in an urban metabolism perspective engages with the need to build more sustainable food systems but also avoids a focus on individual consumption as a political act.

By comparison, food justice takes a community rather than individual perspective in promoting sustainability. Similarly, we see FPCs as opportunities to organize sustainable transitions on the consumption end through a collective approach. In both cases, a perspective that foregrounds how inequality and racism are upheld through social and ecological practices is paramount. This means a focus on consumption should be simultaneously focused on defetishizing the food system in ways that confront political economies of the system at large.[9] Collective consumption adopted as a new political framework of food systems, then, would problematize the status of food as commodity, bringing it within a collective politics that foregrounds its socio-natural complexity and a matter of new political, economic, and ecological needs that exceed its status as a simple biological necessity.

5.7 Consumption Politics beyond the Local

We conclude this paper by commenting on where future challenges and opportunities lie in realizing the radical socio-ecological governance potential of FPCs. The territorial flexibility of the Council form is itself a powerful resource; this flexibility should be embraced as central to FPC typology, avoiding any a priori scale of organization. FPC policy work that supports urban or regional agriculture may offer promising solutions in certain locales compared to others, depending on factors such as local climate, open space, or existing patterns of sprawl and ecological destruction. The federal and state political context also greatly shapes these opportunities.

We are not suggesting that FPCs offer a panacea simply by localizing food systems. Instead, our argument highlights how an urban politics of food, based on the notion of collective consumption, can find more politically effective expression at the local or regional scale. Promoting a just sustainability transition of the agro-industrial food system should remain the normative objective. With this system-scale transformation acting as the foundation of urban food politics, we offer a place-based politics of consumption as an important organizational strategy. Through this form of collective politics, we argue that catalytic points of transformation at the urban level can be fostered which in turn might support broader sustainability transitions. Transformative policy, we argue, is one that increases governance capacity, particularly by appealing to a large number of stakeholders, engaging in longer term struggle rather than prioritizing quick policy solutions, and contributing to new social and political alliances that lay the “groundwork for change in institutional and planning capacities that can outlast any individual political leader.”[73] FPCs offer just such an experiment in rethinking how, even within existing capitalist relations, more radical food justice values can shape governance arrangements that build the local and regional political resources still capable of challenging transnational food systems.

One related and interesting experiment, in this respect, is the launch of the Food Policy Network (FPN) by the John Hopkins Center for a Livable Future. The academic-based networking project focuses on building capacity of local, state, regional and tribal food systems councils, in addition to national organizations and other groups focusing on improving the food system.[74] Santo and Moragues-Faus argues the John Hopkins project progresses our understanding on “how complex, interconnected, dynamic, and geographically dispersed networks constitute new forms of food governance and their role in building more sustainable and just food systems.”[24] At this stage, the project is primarily an information-sharing platform. But in leveraging the political possibilities of networking existing place-based FPCs, the John Hopkins project hints that there is further opportunity to push food governance innovation forward in ways that overcome many limitations of current jurisdictional scales.

We find promising not only this scaling up of governance innovation, but also peer-to-peer learning strategies that have offered significant outcomes in locating place-specific political opportunities in food policy. For instance, in Baltimore, where extensive food initiatives have been organized via new collaborative

institutions and via the City's official Sustainability Plan[75] and Food Plan[76], important lessons have been adopted from the experience of Detroit, a city that has faced similar processes of deindustrialization and community disinvestment. Baltimore's Community Greening Resource Network adopts strategies that have delivered important gains in Detroit via the city's own Garden Resource Network. New ecosystems of food justice mobilization, creative planning practices, and governance innovation foster the desire to share experiences between locales that can spark new urban food initiatives.

In their study of food systems planning, Born and Purcell offer the notion of a local trap to describe the "tendency of food activists and researchers to assume something inherent about the local scale" where the local is assumed to be desirable and "preferred a priori to larger scales." [77] While agreeing with this perspective, it is the innovative and experimental nature of FPCs that suggest new political opportunities for reimagining how the local level can be politically engaged in wider sustainability transition efforts. What we offer, then, byway of conclusion, is an optimistic assessment that FPCs, as a new governance arrangement, can help build an urban politics of food that embraces consumption as a driver of change in the urban metabolism of food – so long as it is built as a collective rather than individual project.

Governance innovation is critical because the complexity of food resource networks pose considerable challenges: both new ecological risks related to climate change and longstanding racial and economic oppression of the system at large. How the urban can be situated in food system transformation is controversial, particularly amongst those who continue to emphasize the need to link sites of production to those of consumption. However, rather than disarticulating the two spheres, we argue consumption as a driver of urban politics should not be abandoned but appropriated strategically in pursuing the goal of just sustainability transitions.

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CHAPTER 6

Harnessing Ethical AI Surveillance for Climate Change Governmentality

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Achieving sustainability in respect to the natural environment necessitates a changing paradigm in climate's governmentality, as to discipline complex modalities of techno-social agency that underlie the current climate crisis. From a transdisciplinary approach, the analysis recalls the science of climate change with the existing frame of international law (hard and soft law), analyzing the conditions for the accountability of organizations (Nations and corporations) in the production of anthropogenic emissions. Organizations are deciphered as complex techno-social systems of communication responding to reflexivity, feature that precludes them from understanding natural environment limitations. Reflexivity triggers carbon lock-in, a special form of path dependency at the base of the current schism between knowledge, intention, and actions. Reflexivity threatens long-term sustainability while endangering life and social systems. Artificial Intelligence can help overcome reflexivity, only if AI is restrained by an ethical approach constructed by the protection of human rights, the notion of environmental stewardship and the sustainability goals. Idealized ethical AI needs to take the form of hard law regulation.

Keywords: Governmentality of global warming, Reflexivity, Carbon majors' accountability, Ethical artificial intelligence, Philosophy of technology.

6.1 Introduction

This paper offers a scaffold for improving the governmentality of global warming, facilitating further studies on each of the problematic nodes it identifies. Climate governmentality is conceived as a wicked or complex problem, involving all levels of society and earth systems.

The notions of environmental resilience, complexity and sustainability are the conceptual nodes that set the background to address Climate governmentality. Considering the diverse perspectives involved in the topic, the notions take diverse significations. From the perspective of organizations and nation states, sustainability and resiliency relate to the conditions and the possibilities for continuing systemic operations. Resilience is the capacity of the organization to persevere when confronted with low probability/high impact events. Sustainability, in its turn, refers to the general environmental conditions that the organization needs to consider as to remain viable.

In contrast, from the perspective of humans affected by the climate crisis, resilience displays the need to recover when facing the consequences of climate change, notwithstanding trauma and uprooting. Sustainability in their perspective, involves the notion of planetary limits and considers economic, environmental and social aspects.

Complexity follows N. Luhmann's typology. Natural complexity is the one experienced by humanity facing the challenge of the natural world. As humanity faced the harsh conditions of the natural world, it developed social-technical systems to alleviate its effects. From the communications arising from social systems emerges a second type of complexity, derived complexity, which evolution challenges planetary boundaries.

Climate governmentality involves the socio-technical productions of the economy, the political system, health systems, among other partial systems of society, with the actions of national states, corporations and the level of humanity. Climate governmentality is multidisciplinary in nature, impacting all levels of society.

The analysis integrates the following sections: 1. The Science. 2. Integrating scientific knowledge in the UN system. 3. The schism between declarations and actions 4. The actants. Organizations as social systems. 5. Carbon Majors. 6. The need for a paradigm change of the notion of governmentality. 7. Litigation. 8. The call for a second-level observer. An ethical Artificial Intelligence (EAI). 9. The features of EAI for helping climate governmentality. Time accelerator, universal translator and ubiquitous observer, superior calculator, and forecaster of future states. 10. Conclusions and Discussion.

6.2 Methodology

The analysis used a 'structured analytic technique'. It is a type of qualitative operational research specifically designed to approach complex problems. It seeks to develop a model of relevant factors, and of their interaction for ulterior decision-making. The approach was born as a reaction to analytical methodologies that could not apprehend complex, intertwined issues that first need to assess components and their interactions. The technique allows us to organize information and identify relevant drivers of a complex problem. This approach allows us to create a scaffold for spotting problematic nodes and their intersections.

After a widespread revision of the existing sources, the task was narrowed down to identifying the central problems considering enhancing the governmentality of climate change. Then, second order analysis prompted the revision of the legal structure and later on, the call for disciplining the behaviour of corporations and nation-states.

There, reflexivity is the crucial trait that blocks organizations from considering natural environment boundaries. There, complex systems analysis can reveal the ontological features that contribute to the veil of reflexivity of organizations. While the veil of reflexivity can be pierced by media of communication conveying excluded information to the attention of the system, for such information to be accounted for, it must be observed by a second-order agent. The analysis proposes Artificial Intelligence (AI) to enact this role of second-order observer and pierce the cognitive impediment of reflexivity in organizations. Since AI, in its turn, features reflexivity, it also needs to be disciplined. A legal framework for an EAI must include human rights protection, biosphere stewardship, and the millennium goals.

6.3 The Science

Rising Earth's temperature is caused by heat-trapping greenhouse gases of anthropogenic source, disrupting weather, life, and social systems, seeding a climate crisis that entails frequent extreme weather events. The transformation of natural systems in the atmosphere, ocean, cryosphere, and biosphere is caused by human action that began with the industrial era [1]. CO₂ atmospheric levels are currently around 40% above natural levels of CO₂ experienced over the last million years of Earth's history.

Earth developed a stasis in its carbon cycle, nurturing a variety of life forms. Rising temperatures disturb the conditions for the survival of existing life forms, breaking havoc not only with life systems but also societies [2].

The World Meteorological Organization (WMO) 2022 issued "State of the Global Climate", [3] exposing that crucial climate change indicators reached in 2021 alarming new records. The key notion here is interconnectedness, as the global climate indicators are closely interlinked and expose how an imbalance

in one, is closely followed by a disequilibrium in the others. A warming world disrupts all components of Earth's system, hampering efforts to attain the UN Sustainable Development Goals.[4].

Earth's climate is part of a complex, dynamical relationship of mutual feedback with other natural systems. The ocean interacts with earth systems [5] and because most of the excess heat from greenhouse gases is absorbed by the ocean, it is currently overheating. Ocean warming then leads to extreme weather events (EWE), and melting the portal ice shelves, disrupting marine ecosystems and weather systems. Follows a process of ocean acidification, that impacts ion availability for organisms to maintain their hard structures, distressing, among many others, shellfish, and corals. Those organisms are, in their turn, connected to the web of life of other species that need them to survive, including humans. This intricate network between natural systems underlies the severity of global warming effects. Indeed, the damage of global warming lies both in its magnitude and in the irreversibility of its effects. Irreversibility is the second notion to keep in mind. Linear processes can often be turned back to a previous state. In complex intertwined systems, the dial back is harder to attain, if such return to normality is even feasible. Ilya Prigogine studied irreversible processes, which are the source of dissipative structures: complex structures that emerge from chaotic states. Earth's delicate and fragile equilibrium of the atmosphere and warming gases is such a dissipative structure that nurtures life forms. The delicate balance supporting life is precipitously degrading.

6.4 Integrating Scientific Knowledge into International Law

The United Nations (UN) is the supranational institution managing the collective response to global warming. The UN system of international law (UNIL) originated after the second World War, accounting for the way of being expected from national states. UNIL, at this supranational level, displays distinct features: National states are bounded by their sovereign will when subscribing treaties, agreements, and conventions. The Vienna Convention on the Law of Treaties (1969) frames the conditions for nation states to fulfil the obligations that derive from subscribing a treaty or a convention. In strict sense, states are obligated by the wording and conditions inscribed in the agreement. Thus, if the agreement lacks agreed upon mechanisms for accountability, then the states cannot be compelled to fulfil their obligations.

Henceforth, UNIL system features two dynamic forms that favor international collective action. First, hard law mechanisms, that refer to legal obligations that are binding on the parties involved and that can be legally enforced before a court. Three criteria define whether a law fits the conditions to be considered as hard law: it must provide a binding obligation, be precisely worded and it has to offer some type of delegation in the implementation of the law. Second, and by exclusion, fragility in one of the three criteria define the domain of soft law. Soft law can present normative content while lacking precision, a clear obligation or delegation. As identified by Chinkin [6] treaties and agreements can be worded as to express the good faith of the subscriber while remaining devoid of binding commitments, as 'legal soft law'. The UN legal corpus falls under this description, and its status explains the failure in marshalling immediate action, notwithstanding the urgency of climate warming.

Even so, international governance can be seen as a process of increasing legalization. The UNIL is a nascent legal system that has not reached its autonomy. Seeing it as a process towards autonomous self-definition, some of the forms of the soft law can antecede the stabilization of legal standards and legal operations. Then, soft law that is today impotent by design, progresses in the path towards a future full-fledged legal supra-national system.

Seeing the urgency of climate change, the limitations of the UNIL system are glaring. In what follows we will briefly revise the problem of a system that is impotent by design, as the parties can withdraw from fulfilling commitments if they deem those commitments to contravene national interests.

The UN Framework Convention on Climate Change (FCCC) 1992 [7], ratified by 197 countries, seeks the "stabilization of greenhouse gas concentrations . . . at a level that would prevent dangerous anthropogenic interference with the climate system". The treaty recognizes the necessity to transform human activity harming weather systems, acknowledging both direct and indirect human activity "that alters the composition

of the global atmosphere, and which is in addition to natural climate variability. . .” (Article 1. Definitions 2.). The FCCC also established the Warsaw International Mechanism on Loss and Damage Associated with the Impacts of Climate Change (WIM) [8]. The mechanism advances the definition of loss and damage resulting from climate change [9], while lacking mandatory, quantified mitigation targets for individual countries, and mechanisms for demanding and effectuating accountability.

Pledging allegiance to the sovereign will of nations, the FCCC specifies that conflict must be solved by further negotiation between the parties. Thus, efficacy, as a measure of goals attained, is strictly limited. By the FCCC, the subscribing nations accept that in case of dispute they can a. Submit the dispute to the International Court of Justice and b. use Arbitration in accordance with procedures to be adopted by the Conference of the Parties as soon as practicable, in an annex on arbitration. At this date, the International Court of Justice (ICJ) has never produced an advisory ruling on the foundation of the UNFCCC and has been ineffectual. The FCCC lacks the coercive elements to enforce its objectives and remains impotent by design. [10].

After the FCCC came the Kyoto Protocol (1997) [11]. In terms of hard law, Kyoto displayed precise, binding national obligations to reduce emissions for each developed country party. Soft law components incentivized developing countries under the Clean Development Mechanism, allowing countries to sell certified emissions reduction credits to developed countries wishing to offset their domestic emissions. There was also a public funding mechanism in the Global Environment Facility, amongst other funding mechanisms.

Seeing their economies and national interests compromised by Kyoto, major parties rejected its provisions and hindered the emergent autonomy of a supranational legal system disciplining countries’ behavior. In more concrete terms, the USA refused to ratify a binding treaty for mitigation obligations, while developing countries were unwilling to legally bind themselves to achieving mitigation targets [12].

Subsequently, a step forward in the process of evolving binding structures for climate governmentality took place with the Paris Agreement (2015) [13]. Paris included a precise collective goal and a legally binding framework for countries to present periodic national contributions (NDCs) and their review. Evaluation of advancement in reaching the goals set by the NDCs produced significant developments. Identification of policies and effects favors a ‘transparency framework’ that requests countries to report on national emissions and policies. Paris reached a crucial step in gathering information from national contributions. Nevertheless, Paris still lacks precision at the level of the obligations of the countries regarding detailed national contributions.

Another important aspect advancing the development of a supranational legal system for climate governmentality can be found in the integration of the science of global warming within the UN.

Since the creation of the IPCC 1988, the international community recognized that climate change was the result of human activities. Later, the Fifth Assessment Report (AR5) 2013, 2014[14] gave scientific input to the Paris Agreement. The IPCC is currently in its Sixth Assessment cycle, producing three Special Reports, a Methodology Report, and the Sixth Assessment Report. The first Special Report, Global Warming of 1.5°C (SR15) [15], was requested by world governments under the Paris Agreement. In 2019, the IPCC updated the 2006 IPCC Guidelines on National Greenhouse Gas Inventories [16]. The Special Report on Climate Change and Land (SRCCL) [17] and the Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) [18] illustrated to policy makers and citizens on the causes, interactions and threats created by global warming. The recent reports of 2021 The Physical Science Basis [19] and 2022 Impacts, Adaptation and Vulnerability [20], enhance and deepen the clarity of the message reviewing the impacts of climate change on ecosystems, biodiversity, and human communities. The interconnectedness of the physics, the biological and the social is fundamental for assessing the necessity of urgent collective action, inscribed already within the UNIL system. The most recent report exposes the connection between;

- (i) the physical aspects of global warming,
- (ii) the impending danger for human health and social systems, and
- (iii) sources of danger and UN millennium goals.

We can observe two distinct and contradictory communications overlapping within the structure of the

UNIL. On the one hand, the science is speaking clearly and loudly, explaining in detail the causes and consequences of climate change at all levels of the global society, insisting on the impacts for Earth systems. On the other hand, the communications from national states are defined by a narrow view of economic growth and national interest. Both communications collide, while the time for collective action has never been more urgent.

6.5 The Schism between Declarations and Actions

The science is included within the UNIL system for climate governance. However, the system has been devised with the autonomy of States at its core, and as a result, it is impotent by design. The difficulty lies in the varied stance that legal agreements have, and in the resulting low level of accountability. The absence of a legal frame for exerting accountability produces a failure in governmentality. In its place, parties avoid moral blame by communicating symbolic and inefficient pledges.

The institutions of the UNIL are also incipient. The Security Council, (UNSC) is the only organ with a clear mandate to maintain international peace and security. While it acknowledges that climate change affects global stability, it has still not integrated climate crisis in its understanding of a security threat. As EWE proliferate, there are mounting signs of a push for increasing climate governmentality: In 2020, Germany led a Joint Initiative to Address Climate-Related Security Risks (Ten UNSC Member States, 2020) [21].

The 2021 Production Gap Report (PGR) [22] exposed governments' plans to produce more than double the amount of fossil fuels in 2030, contradicting their declarations and promises to limit global warming to 1.5 C. In 2022, fossil fuel amounts to the 75% of global emissions causing global warming. Furthermore, the latest emissions gap report from the United Nations Environment Program [23] underscores how current and planned mitigation measures fall short to achieve the goal of the Paris Agreement of limiting global warming to 1.5°C above preindustrial temperatures. The report uncovers that Nationally Determined Contributions (NDCs), along with other commitments, only take an additional 7.5% off predicted annual greenhouse gas emissions in 2030, compared to the previous round of commitments. In reality, reductions need to be of 55% to attain the goal of 1.5C.

The 2022 "Mitigation of Climate Change", Sixth Assessment report (AR6) integrated the flow of alarms, stressing the need to cut greenhouse emissions. Nevertheless, global fossil fuel emissions rebounded sharply (in 2021) back to the pre-pandemic levels. The report discloses a wide schism between the pledges of the countries and the current model for energy production and pathways to development.

In the production of anthropogenic emissions, states are deemed responsible for the emissions within their territories, but the emissions are also produced by substate entities, with actions juxtapose the ones of the national states and that, in the case of transnational corporations, go beyond the physical territories of the nations.

We can thus discern three overlapping layers in the making of the conundrum. First are the nation-states expected to behave according to the rules of international law. On the second layer are substate entities, such as cities and states, that can subscribe autonomous agreements to reach collective goals about climate objectives. The third layer is composed by transnational companies and corporations, that take flexible and wide-ranging forms. Companies and corporations can fit under the statutory and legal umbrella of the national state, or can develop outside of frontiers of nations, developing agreements that are ruled by the text of the contract or by international agreements.

The three layers interact with each other. National states develop general policies for energy production policies which, in turn, affect cities and states. Corporations produce energy, and are responsible for the release of anthropogenic gases into the atmosphere.

In addition, concomitant timeframes demand consideration. Natural systems experience a steep pressure for adaptation to global warming, for living entities time runs faster than their biological ability to change. For national governments, the temporality is multiple. Governments considers the time of the next political election -in the case of democratic societies- and simultaneously, it responds to urgent needs from the communities suffering climate change. EWE can impel human displacement or hunger. Moreover, governments

foremost need to consider the timeframe of the economy. Then, the needs of economic growth, or the continuity of economic operations subordinate to the timeframe of rising temperatures and their effects. Conflicting programs and distinct temporalities underlie the schism between declarations and actions.

6.6 The Actants. Organizations as Social Systems

We previously exposed the fundamental schism between knowledge and action in respect to the challenge of global warming, a schism recognized in the Glasgow Climate Pact (2021) COP26 [24], in charge to revise the state of advancement of the goals set in the Paris Agreement.

Who is to blame for the failure? This analysis evaluates global warming from the perspective of the social apparatuses that mediate every satisfaction of our needs, while creating junctures that both unite and separate us from the natural world.

We use the insight from Luhmann's social systems theory [25]. Luhmann discerns two varieties of complexity. There is first, the complexity that results from the natural world. Second, there is the secondary complexity, developing from the multiplicity of social systems and mechanisms that progress to diminish the burdens of natural complexity. In the current analysis, we assess the role that social systems play in the making of climate warming, as systems produce secondary complexity. The general form "social system" allows to comprehend the nation state and the corporation as organizational systems, and as apparatuses that exert agency. We use also the first Latour who extrapolated the semiotic notion of actant [26] to comprehend non-human forms of agency. Likewise, Luhmann examines social systems as emergent forms of communication that are self-referential, and develop autonomous operations and programs in dealing with their distinct topic matter, social systems that occur in separation from humanity. Both Luhmann and Latour substantiate our understanding of a technologically mediated society where humans share the phenomenological ground with non-human forms of agency. This specific feature is central for understanding how actants-systems usher the production of global warming.

Luhmann proposes understanding social systems as emergent forms of communication, that are self-referential, and may develop autonomous operations and programs in dealing with their distinct topic matter. Systems are reflexive, as their operations follow their internal sense-making. Luhmann understands society as the sum of all communications, and the organization as a specific form of communication that builds on decisions. Social systems intermediate between bare humanity and the world. Let's call to mind that bare life [27] takes the foundational meaning of just living, life as it comes, life that is not accounted for by the law or by other system. Bare humanity does not create an environmental hazard. In contrast, social systems alleviate the burden of the natural world while developing further secondary complexity. In fact, the development of global warming is in direct relationship with the industrial society, as it required the development of expert production and energy systems.

Organizations [28] address the necessity to absorb uncertainty. Organizations transform uncertainty into certainty by linking decisions.

Organizations display a mastery in numerous communicative codes:

First, corporations understand and use the code profit to advance their imbrication with the larger economic system.

Second, the corporation acknowledges the importance of regulatory power, that it first integrates as information worth considering, as it can disrupt the normal concatenation of operations. The corporation can develop legal strategies to deal with the financial risk arising from changing regulatory frames. It can also invest in political lobbying to transform the regulatory frame to its advantage. It can shift its form, developing coordinated management, from national to global.

Third, the corporation is a social technology that controls technical codes. Innovation, efficiency, and the use of supervening technologies such as modern communications grant the corporation its ability to anticipate global trends and keep growing.

Sense-making differs for each kind of system and the particulars of its communication. Firms, corporations, companies 'speak' the language of the economy as a social system. Organizations discriminate

between commodity markets, labor, and financial markets. Organizations can also understand how external regulation affect the opportunities for profit. Such flexibility surges from the absence of essential contents for the form organization. Because its identity is realized by interconnected operations, organizations are compatible with all structures that permit the continuity of such concatenated operations.

Profit organizes the recursive interconnection of operations, following the primordial diktat first identified by Marx in the mechanism of profit production. Operative closure warrants the continuity of the activities seeking profit. Nevertheless, the risk of a difficult relationship to the system's environment may force cognitive openness, pushing the system to consider external codes and programs. As an example, oil spills may introduce, within the system, the extraneous notion of a natural environment that needs to be dealt with, to avoid the punitive consequences that come from a legal system with the power to enforce penalties. If the internalization of a foreign code projects future events, it is rephrased as risk. When the internalization of such code happens after a catastrophe, it becomes an issue of damage control, or how to impede further loss of profit. Then, political, social, or natural environment considerations may be considered within the operations of the economic system in question. An oil company may publicize that it has changed its ways, investing in planting trees and the arts, and that it cares for its human capital, or it may effectively invest in green technologies for energy production.

Pressure from other countries or from the system's stakeholders may force the system to consider integrating responsible behavior and mechanisms for self-accountability. Climate risk is construed reflexively, as financial risk: the risk to diminishing investment performance due to climate change and changing regulation.

In sum, reflexivity in systems orchestrates a mutual and reinforcing relationship between investments, know-how, existing technologies aiming profit production. Once the system takes its form, it creates a normalized, self-maintaining pathway for further economic communications. Then, for organizations profiting from fossil fuels, the use of existing technologies, institutions, and behavioral prescriptions hinder their attempts at reducing carbon emissions, in what is known as carbon lock-in: a case of path dependency in complex systems.

In carbon lock-in [29] there is an intense tendency towards stability, explained by immense capital costs, infrastructure lifetimes and non-virtuous feedback with other social-technical systems. This is because the current global structure of energy production still favors fossil fuel technologies, discounting their inevitable collateral damage on the environment.

To date, restrictive supply-side policies [30] are missing from the toolkit of policies against global warming. Energy production is caught on a path dependency on fossil fuels. Organizations caught in such non-virtuous feedback forsake alternative sources for energy production, continuing the way indicated by initial conditions, hooked to the expectation [31] of increased returns to scale [32], while crystallizing habitus in social corporative behavior.

6.7 Carbon Majors

Having set how reflexivity performs in companies, we can now consider the ontological stance of carbon majors. The Carbon Majors database [33] lists ninety producers engaged in coal, oil and gas, and cement production, accounting for two-thirds of the total historical industrial CO₂ and methane emissions worldwide. The nation state has been the historical source for tracking large scale Greenhouse Gas emissions (GHG). Alternatively, the database allows for tracking these emissions to a smaller group of commercial decision makers. Together, nation states and companies are the main actants producing anthropogenic emissions that cause global warming.

The database classifies [34] companies, distinguishing between investor-owned corporations; state-owned entities; and lastly, state producers. The grouping allows to identify the regime for reclaiming accountability. For instance, investor-owned companies can be public or private, defining different legal regimes. In the case of the state-owned entity in rule of law governed societies, the state may be held responsible for the effects caused by the actant, under the national law, seeking the protection of the human

rights of national citizens. The cases of state-owned entity and state producer display dissimilar regimes for accountability, including the total absence of accountability mechanisms. Then, “State producer” identifies 7 coal producing nations, bringing the necessity to understand their status regarding the accountability for their actions.

The database allocates emissions in proportion to the percentage of investment from each ownership classification. An important part of the spectrum is private ownership, including individuals, venture capital, private equity firms, holding companies, insurance companies, and corporations.

The data is organized in respect to boundaries. The company develops operations and perform activities under legal and operational structures. Operational boundaries are used to identify whether the emission scopes are direct or indirect. Categories include direct company emissions, indirect emissions deriving from purchased energy carriers such as electricity, and value-chain emissions. Value-chain comprises 15 distinct categories of which Category 11: ‘use of sold products’ accounts for over 90% of total fossil fuel company emissions.

The carbon majors respond to their reflexivity, as their activities are ordered following their specific sense-making: Profit production. Profit expectation activates the flow of economic operations, functioning both as a source of subsequent revenue, and as a test on the environment. A venture is worth seeking if it brings prospects of profit. The information coming from the carbon majors describes the minute operations driven by financial gain.

We learn that fossil fuel related emissions account for about 90% of global industrial greenhouse gas emissions, and about 70% of total global anthropogenic emissions. Since 1988, fossil fuel has become more carbon intensive. The contribution of fossil fuels to global warming has doubled since 1988, and coal takes the largest share. Furthermore, newer large ventures have made appearance. Emergent extraction enterprises such as Suncor, ExxonMobil, Chevron, Shell, and ConocoPhillips have funded the extraction of oil sands, tight oil, heavy oils, and other forms which carry a larger environmental impact than conventional oil production.

Another type of actant is the national producer, featuring an array of organizational forms. The state may privatize its assets and then newer, more flexible forms of actant emerge to invest and manage the assets of fossil fuel production. It is the case of China, in coal production, and Russia. In other cases, the state keeps direct control of the assets, as in Saudi Arabia, the United Arab Emirates and Kuwait.

If the exposed path continues, Earth’s temperature will rise above 4C, producing existential danger for the whole chain of being. In 2022, the dire situation has worsened by the current war between Russia and Ukraine, and the impending geopolitical shifts already impacting the political economy of energy production and distribution.

From the data we observe that Carbon Majors behave reflexively, acknowledging the complexity of the external world in their own terms, constructing a version of reality that allows their differentiation and economic continuity.

Reflexivity is at odds with the idea of an enlarged consideration of the environment because the parameter of efficiency develops by defining external information as impertinent. The notion of a natural environment that entails a duty to care for it, is extraneous to the system. Ethics, human rights, critically warming weather, are merely external noise that is translated as a meaningful topic only if the noise threatens the continuity of internal operations. Accordingly, the notion of sustainability is not essentially related to the natural environment. For organizations, sustainability means pondering the economy, the law, or other companies as ecological boundaries that need to be accounted for if, the organization is to remain viable in such an environment. Furthermore, companies tend to decipher nature as an externality, while considering the actions of other corporations or stakeholders as their proper environment; and will primarily incorporate environmental damage as reputation risk, only if it diminishes its value. Reflexivity in systems underlie the schism between knowledge, intention, and action, enhancing dependency paths [35]. Reflexivity causes the system’s deafness to hear the urgent call for addressing climate change.

6.8 Assessing the Need for a Change in Paradigm in Governmentality

As a complex, multidimensional object, governmentality [36] takes different meanings depending on the perspective that sets its contents. Power happens within a relational mode of operation [37], while governmentality links the technical regulation of the conduct of men in reaching a common objective with the required modes of thought and behavior expected from the modern subject. Like the two sides of a coin, governmentality takes a dual semantical form. Yet there is a third signification: the activity of guidance, steering. Foucault understood governmentality in a transversal relationship concerning the state which is a historical configuration of the political. Governmentality, as the practice of steering, transcends the form of the national state, and in the current state of scientific knowledge arising from Earth sciences, forces the consideration of the critical ceiling of ecological boundaries.

The impending environmental crisis forces a redefinition of the notion of governance. It first asks for a prioritization of its topic matter, taking stock of the limits imposed by the Earth's sustainability [38]. Since a relatively small number of actants is causing the most damage, steering their behavior justifies narrowing it to the ways of being of the actants. Companies and nations in the list of carbon majors need to be framed as specific forms of subjectivity.

The challenge of governmentality finds resonance in the current, albeit limited and fragmentary, regulatory responses to address the impending climate crisis. Actants encounter two main novel regulatory proposals that complement the existent soft law regime of pledges and national commitments. First, there is the regulatory challenge from the political system to address the consequences of climate change for global financial instability. Here, a novel approach towards reaching efficient accountability seeks to regulate corporate behavior integrating compulsory environmental, social and governance reporting. Second, there is the self-regulating proposal coming from institutional investors pledging to behave responsibly. In companies, institutional investors are developing the Principles for Responsible Investment. Together, the self-regulation of actants and the pressure from above anticipate novel, and more stringent standards to seek actants' accountability.

Governmentality, in the context of climate warming is interwoven with the notion of accountability. We previously exposed the notion of hard and soft law within the UNIL system. As soft law lacks features such as obligation, uniformity, justiciability, sanctions, and/or an enforcement staff, it is the preferred choice for international relations. In international law, soft law mechanisms build on the reputation that countries have, considering their stance before the international community. The efficacy of soft law builds upon the need that countries must maintain their reputation. Shaming countries or corporations appear as a straightforward tool to change policies and countries behaviors. Yet when most of the countries behave shamelessly by developing policies counteracting their carbon emission goals, the efficacy of shaming is nullified. Instead, shaming has created some symbolic behavioral transformations. Governments have bought carbon offsets to nominally decrease their carbon emissions or footprint. Companies have green-washed their practices and brands, without changing their real production of emissions. Soft law mechanisms as self-regulations and self-proclamations have limited practical value, as they express good will and better intentions that lack punitive consequences for unfulfilled commitments.

The absence of hard-law mechanisms hinders the legal adjudication by supra-national courts. The incipient and fragmentary nature of the International Law (IL) system impedes allocating juridical consequences to national states that fail their duty to diminish their emissions. This is the case for China, Russia, India, the Middle East countries, Australia, the USA, and many more.

The way out of the schism seems to signal the path of hard law. More prescriptive than soft law, it defines how and when the objective is to be achieved. Hard law for environmental protection is often present in national regulations, often restricting a fraction of the economic activities while prompting markets to consider a regulatory boundary. Considering the urgency of the environmental impending crisis, governmentality before corporations and national states needs to assert binding power entailing negative outcomes for transgressors.

6.9 Litigation

Notwithstanding the feebleness of IL, there are residual mechanisms that have been used successfully for enlarging climate governmentality. National courts are creating case-by-case, strong accountability. As an example, the Urgenda Foundation and 900 Dutch citizens sued the Dutch government to do more to impede global climate change [39]. The Hague court found that the government pledge to limit emissions was insufficient to maintain global temperatures within the UN goals. The court thus ordered the state to limit GHG emissions to 25% below 1990 levels by 2020. The court founded its decision upon an assortment of soft and hard law sources and legal principles;

- (i) the Dutch Constitution;
- (ii) the EU emissions reduction targets;
- (iii) the European Convention on Human Rights;
- (iv) the IL principle of no harm, and foremost;
- (v) the national law doctrine of hazardous negligence, among many others.

The ruling was upheld by the Hague Court of Appeal, that determined that the Dutch government acted unlawfully contravening its duty of care, under articles 2 and 8 of the European Convention on Human Rights, against the threat of global warming, applying provisions with direct effects in treaties in which the Netherlands is party.

Here, national hard law (the Dutch Civil Code) was the legal source granting to determine that the Dutch State breached its obligation to take precautionary measures to mitigate a hazardous situation. Afterwards, sources of soft law were incorporated in the ruling, as the District Court contemplated United Nations and European Union climate agreements, along with international law principles and climate science, to define the scope of the state's duty of care with respect to climate change.

The case highlights the reflexive relationship between soft and hard law, while involving the need for hard law to establish environmental duties. The standards of care were specified using UN resolutions and EU agreements, allowing the Court to conclude that the government acted negligently when it set a target for CO₂ emission reductions at 17 percent compared to 1990 levels, instead of 25 percent. However, it was the hard law of the civil code that enable determination that the Netherlands was knowingly exposing its own citizens to danger, incurring a wrongful act. Soft law was again at stake when the Court found that implementation of adaptation measures alone is insufficient to fulfil the state's duty of care. The Court ruled that mitigation is the "only effective remedy", determining that the Netherlands has a duty of care to mitigate as quickly, and as much as possible. This case constitutes a prime example of a legal coding (legal/illegal) enforcing the duty of care within the activities of a Nation State as an actant. It reaffirms the power of the legal system to steer an actant out of its inertial course of action.

Another important case is *Milieudefensie et al. v. Royal Dutch Shell plc* [40]. *Milieudefensie* alleged that Shell's contributions to climate change violated its duty of care, and human rights obligations by failing to act against climate change. The plaintiff argued that Shell had thorough knowledge on the causes of climate change, produced misleading statements on climate change and failed to reduce climate change, endangering Dutch citizens. The Hague District Court ordered Shell to reduce its emissions by 45% by 2030, relative to 2019, across all its operations, including its own emissions from the use of the oil it produces. Furthermore, the Court concluded that the standard of care involves taking responsibility for Scope 3 emissions, specifically when these emissions compose most of the company's emissions, as is the case for companies that produce and sell fossil fuels.

The selected cases are part of a wider trend on demanding accountability via the legal system. Despite the limitations of the UN system, there are indications of the tendency on integrating within its operations, the definition of the illegality of actions that cause climate change. This incorporation is still limited, as the requisites of hard law are still nascent. In this process, the IPCC has advanced that climate litigation is another venue to challenge and cooperate over the governance of climate change.

Historically, governmentality dealt with the problem of shaping human beings into accountable subjects. Seeing the participation of non-human forms of agency in the making of climate crisis, a paradigm change

should encompass the behavior and liability of corporations, and national states.

Understanding the self-referential nature of nations and corporations allows observers to see why their behavior is impervious to climate crisis, and to develop the steering mechanisms to frame their activities, through an enlarged notion of governmentality.

Organizations exhibit a proficient use of the codes and programs of technological systems. Money as a medium of communication, within the economy as a social system, and power as a mechanism for producing collective action within politics as a system; are both media of communication endowed with enormous communicative power. Such media allow for transversal exchanges between organizations and society, allowing organizations to integrate the climate exigencies, if regulation compels them [41]. Furthermore, strong regulation from the law as a system grants the possibility to connect the protection of human rights to the actant's behavior. Regulation forces organizations to consider external facts such as health hazards into their operations, reducing the strength of their overarching aim of profit making. Conversely, weak regulation diminishes the chances to steer organizational behavior, and organizations may try to dismantle the regulatory impediment.

The significant problem remains of establishing a causal relationship between actant's behavior, global warming, and emergent damage. This requires a legal frame of distinction [42], identifying causes and effects, enabling to connect actions to damages and penalties.

6.10 The call for a second-level observer

The schism between knowledge, intention and action continues as the systems resume their self-defined, myopic path. Meanwhile, EWE confront actants with the reality of a natural, disruptive temporality. The World Meteorological Organization informs that the number of disasters has increased by a factor of five over the last fifty years, and has caused US 202 million loses daily. Economic loses, counting from the seventies have increased sevenfold [43].

Considering litigation cases, it becomes clear that growing demands for governmentality request precision and speed in gathering and evaluating information [44]. However, organizational reflexivity hinders constructing an overall picture of the required information at the necessary speed to address global warming. Luhmann's notion of "second level observer" can help circumvent the problem of reflexive systems that fail to gauge the conditions of their environment. In social systems theory, every observation is made within the constraints and possibilities that the phenomenological stance of the observer allows for. Likewise, every perspective carries, simultaneously, a view and a blind spot. The actant has a unique perspective that builds from what its structure allows to be seen as observable. If the perspective is too narrow, the actant may disregard data that is crucial for its own continuity. The corporation, which behavior seeks decision making for profit, can neither see ethical considerations nor understand natural environment data unless such data is construed as relevant for profit. A second party can see what the corporation cannot, but in its turn, such a second party has its own blind spot. A legal system setting the conditions for making the corporations accountable can see and evaluate the blind spot of the corporation. Such legal system, in its turn, can only operate within its own reflexive codes. Reflexivity creates a veil, impeding the direct observation of anything that the system does not consider as its topic-matter. Reflexivity can be pierced when media of communication conveys the information that was discarded, forcing external complexity within the concerned system. An example is found in banking law of some countries, that protects consumers. This law forces financial entities to behave in good faith while offering the best advice to the applicant-consumer, regarding the financial product that best suits the consumer's financial circumstances. Let's now discern in detail what is at stake. On the one hand, there is a financial entity which main purpose is to make profit from its business of dealing with financial and monetary transactions. On the other, there is the client. Between both intermediates the legal framework, which imposes upon both parties the whole complexity of the law, defining that it is illegal to act in a manner that goes against the regulation. Here, the code legal/illegal confronts the financial entity with the complexity of punitive consequences that it is forced to consider. In each financial operation that considers the legal code, the veil of ignorance of reflexivity has been pierced, allowing for external information to be

accounted for, integrating the code legal/illegal within the normalized operations of the financial entity.

In the case of climate governmentality, there is no overarching, general legal framework. Nevertheless, there are some incipient mechanisms as indicated in the section dealing with litigation. There, soft and national hard law signal the budding stabilization of ways forward to claim accountability. At this point of the analysis, the logical necessity is to advance ways to acknowledge the different levels of blindness of carbon majors, as to pierce their reflexivity- induced veil of ignorance. By examining the speed of climate change and the lack of accountability of carbon majors it becomes clear that there must be an additional observer to precisely identify the blind spots caused by reflexive behavior. Artificial Intelligence (AI) could fulfil this need, enhancing the chances for climate governmentality.

We understand hereby, AI as:

“A system’s ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation.” [45]

This definition is supplemented with the requirement for AI to perform ethically, within the boundaries of human rights protection; and integrating both the notion of biosphere stewardship [46] and the 17 Sustainable development goals (SDGs). AI thus conceived is an idealized version of actual developments.

Ellul’s insight on technique sources the call for AI. For Ellul, Technique is “the totality of methods rationally arrived at and having (for a given stage of development) in every field of human activity” [47]. In the same line of thinking, technological problems can only be solved within the confines of technique, for technique sets the horizon of what is possible, indicating the ways forward.

In this setting, AI [48] is the disruptive technical way to the future: general enough to allow for dual uses at all levels of society’s production, AI can be tailored to the problems it addresses. AI can be a tool in the fight against global warming in spite of its dependency on electricity that hinge on fossil fuels [49].

- **Ubiquitous observer.** AI is capable of intensive surveillance. While AI can help companies in maximizing efficiency, what matters more for the ends of climate governance is the capacity it brings to provide data, and precisely evaluate anthropogenic factors driving global warming. Monitoring is a normal activity for satellites using sophisticated probes and algorithms to seize and evaluate the transformations that human activity has produced on Earth systems [50]. A case in point is the use of AI in satellites [51], scrutinizing the atmosphere [52], gathering data integrated into a complex scientific system of observation available to global users.

In confronting the problem of actants behavior, data gathering, and surveillance advance the conditions for exerting accountability. Information is crucial in the chain of activities that integrate the notion of climate governmentality. Surveillance links actants to activities producing anthropogenic emissions. Climate governmentality necessitates gathering reliable data on fossil fuel-related emissions. It then assesses its impacts on Earth and social systems, following the UNFCCC that includes 34 essential Climate Variables [53] involving observations from space [54].

- **Technical amplifier for scientific knowledge and superior calculator.** AI builds upon previous technological revolutions, as big data [55]. Big data involves colossal datasets requiring a scalable architecture for efficient storage, handling, and analysis, featuring Volume, Velocity, Variety both in structured data and unstructured data, Veracity, Variability, Visualization, Value to improve decision making. Building from such qualities, AI can compile and extract information for fighting global warming. As an example, the UN early warning system [56], following the scientific advice of the (WMO) released two major strategic proposals to ensure early warnings [57], for all regions of the planet. Additionally it has also proposed a Greenhouse Gas monitoring system as part of the support for the United Nations IPCC Intergovernmental panel on Climate change (IPCC).
- **Universal mediator.** Considering that systems are operationally closed while remaining cognitively open, AI can highlight obscured notions that systems need to integrate in their sense-making production. This task can be developed by an AI observing the blind spots of organizations and systems, identifying which notions would allow for transitioning from a carbon locked-in [58] status towards a carbon free productivity model.

Reflexivity in systems yields distinct outcomes. For instance, the oil and gas industry recognize the environmental call to stop emissions as there is a changing regulation. Concurrently, the industry perceives the stress in energy production caused by the invasion of Ukraine, and deciphers the event as an opportunity to squeeze the juice of previous investments and augment profit, while increasing its participation in the market share. Likewise, for the nation state, it is the time to secure fossil fuels without considering the vendor's ideology or respect for human rights standards.

In contrast, for victims of rising sea levels, the time to stop emissions is immediate. Between the distinct reasonings and temporalities appears the need for a translator, a universal mediator enabling the industry to see minute opportunities for profit in newer technologies while attending the facts of global warming from the scientific perspective.

AI can disclose the functioning of the organizational black box of carbon majors as to render its internal processes open and transparent [59] to environmental and ethical critique, increasing the spectrum for regulation.

- **Time accelerator.** AI, supported by supercomputers, accelerates calculations, and optimizes informed decision making. While duration is objective, organizations consider timeframes and construe their distinct temporality. For a system, time it is about how long it takes to perform the system's operations. While the extent remains the same, both its perception and the cumulative effects of calculation are intensified. This can be used for accelerating the pace of reduction of CO₂ and other anthropogenic gases. Several paths are considered. First, AI can use actual big data and calculating capacities numbers to compare Carbon Majors emissions; with their pledges and the Sustainability Development Goals SDGs, over three dimensions:

1. Big data dimension [60]: Encompasses corporative and national production of global warming emissions in their relationship with discernible patterns [61] arising from big data, gathering self-disclosure mechanisms and their drivers.
2. Measuring actual anthropogenic emissions. Contrasting existing data from self-disclosure mechanisms to data arising from novel surveillance tools such as the satellite viewing of global warming emissions.
3. Dodging path dependencies. AI can use statistical models inscribed in deep learning for anticipating the probability of future events. Banks are important stakeholders financing fossil fuel companies [62]. The Basel agreements [63] seek the stability of the global financial systems. For banks, the prospect of market risk losses is calculated using ES, a mathematical formula that implies a time horizon in relationships with a level of confidence in which the capital is defined by the shortfall. This supplements the coverage to the average loss once the threshold is exceeded [64].

AI can identify ES [65] and convey the risk of carbon majors' investments for banks. Banks can suffer market losses associated with global warming. AI can also integrate the liquidity risk that results from a changing regulatory environment for the companies. AI can produce models of future states of companies [66].

Furthermore, AI can produce model of future states of companies in and outside of the carbon path dependency. AI can teach companies how to replace fuels, while market simulation tools such as CarbonSim EDF's can help investors to reduce pollution at the least cost [67].

- **Restorer of broken causality [68].** In the context of a global society defined by social differentiation, there is a separation between scientific knowledge of facts and how such knowledge is integrated as part of the topic matter of the legal and political systems [69]. Allocating legal responsibility for wrongdoing requires a clear regulatory framework and a strong causality link between actions and deleterious consequences, helping to establish the liability for wrongdoing. AI can help in restoring the link between distinct carbon emissions and EWE, using techniques such as probabilistic climate event attribution studies [70], and similar statistic AI enhanced calculations, facilitating litigation. [71].

6.11 Conclusions and Discussion

This analysis offers a scaffold to understand and explore ways to enhance the governmentality of climate. The sections provide an entry point to further develop specialized studies that can effect transformative action. Some of the findings are:

- Insufficiency of current UNIL structures
- Uncoordinated communications between science, the political and the law as social systems.
- Necessity to comprehend the cognitive mechanisms of organizations that cause them to disdain existential risks.
- The governmentality of climate change demands to tackle actants.
- In the absence of an overarching supra national law system, national jurisdictions that include environmental protections advance the process of enlarging governmentality.
- Rulings necessitate restoring the causal link between emissions, extreme weather events and liability.
- Artificial intelligence offers promising paths, if contained within ethical and human rights protections.

To date, the UNIL system is incipient, displaying mixed signals from a variety of partial systems while lacking the self-reference that would allow it to rule over its parties. Scientific truth has been integrated in the IPCC but contends with the communications from the economy, that have so far prevailed in the decision-making of parties. Carbon majors cause the majority of anthropogenic emissions remaining in carbon lock-in.

Legal causation needs strong fact checking for EWE to be linked to the actions of the direct emitters of anthropogenic warming gases. EAI is well placed to helping restoring causation between emitters and EWE.

In respect to the core notion of reflexive behavior, AI has superior surveillance capacities which place it in the position of being a second order observer of the comportment of carbon majors. Furthermore, its translational abilities can enhance the capacity of media of communication to pierce the reflexivity of carbon majors.

Awaiting the birthing of an autonomous legal international system, AI can help overcome the schism between knowledge, intentions, and actions. If disciplined by hard law, AI can integrate both the protection of human rights, the notion of stewardship and the UN sustainability goals. This is to balance the part of each as to orient a virtuous ethical AI.

Discussion

The crucial problem remains relating to the form and boundaries of AI. AI is a complex, and even more convoluted form of derived complexity that has blossomed under the umbrella of corporations and powerful national states. AI displays the attributes of alienation of other complex technologies, developing on its own a path far from the needs and values of humanity. How can we steer its behavior?

Two major dangers emerge at first sight. First, the dangerousness of a technology integrating efficiency and economic coding within organizations, worsening the already wicked problem of path dependency. Second, remains the threat of excluding the notion of accountability before human rights, and the welfare of populations.

Conclusion

At the end, understanding actants as liable doers amplifies both the notion and the practice of governmentality. Furthermore, there is a direct gain for the level of humanity: we can reclaim spaces for exerting human freedom. We can remember how profound is our need for nature. We can then see ourselves and our communities intensely intertwined with all beings. Ultimately, we can recognize the planet as a whole vessel for life perseverance.

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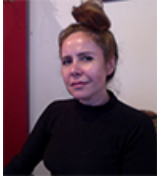
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About the Author



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CHAPTER

A Transdisciplinary Approach to Hospitality and Habitability in Healthcare Settings

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T*his article intends to contribute to the theoretical work concerning the relationship between spaces/settings and user's well-being in the context of healthcare organizations. Using a transdisciplinary approach anchored in psychosociology, the article stems from the conceptual contributions of Environmental Psychology – namely, Ulrich's Theory of Supportive Design – and articulates it with the Sociology of engagements. Namely, the aim is to combine the conceptual patrimony from both fields to more acutely identify and differentiate the plurality of evaluative frameworks patients/users mobilize concerning how clinical spaces/settings should be configured to safeguard their psychological well-being. Namely, two specific concepts from Sociology are integrated into the analysis: hospitality and habitability. We intend, thus, to elaborate the first proposal of a more nuanced conceptual model on person-environment relations that allows mitigating ambiguities identified when analyzing users' evaluations of clinical spaces/settings. A deeper understanding of these relations can, in turn, favor patients' resilience and health organizations' sustainability.*

Keywords: Transdisciplinarity, Theory of Supportive Design, Sociology of engagements, hospitality, habitability.

7.1 Introduction

The relation between spaces/environment and individuals' well-being constitutes an object of questioning that is transversal to several disciplinary areas. Its complexity favors, to this extent, the undertaking of transdisciplinary perspectives, summoning concepts and methodologies from different fields, transcending and integrating disciplinary paradigms, to obtain knowledge progression and advances in the practical interventions on social problems and concerns [1].

Among the transdisciplinary areas developed toward research and action, the intervention of Psychosociology stands out. Indeed, Psychosociology focuses on the relation between person and environment, with particular focus on the mediating systems between the individual and society – namely, organizations and institutions [2]. The privileged angle lies in the relationship between external conditions (practices/activities and settings) and individuals' psychic processes and experiences. It intervenes, therefore, in the organizational/institutional arrangements to foster an essential function: ensuring a supportive environment for individuals' actions and mental space [2].

The present article is placed precisely in the Psychosociology field, a discipline whose main characteristics are the approach and contextualization of a given phenomenon in which the method of evaluation involves a synthesis of theoretical perspectives [3]. Namely, if Psychosociology is anchored in the contributions of Social Psychology, Environmental Psychology, as well as of Sociology and Anthropology, this article stems particularly from the theoretical-conceptual heritage of Environmental Psychology and articulates it with contributions from Sociology. The purpose is to provide a different outlook on the interaction dynamics between social and psychological processes, in terms of organizational arrangements and individuals' well-being.

With regard to the work developed on the relation between the design of environments and psychological states, gaps can still be identified at a theoretical level [4]. Transdisciplinary perspectives can, in this sense, allow a broader and deeper understanding of the relation between the individual and the environment [4]. In this case, the focus is placed on the clinical/hospital context, namely on the impact of the environment – both spatial (physical characteristics) and socio-functional (social and organizational relationships) – on patients' recovery processes and well-being [5].

Precisely concerning these theoretical gaps, this article aims to contribute to the development of conceptual instruments for evaluating physical and socio-functional environments in the context of health care provision. We chose the *Theory of Supportive Design*, developed by Roger S. Ulrich [6] [7] [8], as a ground-breaking work within Environmental Psychology concerning the impact of hospitals' physical and socio-functional arrangements on patients' recovery and psychological well-being [9] [10].

The effort to expand and advance the analytical scope of this theory is made through the articulation with contributions from the theoretical framework commonly known as *Sociology of Engagements* [11] [12] [13]. Namely, the aim is to infuse two concepts developed within the orbit of this conceptual structure, concerning how social actors relate to their surrounding environment: *hospitality* [14] and *habitability* [15].

Specifically, the article aims at a first exploration of how the analytical dimensions integrating Ulrich's theory – *sense of control*, *positive distractions*, and *social support* [6] – can encompass *hospitality* and *habitability* as sub-dimensions valued by users/patients in how they evaluate the environment in a clinical context. Particular focus is placed on the dimension sense of control to illustrate the potentialities of combining both theoretical constructions. Data from a research project that comprises the analysis of patients' experience in clinical contexts – namely, within Assisted Reproductive Technologies (ART) – provides the empirical material to achieve this desideratum.

We intend, thus, to contribute, within a transdisciplinary approach anchored in psychosociology, to the development of the conceptual model on organizational environments, in a perspective of the relationship between individuals' *psychic life* and *organizational functioning* [3]. In a hospital setting, space disposition and organizational factors can impact patients' recovery process and psychological *resilience* throughout their therapeutic process [16]. The development of more nuanced conceptual tools concerning the individual-environment relationship can favor more effective clinical practice guidelines towards that resilience and, concomitantly, promote the improvement of healthcare systems' quality in a perspective of *sustainability* [17]. We proceed, therefore, with a description of the theoretical-conceptual framework that guides the analysis, with a specific focus on the *Theory of Supportive Design and Sociology of Engagements*.

7.2 Theoretical Framework

a) Theory of Supportive Design and its operationalization

The postulate that the physical environment is an important factor for improving the patients' well-being in a hospital environment and, consequently, in the clinical outcomes obtained, has a long bearing [18]. A fundamental orientation underlies this focus on the relationship between space and the therapeutic process: treating patients not only as *clinical objects* but also as subjects endowed with singularity, by listening to and integrating their needs and preferences in the therapeutic process [19] [10]. It is on this wider perspective about how patients' needs are conceived and attended to that the notion of *patient-centered* care is based [19]. Notwithstanding its different dimensions and manifestations, this guiding concept in the

provision of healthcare was built from the 1970s onwards in opposition to the biomedical model in the way of understanding and exercising clinical practice – focused exclusively on identifying and treating typified pathologies in the human body [19].

It is in the research context of *patient-centered* healthcare that Roger S. Ulrich's influential *Theory of Supportive Design* [6] [8] emerges within Environmental Psychology. This theoretical-conceptual framework aims to account for the impact of environmental factors on attitudes and satisfaction of health facilities' users. The notion of *supporting* refers precisely to environmental characteristics that promote or help patients' coping strategies and their recovery concerning the stress that accompanies the illness experience and their therapeutic trajectory [7]. In fact, functionally effective but psychologically adverse spaces are potentially generators of adverse psychic conditions. Hence the importance of promoting spaces that are not only efficient, but also capable of providing psychological support [6].

Concretely, Ulrich's *Theory of Supportive Design* provides a conceptualization of how the physical and socio-functional environments affect patients' well-being – particularly, with an impact on their stress levels. The promotion or restriction of well-being in the context of health care depends, according to this theoretical framework, on socio-environmental factors organized into three major dimensions: *perception of control*, *positive distractions*, and *social support* [6].

The *perception of control* is related to the patient's ability to modify aspects of the surrounding physical and socio-functional environment. This dimension corresponds, therefore, to the human beings' need for *self-efficacy* in their relation with the surroundings, with an impact on their psychic processes (i.e., levels of well-being). Situations or external conditions that cannot be controlled therefore constitute stress-enhancing environments [6]. In this dimension, an approach in terms of designing hospital spaces that favors a supportive environment and that reduces stress factors encompasses characteristics such as: the ability to access visual privacy and control personal information; control over amenities of the hospital room (light, temperature, bed position, etc.); access to controllable technology (music, television, entertainment, etc.); access to services (food, beauty services, SPA's, etc.); control over aesthetic elements (e.g., choice of artwork or other ornamentation elements), etc. [6] [9] [10].

In the case of *positive distractions*, this dimension concerns the physical and socio-functional configuration of spaces that responds to stimulation likely to reduce sources of stress for patients. In addition to the patient's control over the characteristics of the surrounding space (in particular, the recovery room), certain visual and sound stimuli included in this category have an impact on patients' well-being: sunlight, ambient aromas, artwork, wall's color, music, suppression of disturbing sounds (e.g. phone rings), etc. [4] [6] [9] [10].

Finally, *social support* is the last dimension regarding the impact of socio-spatial characteristics that mitigate stress in a clinical context. Since a clinic/hospital takes the patient out of their intimate/personal environment, elements such as spaces capable of accommodating hospital visits or the presence/accompaniment of family members are important psychosocial factors with an impact on patients' stress levels [6] [9] [10].

Regarding the relation between physical and socio-functional space and patients' stress, is relevant to mobilize the concept of *resilience* [20], which focuses on contextual, social, and individual variables that can interfere with or disturb the therapeutic trajectories in terms of health problems – particularly, stress-generating factors [16] [21]. These variables are called *promoting factors*, which operate in opposition to *risk factors*, and help individuals to overcome negative results of a specific circumstance or exposure to risks [16] [21].

This psychological resilience of patients, as a fundamental component in healthcare provision, can be fostered, in turn, with the implementation of programs/guidelines (such as those concerning space layouts and architectural elements) that ensure the *sustainability* of the healthcare delivery systems – in this case, at an institutional level. Indeed, *sustainability* constitutes a fundamental element/concept of the functioning of healthcare organizations, referring to programs, forms of clinical intervention or guidelines/strategies capable of evolving and adapting to the behaviors of the targeted individuals (patients, in this case), and allowing that continuous production of benefits in terms of well-being [22] [17].

Sustainability must therefore be understood from the perspective of unifying ecosystems/organizations and the resilience of their users [23]. And, in this particular case, the flexibility and ability to focus on

patients, in a perspective of continuity and holistic attention to their specific needs, constitutes a fundamental vector when evaluating how healthcare is provided and, consequently, the benefits in terms of fostering the psychological resilience of patients [17].

However, regarding this recognition of environmental factors that impact users' stress levels, it is possible to perceive some ambiguities concerning the identification of forms of relation with the environment that contribute, or not, to the well-being of patients in how they evaluate a given clinical/hospital space – hospital room, consultation room, examination room, etc. This ambiguity can particularly be identifiable in the *perception of control* dimension.

Indeed, if well-being is rooted in the *perception of control* over the hospital environment, as one of the dimensions of Ulrich's theoretical framework, the notion of *control* is likely to give rise to different interpretations from the perspective of diverse modes of relation between the patient and the surrounding environment. Namely, in the operationalization of this theory, that concept can mean, on one hand, control in terms of communicational dynamics to meet the patient's expressed *will*. This is the case, for instance, of obtaining informed consent, to ensure effective fulfillment of the patients' will, or also the functional arrangement of a hospital recovery room to allow access and control to certain *commodities/services* (television, internet, etc.). On the other hand, a distinct situation is a modality of control over the environment that attends user's *comfort/ease*. This is achieved through a spatial arrangement that allows a personal appropriation by the patient, in the sense of allowing a design of the surrounding physical environment that favors a personalized relationship of the patient with the space – similar to the spatial arrangement in a domestic context (*home*).

This ambiguity of the aimed good targeted in the individual-environment relation can lead to certain modes of operationalization of Ulrich's theory that can hinder the identification of statistical correlations between the *perception of control* and patients' well-being [9]. A non-clear differentiation of those two distinct forms of relationship with the environment – *functional* and *personalized* – can lead to the construction of operationalization indicators of this dimension of the *Theory of Supportive Design* that do not favor a clear apprehension of the different ways patients evaluate the clinical environment.¹

It is, therefore, the *type of control* over the environment, ensuring different forms of patient's relationship with it, that can be improved in the operationalization of the *perception of control* dimension of Ulrich's *Theory of Supportive Design*. Contributing each modality of control over the environment in a different way to the patient's well-being – aiming at *comfort/ease* and/or *accomplishment of will* –, this conceptual improvement can allow, hence, the construction of more comprehensive and accurate measurement indicators for evaluating the physical and socio-functional hospital environment according to this dimension.

The theoretical framework commonly referred to as the *Sociology of Engagements* [11] [12] [13] provides conceptual tools that precisely allow greater detail and analytical reach in distinguishing the different socially valued goods in how social actors relate to their surrounding environment. Particularly, we intend to incorporate the notions of *hospitality* and *habitability* as specific normative perspectives in how patients evaluate their surrounding social-physical space (in this case, the clinical/hospital space) in terms of its contribution to their well-being. The description of this theoretical- conceptual framework is exposed below, articulating it with the *Theory of Supportive Design*.

b) Sociology of engagements – for a theoretical deepening of the individual-environment relation

If space, in its architecture and disposition, has an impact on individuals' well-being, *Sociology of Engagements* focuses precisely on how social actors relate to their surrounding environment according to different normative orientations. The notion of engagement intends, precisely, to emphasize how action depends on the way the environment is formatted – and it is in this formatting that lies the individuals' ability to coordinate their action, with themselves and with others [11].

Namely, this theoretical-conceptual framework focuses on the relationship between actors and the arrangement of *material objects* (technical-scientific objects, furniture, spaces, etc.) and intangible objects (discourses and biomedical categories/classifications, legal rules, procedural norms, etc.) that constitute a

¹This is the case, for instance, of indicators concerning the provision of *Education and support* by professionals, in the sense of providing the patient with information on medical procedures [9]. This constitutes an element of control that can be associated with a perspective of patient empowerment in terms of his capacity for decision-making, therefore, different from an assessment strictly focused on *comfort/ease* in the appropriation of the environment.

given environment. These compositions, which form a given situation, are, in turn, tributary of different *regimes of engagement*. Each regime constitutes a specific format of actors relating with the environment at a cognitive-evaluative level – *cognitive* in the sense that each regime contains a categorization and apprehension of the relevant elements in a situation, and *evaluative* in the sense that each regime contains a normative conception, in terms of a certain socially valued *good* which is aimed [12].

In this way, the cognitive and evaluative dimensions of regimes of engagement can be transposed to studies within the scope of Environmental Psychology – focused precisely on the relationship between the formatting of situations and the actions/attitudes of the actors, with an impact, in turn, on their psychological well-being. It is through congruence in person-environment interactions – therefore, between the actors' normative expectations and the effective formatting of the environment – that individuals' well-being is achieved [5] [2].

Three regimes of engagement can be distinguished according to different socially valued goods aimed at and that, therefore, contribute in different ways to individuals' well-being. These regimes differ according to an analytical axis that goes from the general to the particular – that is, from collective conventions that serve as normative references when acting in the public space to the more local and personal acting references. It is precisely through these different goods as normative horizons – substantiating a heterogeneity of the actor's relationship with the environment [24] – that the surrounding environment supporting action is formatted [11] [12]. The conceptualized regimes of engagement are the *regime of plural orders of worth*, the *engagement in a plan*, and the *familiar engagement*.

In the *regime plural orders of worth*, action is oriented with reference to different conceptions of the common good (expressed by different *orders of worth*). These orders constitute publicly consolidated conventions that actors mobilize to qualify (classify and hierarchize) the different situations composed of different *beings* – individuals, objects, and relational formats [25]. This is the case, for instance, of *efficiency* as a conception of the common good expressed by the industrial *order of worth*. This convention is supported by beings qualified to express this *worth* (e.g. *experts, patients, technicians, technical instruments, procedures/protocols*, etc.).

In the *regime of engagement in a plan*, the space is functionally prepared, with the aimed good being the *satisfaction of accomplishing an action* [11]. The action is, thus, oriented towards the achievement of certain aims, through an environment properly formatted for this purpose. The environment is constituted by beings that support different *orders of worth*. For the case under analysis, associated with the hospital context, the beings endowed with *industrial worth* take a central place – in the form of *performance indicators, parameters, clinical procedures*, etc. However, when inserted in a prepared functioning space, the conception of the common good that these beings express is reduced to the functional properties of an engagement in a plan. Meaning, the evaluation of the situation is restricted to the objective of the plan of action, rather than referring to any characterization of the common good [26].

Finally, in the case of the *regime of familiarity*, the aimed good corresponds to *comfort/ease*. The action takes place in an environment formatted according not to far-reaching conventions or markers for a functional appropriation, but according to localized, personalized references, built by a person or by the set of actors who share a set of personal meanings [24] [11]. This is, therefore, the regime of action associated with the *proximal sphere* [15] – of close family and friends. It is this familiar mode of relation, through the individuals' gradual forging of personal/intimate bonds with the people close to them, the environment, and the objects that compose it, that constitutes the basis of the constitution of the personality of each social actor [24].

It is precisely in the regime of familiar action that the concepts of *hospitality* [27] [14] [28] and *habitability* [15] [29] are integrated as normative principles for guiding action. Namely, both cognitive and evaluative frameworks [12] focus on the plurality of intimate bonds between actors and space, favoring the recognition of diverse forms of personal engagement with the environment – and which are fundamental to preserving the consistency of the person's personality/subjectivity [30]. Therefore, both concepts presuppose a spatial configuration and relational dynamics with the environment distant from evaluations in generality – oriented, for example, towards *effectiveness* in the evaluation of clinical spaces, organizational norms and practices, or according to functionality criteria.

The grammar of *hospitality*, as a normative framework that can be used to evaluate the arrangement of spaces, procedures, and interactions, concerns the evaluation of an organization's *plasticity* – its ability to accommodate users' particularities and vulnerabilities [27]. *Hospitality* refers, therefore, to the ability of institutions to open up to their users, to welcome them, through an active malleability to accommodate users' singularities [14]. If a healthcare organization is based on conventions and standardized norms that regulate and support all activity and treat people in generality [26], the focus on *hospitality* as a normative reference aims to favor the promotion of spaces, procedures and relationships (also) capable of considering the singularities and differences of each user [31].

Hospitality, as a normative reference for action, arises, then, from asymmetries in how people appropriate places and objects and in terms of their capacity for participating in the organizations. It manifests itself, therefore, in an attention to each person's intimate bonds with the environment (intimate forms of action and meanings, outside the conventions and standardized norms that regulate organizations) and vulnerabilities (which condition an engagement of a person exclusively through conventions and standards) [27]. Through these engagements in proximity, *hospitality*, as a modality of action, aims, therefore, to obtain from a person a full participation in that space [27] – ensuring, in this case, the patient's engagement in the therapeutic trajectory.

The *grammar of habitability*, in turn, concerns the ability of the environment to involve the human body in a familiar space, favoring *comfort/ease* [15]. It presupposes a spatial and socio-functional configuration that allows personalized ways of acting, intimate traits, and idiosyncratic gestures that constitute the fundamental expression of each person – of their personality. Therefore, fostering *habitability* refers to the intervention in a space that lacks comfort and the capacity for physical and emotional reassurance, resulting from the rupture with the individual's proximal environment (i.e., home, family, friends, etc.) [29]. This disruption results, for instance, from the insertion of the person in a hospital/clinical context, as a space functionally prepared and formatted in reference to conventions (in particular, *effectiveness*).

Habitability distinguishes from *hospitality* insofar as it is not based on an economy of exchange, of transaction, between those who *welcome* and the *welcomed*. There is an appropriation of space by the person, under a model of familiarity, allowing to create of a close and intimate space that the entrance into the functionally prepared clinical space contradicts [15]. By giving the capacity of familiar appropriation of a space to the person (e.g., a recovery room in a hospital/clinic), *habitability* departs from *hospitality* as a relational dynamic between patient and professionals, relegating it to a mere contingent dimension [15].

Through a *Sociology of Engagements*, stress can, thus, be conceptualized as a disturbance in the actor's relationship with the environment from the point of view of two aimed goods: (a) *ease/comfort*, if an environment limits the presence of persons, objects and forms of relationships that characterize the *proximal sphere*; and (b) the *accomplishment of the will*, when there are constraints in the capacity of the individual to achieve the objective aimed by an action plan (and/or failure to achieve that aim).

Precisely, through this theoretical-conceptual framework, the entry into the clinical/hospital space can have disruptive effects from the point of view of the coherence of the biographical trajectory and consistency of their personality [30], therefore, inducing *stress*. These disruptive effects stem from an oppression of the *engagement in a plan* [26], in the sense that the accomplishment of the therapeutic project in a clinical context – as functionally formatted environment according to an *engagement in a plan* – can overlap other forms of engagement of the actor. This is the case, with particular focus in this article, of the coartation of the relation with the surrounding environment associated with *comfort/ease* – associated, therefore, with the *proximal sphere* as the base of the actor's personality [15].

Thus, as *hospitality* and *habitability* are central elements in maintaining personality consistency [30] [24], they constitute, to this extent, *resilience* factors [20] for patients in the face of a disruptive context, like a hospital setting. In particular, these elements can mitigate the stress that the entry into the clinical environment is likely to generate – in particular, the disruptive effect of entering and staying in a functionally prepared context, therefore, potentially oppressive for the patients' *familiar engagement* with their environment [26] [30]. To that extent, both normative frameworks for formatting situations (either in terms of the design of physical spaces and socio-functional disposition) can be factors that encourage patients' permanence in the therapeutic trajectory, threatened by the *stress* that this experience entails.

In service of patients' *resilience*, the *sustainability* of these spaces and situational arrangements is precisely put to the test from an ethical-social point of view. In other words, these environments are also evaluated by their flexibility in terms of focusing on users'/patients' specific needs and singularities. And the application of mechanisms for assessing needs and implementing sustainability strategies [17] depends precisely on conceptual models that encompass this normative plurality in how users evaluate the surrounding environment.

It is precisely this conceptual distinction between normative orientations – in particular, between *engagement in a plan* and *familiar engagement* – that can be combined with the *Theory of Supportive Design* for a deeper understanding of actor-environment dynamics of interaction in a clinical context. In particular, the *perception of control*, as a dimension of evaluation of the characteristics of physical/spatial design and social atmosphere/ambiance in a clinical/hospital context, can encompass two aimed goods: the ability of the environment to meet the patient's *will*, associated with the *engagement in a plan*; but also the ability of the actor/patient to modify/shape the surrounding space accordingly to his singularities, in a perspective of *hospitality* and *habitability*. The latter form of appropriating the space is, therefore, distinct from that which is based on a functional preparation for achieving a goal.

It is, therefore, based on this articulation of concepts, that we intend to analyze the issues of *hospitality* and *habitability* as normative frameworks that patients can mobilize to evaluate spaces (besides their functionality) in a clinical context. Thus, we seek to explore socio-cognitive processes in a clinical context – specifically, in ART –, analyzing the relationship between social and psychic processes from the perspective of users' well-being [2] from the specific angle of those two concepts.

Indeed, in the scientific literature around the impact of physical and socio-functional characteristics of spaces that promote or restrict well-being, and in the operationalization of Ulrich's theory in particular, little attention has been paid to the incorporation of elements related to *hospitality* [10] [14], as well as *habitability* [15]. Both notions, presenting specificities in terms of modalities of relation between actors and the surrounding environment, are crucial elements in the design of spaces concerning the well-being of users.

The *Theory of Supportive Design* encompasses, as mentioned, three dimensions: *perception of control*, *social support* and *positive distraction*. The analysis undertaken in this article focuses, however, on the *perception of control* insofar as it is the one that can lend itself to more ambiguities in terms of the different forms of the actor's relationship with the environment from the point of view of the aimed good intended to guarantee his well-being. Indeed, if the concept of *perception of control* refers to the individuals' ability to "change, modify or transform the environment according to their needs" [9: 130], it is imperative to dissociate a capacity for self-efficacy in action allowed by a functional formatting of the space for the achievement of an goal from an appropriation of the same space in terms of the *comfort/ease* provided. For a clear dissociation of these different aimed goods, the incorporation of the concepts of *hospitality* and *habitability*, intends, therefore, to contribute to the conceptual improvement and respective operationalization of Ulrich's theory through a transdisciplinary approach.

7.3 Methodology

The presented data was collected from a broader research project developed in Portugal. Having as a central issue the plurality of meanings produced by ART beneficiaries and professionals around *in vitro* human embryos, the research encompasses other analytical dimensions related to the experience of ART patients/beneficiaries: experience and conceptions around infertility, experiences and evaluations concerning the therapeutic trajectory, relationship with health professionals, etc.

To capture these several dimensions, the methodological protocol covers inquiring ART beneficiaries/patients and four ART professional groups – medical doctors, clinical embryologists, nurses, and psychologists. In the specific case of beneficiaries, whose perspective is privileged in this article, the inquiry comprises an online questionnaire and semi-directive interviews. Considering the object under analysis, this article focuses specifically on the empirical material collected from this latter technique for data collection.

A total of 69 interviews were conducted, five of them with couples, corresponding to 74 respondents. The interviews took place between September 2019 and January 2021, and were conducted by the same researcher. The sampling (non-probability for convenience) follows a fundamental methodological criterion: the selection of ART beneficiaries with at least one cycle of second-line treatments – *In Vitro Fertilization* (IVF) and *Intracytoplasmic Sperm Injection* (ICSI) – started or completed. The appeal for the participation of potential respondents was carried out through online forums – social networks or blogs related to infertility –, as well as through associations that support people with fertility problems.

In a brief description of the sample, most respondents are female (approximately 92%). Also, in the majority of interviewees, the resort to ART treatments is framed within a heterosexual parental project (90.5%); only five respondents are associated with homosexual parental projects and in two cases the access to IVF/ICSI is part of a single parental project. Furthermore, most respondents have higher education (81.8%), with a significant percentage presenting also some postgraduate degree – Master's or Ph.D. (35%). Moreover, only five interviewees are of non-Portuguese origin.

The content analysis of the interviews – recorded and transcribed in full – was supported by the computer-assisted qualitative data analysis software MaxQDA (2018 version). The analysis undertaken is of a *categorical* nature, to carry out a comparison between interviewees' discourses and highlight associations and variations of perspectives, according to a set of themes covered by the research project.

In this article, the judgments issued by beneficiaries about their experiences in ART centres – public units or private clinics – are examined. Their evaluations concerning the experience in different spaces in a clinical context (exam room, recovery room, visiting room, etc.) are privileged, covering both architectural and organizational/functional dimensions. In particular, the focus is on how respondents assess the functioning and arrangement of different clinical spaces, in light of a normative plurality in terms of individuals-environment relations. The evaluations captured from the discourses account for not only issues such as *functionality* or *effectiveness* in the functioning of these medical care units, but also the ability of physical spaces and socio-functional features to meet requirements of *hospitality* and *habitability*.

7.4 Results

In the analysis undertaken of the interviewees' discourses regarding the experience during their therapeutic trajectory in ART, three analytical axes emerge that integrate the dimension related to the patients' *perception of control* in a clinical context: (a) *perception of control over private information*, (b) *perception of control over intrusive elements* and (c) *perception of control over intimacy*.

Each of these analytical axes is explored. We intended to address the extent to which they substantiate evaluations of the hospital/clinical environment from the perspective of the ability to ensure the patients' well-being – particularly, the well-being associated with the *comfort/ease* provided by physical spaces and their socio-functional aspects. *Hospitality* and *habitability* emerge, namely, as normative horizons that guide how the environment is put to the test [11], evaluated, by the interviewees. And it is precisely the fulfilment (or not) of these formats of relation with the surrounding environment that, in turn, has consequences on the interviewees' psychic well-being as patients.

a) Perception of control over private information

The first analytical axis regarding the *perception of control* over the environment concerns the ability to dispose of one's body, more than in the sense of the fulfilment of the conditions of the expression of consent/will, in a perspective of preservation of the personal sphere and hence, the patients' *comfort/ease* – potentially compromised by hospitals' organizational norms. This is illustrated in the first excerpt, in which the respondent's evaluation of her therapeutic experience focuses on a specific socio-functional element of hospital functioning as an organization:

Diana: Let's imagine, I go to an appointment. . . Hypothetically, I go to an otolaryngology appointment, at the hospital in [name of the city]. . . but my card has my hospital user number. . . has a giant label, with my name and it says underneath Sterility Service. . . So, I'm going to present that card at every other medical specialty where I eventually have medical

appointments... And I believe there are people who feel very uncomfortable carrying this card [Laughter] because this card, later, will be used for all appointments a person may have...

Being a hospital's activity regulated by *standardized norms* [26], the set of rules that guide actions and interactions in this context, suitable for the treatment of individuals in generality (in this case, according to the condition of patients attached to a specific medical specialty) can conflict with the patients' sphere of decision-making in terms of the intimate information to be revealed. It is the excessive production of normative references to ensure the readability of the actors in the functionally prepared space, according to the *regime of engagement in a plan*, that is the object of criticism [29].

The perspective from the perception of control, having *comfort* as the normative orientation, focuses therefore on the prospect of publicizing information regarding patients' clinical situations as personal information. This relates to the right to an *information preserve*, i.e. the set of facts about oneself to which a person expects to control access while in the presence of others [32]. For example, the expectation that control will be maintained over biographical facts about the individual divulged or shared with other people.

Therefore, the interviewee's evaluation addresses the importance of situational configurations that safeguard patients from the exposure of vulnerabilities associated with their medical condition (e.g., infertility and the related social stigma). It is this *control* over the boundary between the public sphere and the intimate sphere that, in the interviewee's opinion, confers to the described situation an *inhospitable* nature [14] – insofar as it consubstantiates a loss of control over the body associated with a violation of privacy [33].

In the context of this control over private information, the respondents' views also include the arrangement of different clinical physical spaces – in particular, the way in which privacy is likely to be compromised by the configuration they assume. This is evidenced by the perspectives conveyed by the two following interviewees, in which the *habitability* of the layout of hospital spaces is evaluated:

Diana: “To make things faster, sometimes there are two people inside a consultation room changing clothes while another is doing an ultrasound, separated only by a folding screen... and the other person is doing the consultation... [...] And I think this shouldn't happen. I'm not supposed to be listening to the medical advice someone is giving a patient. So, you're saying, 'You're going to take this to trigger ovulation. You can't have sex in the previous hours'. These are private matters and I'm not supposed to be listening to, even though I'm going through the same thing”.

Cecilia: “For example, I was going to do a monitoring ultrasound. [...] The room was very narrow... The hallway door was sometimes open. [...] We undress behind this folding screen. When you move to the examination table you come out of the folding screen. So, people who are passing in the corridor... It's a corridor where not only medical personnel or nurses or auxiliaries pass, but also some couples who are leaving other appointments. And, therefore, you do this little show off for the people who are passing by.”

In both cases, the evaluation made is based on the configuration of the space, but also considers the organizational elements (such as managing the presence of patients in a consultation room), as factors likely to favor situations that violate the separation of the public sphere from the private, through coercive advertising to third parties. It is in this perception of lack of control that the *uninhabitable* character attributed to a space or situation can reside [27].

As the first interviewee mentions, the similitude of situations (“going through the same thing”) that place both persons in the same equivalence class (as patients), to which standardized medical instructions are attached (such as the timing of sexual intercourse during medication), should not hinder an arrangement of space capable of safeguarding for each patient, as a singular person, control over information that contains elements belonging to the intimate sphere – a control that ensures, in this sense, the patient's *ease*.

On the other hand, in the second excerpt, the *habitability* of the space is compromised by the lack of reservation of the intimate sphere. The space is characterized by an equivocal status of spaces, presenting porous zones between areas for the patient to *inhabit* (assuring her privacy) and space of circulation (where individuals are treated in generality). Consequently, the separation between public/private is neutralized

[29]. The ironic comment of the interviewee (“you do this little show off”) precisely aims to emphasize her corrosive evaluation regarding a deficient arrangement of space in light of the grammar of *habitability* as a normative reference.

b) Perception of control over intrusive elements

The second analytical axis concerns the interference of intrusive elements, but not in the sense of dispersion in terms of what is the appropriate degree of information made available to – or from – the patient. Differently, the focus is on the control over elements of the surrounding environment that can have disruptive effects on the practical relationship of actors with themselves, also in view of ensuring their *comfort/ease*. This disruptive effect of a hospital context can be generated by failures or uncertainties concerning clinical objectives (within the *engagement in a plan*), but also by failures in creating spaces for intimate atmospheres in a clinical context (associated with the *familiar engagement*).

It is precisely the ability to protect the patient from situations that may expose their vulnerability in a clinical context, in terms of a failure in both forms of relationship with themselves (and which are detrimental to their well-being), which is also evoked by the interviewees. On this issue, the testimonies account, firstly, situations that put emphasis on their vulnerability associated with the therapeutic trajectory (in particular, the context of infertility). It is the perception of control over these elements associated with the layout/configuration of hospital spaces that emerges from the following excerpts:

Mila: “The first thing I heard when I entered the birthing block was a child being born next to me. . . [. . .] And that is very difficult for you to deal with. Or you’re being transported to the delivery block and the corridor is covered with photographs with newborn babies from the block, you know? There is no tact, there isn’t. . .”

Valentina: “A situation that happened at [name of hospital], which at the time really angered me, was having. . . [. . .] the pediatrics service in the same room as the medically assisted procreation treatments. I was in the waiting room with mothers and their babies, waiting to know the result of my treatment. . .”

Ema: “It’s a maternity hospital. . . You see pregnant women everywhere and that had a very, very negative impact. It was painful. [. . .] Or to see... For example, I once went for an exam in the hallway where I heard that an abortion had been done...”

Despite the particularities that differentiate them, the different experiences reported, share a common thread in the evaluation made: an assessment of the clinical/hospital space that goes beyond a focus on its functional configuration, ensuring the achievement of the intended goal, in the form of a therapeutic plan, as the aimed good [11].

Indeed, the testimonies refer to the *hospitality* in the arrangement of the clinical environment, in the sense of the ability to attend to the vulnerability of the beneficiaries in a context of uncertainty that characterizes their therapeutic trajectory, namely the moments of failures or setbacks in the accomplishment of the parental project [34]. There is also the coexistence in the same hospital space of users with different (and contrasting) clinical purposes (“an abortion had been done”). These experiences are, therefore, evaluated as *inhospitable*. The arrangement of physical and socio-functional settings does not raise criticisms from a functional perspective; it’s negatively evaluated because environmental elements that fail to pay attention to situations of vulnerability associated with the impact of the infertility experience on the patients’ biographical trajectory and, hence, their well-being [30].

Considering precisely the vulnerability that accompanies the experience of couples/beneficiaries in the context of ART, the hospital’s recovery room space constitutes, in this sense, a central element in the assessment of the therapeutic experience – particularly, in terms of the capacity of *habitability* provided. This is illustrated in the next excerpt:

Lena: “And they have little rooms, almost like a hotel room, when the person is recovering. . . While in [name of a hospital] it was. . . [. . .] In that area of the sutures, people are only divided by curtains, so you can hear everything... It was the person who had broken his finger

or... The person who was doing a suture here or there... And then you hear everything. In other words, you hear... a person who says 'Look, it went really well, we got ten embryos, everything is great'. And then next to us, 'Look, we only got two' or 'We only got three', or 'We didn't get any'. And you hear the couple celebrating or you hear the sad couple. There is no privacy in the treatment. . ."

The *habitability* of the space resides, more than in the set of services or objects present/available, in the privacy it provides to patients and their family members, in the sense of favoring a singularizing appropriation of space, allowing relational forms associated with the intimate sphere. This *familiar engagement* is, hence, not favored by the sensorial appropriation of elements external to the couple's intimate experience. Elements that integrate the space to ensure privacy as a form of control over one's body (such as "curtains") are, therefore, precarious when put to the test [11] from the perspective of this grammar.

The comparison with a hotel room made by the interviewee is essential to understand the perspective conveyed. Apart from any evaluation from the point of view of the commodities present and the control that the patient has over them [9], the respondent focus is the perspective of control associated with the *familiar engagement*, of recreating a proximal space in a clinical/hospital context that is evaluated in terms of its importance for the patients' well-being. It is through that capacity of protecting intimacy in a clinical context populated by different individuals (with their respective therapeutic plans) that the quality of the space is primarily assessed ("you can hear everything"). The relation between hospital rooms similar to hotel rooms and the well-being of patients [10] is therefore associated with the *habitability* provided – apart, therefore, from an assessment of the functionality of the commodities present, associated with an *engagement in a plan* as a normative reference in the person's relationship with the environment [13].

This capacity of the space to provide *habitability*, as a capacity to favor durable ways of making the familiar/domestic world available for the patient [15], favors, in turn, their *resilience* [18] in the face of the constraints and adversities associated with the therapeutic trajectory. It is through the protection of intrusive elements – insofar as they hinder moments of the patient's relationship with themselves associated with *comfort/ease* – that the space contributes as an element for counteracting the impacts related to the clinical process as a plan of action that disturbs the consistency of the personality [30]. Namely, the space configuration can counterbalance the consequences of the clinical experience as a trajectory that disturbs the actor's relationships with himself and with others within the *proximal sphere* – with an impact, therefore, on the patient's psychic well-being.

c) Perception of control over intimacy

The final analytical axis that stands out from the patients' discourses focuses on the control from the point of view of an appropriation of the clinical space in which there is room for the couple's intimacy – that is, relational forms associated with the proximal sphere of the beneficiary [15], specifically with regard to the couple dynamics. In fact, if resorting to ART represents the transition from the realization of the parental project from the intimate sphere to a clinical context [34], the gaze of the interviewed beneficiaries focuses on the organizational/spatial features that hospital contexts provide to endure this disruptive experience of the couple's intimate dynamics.

In the analysis of their experience in a hospital context as a space functionally prepared for the exercise of clinical practice, interviewees allude to the existence/inexistence of compromises between the *functional* and *familiar* appropriation of the surrounding environment by the patients – as distinct, but reconcilable, levels of patient control over the surrounding environment. This is illustrated by the following excerpts:

Lena: "And then at [name of a hospital], the entire ART sector. . . The space is very small. And, therefore, the whole part of being able to be. . . The men's bathroom doesn't have any privacy. . . it doesn't. . . It's not that there's something glamorous about the person having to ejaculate into a cup to do in vitro fertilization, right? But I think there are a minimum of conditions that must and can be created. At least the couple being able to do it together... It wasn't allowed."

Matilda: "One very important thing at [clinic's name], which for me was very important and I think can make a difference for many women, is the way men collect semen, ok? So, even then

we had an act of love, because they allow you. . . unlike all other places I know. . . they allow the man to be together with his wife in a room. [. . .] I think that's so, so, but so important detail for the realization of this moment, right?, of having a child. Because, in reality, the woman participates and you are there in a moment of pleasure and love and union with the man, husband, boyfriend, or partner, right?"

Both perspectives converge in the focus on a procedure (ejaculation), whose experience moves from an intimate context of a couple to the clinical context, to illustrate the importance of hospital contexts capable of building settings that integrate relational elements from the *familiar sphere* [15]. Namely, if in a hospital context the collection of semen constitutes a stage of a standardized clinical procedure, this action, carried out in a functionally prepared space, can be combined with relational forms associated with the intimacy of the couple. As mentioned by the two respondents, that compromise is achieved through space arrangements and organizational rules capable of replicating, to some extent, that intimate situation.

It is, therefore, the ability to build compromises between the clinical and intimate context, through suitable architectural and organizational devices, that the clinical experience is equally evaluated by the patients. If strictly for the execution of the therapeutic plan this socio-functional characteristic is negligible, the *habitability* of the space provides another type of control valued by patients: a control based on the regime of familiarity, as a mode of patients' relation with themselves important for their well-being.

Furthermore, these compromises between *engagement in a plan* (associated with the clinical space) and the *familiar engagement* (related to the proximal sphere) can also be obtained in the context of different therapeutic procedures, as is the case of surgical procedures. These situations in a clinical context are characterized by an intensification of the presence of objects and relationships qualified for *industrial worth* [25] inserted in a functionally prepared space. Despite this configuration, compromises can also be forged that ensure patient control associated with a more intimate engagement with the environment. This is illustrated in the next excerpt:

Vanessa: "We agreed on the day to perform the implantation [of the embryo] and, at that time, the father is invited to be present. We found that weird. And then we reflected for a while and thought, 'Well, it makes some sense, it's a form of participation', isn't it? Trying to recreate his participation in the whole process, even though the biological information is his too, isn't it?"

Again, the control resides not in a perspective of functional formatting to achieve an intended aim, but of (partial) accommodation of clinical procedures attending to the beneficiary's *ease/comfort*. At a first glance, the perspective of participation of the male element of the couple, who has no direct participation in the surgical procedure, is evaluated by the couple themselves as "weird". Being the situation evaluated according to the *regime of engagement in a plan*, any presence of elements devoid of functional utility (i.e., apart from the woman as the *clinical object*, clinical personnel, surgical instruments, etc.) is assessed as inappropriate/misplaced.

However, the presence of the partner/husband is reassessed when the interviewee adopts another cognitive and evaluative format [12]. Namely, it is the combination of the technical act of embryo transfer with relational activities from the *proximal sphere* that is aimed and valued. This perspective of *habitability* provides the patient a distinct form of control in the relationship with himself and with the environment – not associated with an *engagement in a plan* but centered on *ease/comfort*. The "biological information" of the embryo to be transferred assures the couple's plan to have biological progeny. However, it is the possibility of participation of the father in that surgical act, to "recreate" an intimate moment in a clinic context, that normatively grounds that clinical setting to be oriented towards *habitability*.

7.5 Discussion

The paradigm of the *patient-centered approach*, which has emerged in recent decades, is based on the fundamental assumption that the quality of medical treatment is not limited to the effectiveness and outcomes obtained; it also relies on the ability to meet the patient's preferences and needs [19]. In addition to the

strictly interpersonal dimension in the interaction between health professionals and patients, this holistic perspective in medical care toward the patient also encompasses systemic factors [35], which encompasses the impact of spaces design and socio-functional features on users' well-being [5] [9] [10].

This focus on the patient is a central element, on the one hand, from a *sustainability* perspective – in terms of responsiveness not only to users' decisions, but also to their specific needs in the context of healthcare provision [21]. Also, and in a combined way, that focus is equally important from a perspective of promoting the patients' *resilience*, as the ability to intervene in environmental/spatial factors that promote or restrict users' psychic health [20] [16], with consequences for their health recovery.

Indeed, when individuals evaluate organizations – including spaces and socio-functional features –, it is not just principles related to effectiveness and functionality that emerge as organizing elements of their judgments regarding professional-patient interactions, organizational norms, and clinical procedures [10]. A plurality of normative guidelines, articulated with each other, supports this evaluative work [28]. Transdisciplinary approaches can favor, in this sense, more detailed and broader perspectives that can identify this plurality that meeting patients' "preferences, needs and values" [19: 1087] involves when providing medical care.

The present article aims, therefore, to provide a theoretical contribution to the *Theory of Supportive Design* [6] [8], particularly with the articulation of the sociological concepts of *hospitality* and *habitability* in the context of medical care. The focus is particularly on deepening the dimensions of this theoretical-conceptual framework, in the sense of favoring a more refined differentiation of the diversity of formats of actors' relation with their surrounding environment. With this more nuanced capture of the plurality of aimed goods in how actors relate with space, it is possible to understand more thoroughly the different ways situational settings can impact users' well-being.

In this regard, it is important to emphasize that institutions favoring *sustainability* and *resilience* imply a greater range of normative repertoires in how they function [28]. Capturing this complexity implies, therefore, a detailed look at the plurality of forms of relationship between the actor and the environment according to different normative references. It is precisely in the calibration between these different aimed goods – in particular, in a perspective of *accomplishment of will* and of *comfort/ease* – that the physical and socio-functional space can be evaluated from the point of view of the well-being it promotes.

Thus, a clearer conceptualization of the various dimensions of Ulrich's theory allows for the construction of indicators conducive to a more rigorous assessment of this normative plurality in the person-environment relation. In the specific case of the dimension related to the *perception of control*, it can be associated not only with the ability to use objects that integrate a functionally arranged space [9], but also with a control rooted in a singularized/personalized appropriation. In the latter, this comfort-oriented appropriation is materialized either in a perspective of accommodating the space to attend patient's *vulnerabilities* and *singularities* (according to a *hospitality* perspective), or in a perspective of allowing relational formats anchored in more intimate/personal appropriations of space (associated with *habitability*).

Moreover, if in the remaining dimensions of Ulrich's theory – *positive distraction* and *social support* – this absence of a detailed differentiation of aimed goods (conceptualized through Pragmatic Sociology) has no implications from the point of view of identifying statistical correlations with the well-being [9], interpretive ambiguities may still emerge, with implications for the analytical scope of these indicators. In the case of *social support*, items/indicators such as *Involvement in social activities* [9] can be associated with different regimes of engagement – oscillating between social activities in the form of critical operations (regime of *orders of worth*), communication with professionals to capacitate the patient for the decision-making about therapeutic protocols (*engagement in a plan*) and interactions associated with the patients' intimate/personal sphere (*familiar engagement*).

Similarly, in the case of *positive distractions*, indicators such as *My attention is directed to interesting things* [9] can be associated with the *exploratory regime* [36]. This regime is oriented towards the *pleasure of discovery* as the aimed good through a constant change in the environment [36]. This type of relationship with space is, therefore, distinct from a construction of crystallized acting references, through more intimate connections to space within a *familiar engagement*.

In this sense, this conceptual distinction with the support of a *Sociology of Engagements* can also provide

important differentiation in the construction of indicators and assessment of how space impacts patients' well-being in future iterations in the operationalization of the *Theory of Supportive Design*. The same fruitful conceptual articulation can also be applied to other theoretical constructions focused on the relationship between environment (physical and socio-functional features) and user's well-being.

7.6 Conclusions

The hospital/clinic is a context in which the patient's relationship with the surrounding space is put to the test according to different normative guidelines. It is precisely this contrast between a control resulting from a space formatted for treatment in generality and other normative expectations oriented towards more personalized relational forms of patients with the environment that this article intends to highlight by articulating theoretical frameworks from different disciplinary areas.

Finally, it is important to stress that the purpose of this article is to build a communication platform through a transdisciplinary attitude that allows, if not the basis for the construction of a single theoretical-conceptual framework, to highlight the need to expose the interstices between disciplines – including the limitations and potential of the respective theoretical frameworks, formulating new problems, generating conceptual models, hypotheses, design interventions and conduct evaluations [37]. In the particular case under analysis, the relationship between environment and well-being is based on a normative complexity that is important to understand and capture through transdisciplinary articulations, thus favoring architectural constructions and spatial arrangements that foster the sustainability of organizations and the resilience of its users.

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CHAPTER 8

Sustainable Development of Nature and Society in the Context of a Systems Transdisciplinary Paradigm

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This paper attempts to substantiate the possibility of planning, forecasting, and managing the sustainable development of modern society. Disciplinary approaches have proven ineffective in addressing the complex issue of sustainable development. As a result, sustainable development turned out to be a group of concepts that reflect an idea that can be formulated in general terms. Therefore, it is important to show the possibility of solving this problem using a special scientific approach that has the necessary theoretical and practical capabilities. To achieve the goal of the article, a systems transdisciplinary approach was applied. The results of the study allow us to talk about the opening of a “window of opportunity” (2023-2030). These opportunities will allow the leaders of states and state unions to move on to planning, forecasting, and managing sustainable development based on a scientific approach. It is proposed to abandon the expert approach to solving complex problems, based on the intuition and foresight of disciplinary specialists. Instead of an expert approach, it is proposed to use a systems transdisciplinary approach based on the methodology of a scientific discipline - systems transdisciplinarity. In this case, specialists in systems transdisciplinarity (generalists) will strengthen narrow disciplinary specialists in teams involved in solving high-threshold problems.

Keywords: Sustainability, sustainable development, resilience, systems transdisciplinarity, systems thinking.

8.1 Introduction

Since the 80s of the 20th century, the term sustainable development has been used in the scientific literature to denote a promising concept of the existence of mankind [1]. In this concept, sustainable development is associated with development that meets the needs of the present without compromising the ability of future generations to meet their own needs [2]. According to many scientists and practitioners, the concept of sustainable development should combine its three main components: economic, social, and environmental [3].

Reviews of thematic literature indicate that in modern science and society the formation of the main elements of the concept of sustainable development continues, including the development of its conceptual and possible methodological apparatus [4, 5, 6]. The oft-quoted definition of sustainable development presented in the Brundtland Commission report reflects a *strategic goal* but does not indicate a *concrete path* for practical action. Therefore, many modern authors offer their own versions, trying to find a definition that would be convenient in practice. Probably, there will be even more of these definitions, since there

is a process of understanding future development, which, according to a number of authors, is in principle uncertain and multivariate [7].

In the absence of consensus in the definition and interpretation of sustainable development, due to the complexity of the concept itself and the discrepancy between the views of representatives of different sectors of society - scientific, political, entrepreneurial, sustainable development may be in a group of concepts that reflecting an idea that can be formulated in general terms, but cannot describe exact quantitative and qualitative categories [8].

Due to the complex, radical and dynamic issues of the Anthropocene, some scholars are proclaiming the end of the concept of sustainability. These challenges are the unprecedented and irreversible rate of human-caused biodiversity loss; exponential growth in resource consumption per capita; global climate change [9].

Based on this information, we can conclude that the problems with the formation of the concept of sustainable development, its concepts and ways for practical actions are due not so much to their complexity as to the lack of an adequate scientific worldview, methodological approach, and practical technologies.

Symposium on long-range forecasting and planning (Bellagio, 1968) drew attention to this deficiency in the concept of sustainable development. This symposium was organized by the Organization for Economic Cooperation and Development (OECD). The participants of the symposium discussed the prospects of planning as a method of approach to solving many problems of modern society. They argued that the development of multinational industrial activity would increasingly influence the political relations between countries. This circumstance will require international planning. The complexity and magnitude of the problems will force decisions to be made at levels where the individual participation of those affected is increasingly remote. This leads to a crisis in political and social development that threatens our entire future. It is in connection with this crisis that we feel that the function of planning and related arts such as forecasting are taking on a new meaning. Planning should be linked to the structural design of the complex system itself and be involved in policy making [10].

In 1970, OECO organized a seminar on Interdisciplinarity—Problems in Research and Teaching in Universities (Paris, 1970). This seminar laid down the main directions for the development of transdisciplinarity as one of the possible approaches to planning solutions to the problems of modern society [11,12,13].

Planning is a type of activity associated with setting goals, objectives, and actions necessary to achieve the desired goal. Planning is based on the fundamental ability to mentally travel through time. It is believed that the evolution of foresight, the ability to think ahead, was the main driving force behind human evolution [14]. Therefore, a transdisciplinary approach should generate reliable information about the promising future of society. Politicians, government officials and narrow disciplinary specialists should see the general picture of the future, get a description of its individual stages and goals. In other words, they must be given a context within which to develop solutions to the economic, social and environmental dimensions of sustainable development. Therefore, the purpose of the article is to substantiate the possibility of planning, forecasting and managing the sustainable development of modern society. To achieve this goal, in the section "General Provisions" an assessment of the current state of transdisciplinarity is given. The section "Methodology" describes a systems transdisciplinary model of a temporary unit of order, which formed the basis for describing the past, present and future. The section "Analysis of the past, present and future" describes the content of the past, present and future of society, which is necessary for sustainable development planning. The section "Discussion of the results" describes the features of the current stage of sustainable development. And, finally, in the section "Conclusions" the rationale for the inevitability of sustainable development is given.

8.2 General Provisions

Within the framework of the article, terms are used that need to be clarified in their content. To this terms include: sustainability, sustainable development, resilience, complexity and transdisciplinarity.

Sustainability is a long-term goal towards which development is striving.

Sustainable development is a variety of processes and ways to achieve a long-term goal. Therefore, sustainable development can be compared with a paradigm (general point of view, basis) for thinking about the future, in which environmental, social and economic components are balanced in the pursuit of improving the quality of life [15].

Resilience is the ability of an object to restore its state, which allows it to move towards the goal of sustainable development after a shock or disturbance [16].

The disciplinary nature of science has contributed to sustainability, sustainable development and resilience are considered separately within the relevant disciplines: sociology, economics, ecology.

Figure 1 illustrates a refined representation of the meaning of the terms sustainability, sustainable development and resilience. The refined meaning allows us to apply these terms to all disciplinary types of objects.

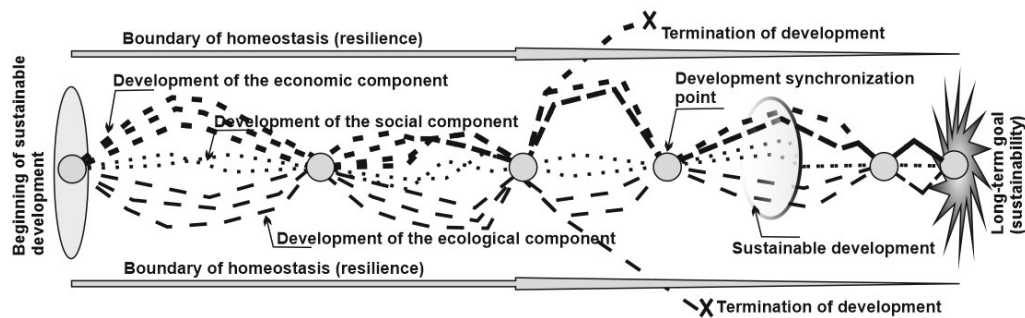


Figure 8.1: Illustration meaning terms sustainability, sustainable development, resilience.

In Figure 8.1, the terms sustainability as a long-term goal, and sustainable development as a variety of processes and ways to achieve a long-term goal have retained their original meaning. Resilience in this figure is associated with the boundaries of homeostasis (the constancy of the composition of the internal environment and the functions of the object). With a critical change in the state of the internal environment of the object (going beyond the boundaries of resilience), development along this path stops. A fundamentally important term, which researchers of sustainable development pay little attention to, is the term “development synchronization point”. Economic, social and environmental components are the facets of a single development process. Therefore, they must synchronize their results periodically. Without such synchronization, these components will not be able to simultaneously achieve the long-term goal with the expected results.

Complexity is a designation of the difficulty of understanding, describing and verifying an object that accompanies the search for a solution to a multifactorial problem. Difficulties arise due to: lack of information about the object; limited analytical potential of the chosen model; an incorrectly formulated idea, assumption or hypothesis. Therefore, the complex problems of the Anthropocene are the distortion of reality near the horizon of the existing scientific worldview. The expansion of the horizon of the scientific worldview is achieved by: strengthening the integration and synthesis of disciplinary knowledge within the framework of academic scientific approaches (from interdisciplinary approaches to transdisciplinary approaches); strengthening the unification and generalization of disciplinary knowledge within the framework of systems approaches (from systems interdisciplinary approaches to systems transdisciplinary approach) [17].

In the context of these considerations, the general definition of transdisciplinarity would be:

Transdisciplinarity is a method of intellectual activity intensification in the area of interdisciplinary interactions contributing to the maximum broadening of the scientific worldview horizon. Such a definition of transdisciplinarity supposes the availability of the tools that ensure the broadening of the scientific worldview horizon. A role of such tools in the area of interdisciplinary interactions is played by the transdisciplinary and systems transdisciplinary approaches.

Considering the generalized definition of transdisciplinarity the definition of transdisciplinary approach will be as follows:

Transdisciplinary approach is a method for broadening of the scientific worldview horizon in the terms of natural-science worldview by implementation of integrative trends of disciplinary, interdisciplinary, and multi-disciplinary knowledge and models of the object.

In its turn the definition of the systems transdisciplinary approach will be as follows:

Systems transdisciplinary approach is a method for broadening of the scientific worldview horizon within the limits of the philosophic picture of a single world by simulation of the object in the form of the transdisciplinary system allowing using the systems transdisciplinary methodology for its research [18].

8.3 Methodology

In choosing the methodology for research sustainability, sustainable development, and resilience we took into account the following circumstances. Transdisciplinarity researchers believe that despite its increasing popularity, transdisciplinarity is still far from being academically established, and current funding practices do not effectively support it at universities and research institutions. One reason for this deficit is that a universally accepted definition for transdisciplinarity is still not available. Consequently, quality standards that equally guide researchers, program managers, and donors are widely lacking. Therefore, a rhetorical mainstreaming of transdisciplinarity prevails which risks marginalizing those who seriously take the integrative efforts creative collaboration requires [19].

Modern organizers of transdisciplinary research prefer to invite representatives of public organizations and local administration to transdisciplinary teams. It is assumed that the fusion of theorists and practitioners will help in solving complex problems.

G. Lotrecchiano and S. Misra categorically stated the problems of interaction between narrow disciplinary specialists in transdisciplinary teams. They said that one category of systemic complexity pertains to the barriers to transdisciplinary integration arising from interpersonal interactions in transdisciplinary team-based contexts, called interactive systemic complexities. Interactive systemic challenges to transdisciplinary integration include perceived inequitable contributions to the project, unbalanced problem ownership, discontinuous participation, fear of failure, variability in communication types and skills, and overall lack of participant satisfaction with the project processes and outcomes, among others. Structural systemic complexities, on the other hand, are barriers to transdisciplinary integration that arise from characteristics inherent to the makeup of teams. These include differences in foundational training among team members, diverse and changing career paths, geographic dispersion, a lack of awareness of the breadth and complexity of the problem, perceived insufficient legitimacy of a team to solve the problem, conflicting methodological standards, conflicting epistemological and ontological orientations, and differing levels of transdisciplinary orientation among team members [20].

In turn, many experts note the shortcomings of systems thinking. In certain cases, it is ambiguous and amorphous, systemic sciences are still in the process of formation, and the systemic community is represented by a variety of specializations and a high level of fragmentation in its field of knowledge and understanding of the world [21]. The reasons for these shortcomings are an excessive variety of points of view on the meaning of the concept of "system"; the slowness of progress in the creation of a general systems theory; a variety of terms used within system specializations; the absence of a systems domain model capable of

becoming an academic discipline, in the image of which the founders of the systems movement imagined the general theory of systems: L. Bertalanffy, K. Boulding, A. Rapoport and R. Gerard [22].

The shortcomings of transdisciplinarity within the framework of academic scientific approaches and systems thinking have objective (ideological) reasons. It should be noted that in the direction from interdisciplinarity to transdisciplinarity when solving complex problems, the share of expert opinion increases to the detriment of strict scientific methodology. Often, in multidisciplinary and transdisciplinary teams, the final decision is made on the basis of expert consensus and compromise. In such a situation, it became necessary to combine the positive experience of transdisciplinarity and systems thinking into a special scientific discipline "systems transdisciplinarity" [23, 24].

8.4 Systems Transdisciplinarity: Philosophy, Concept, and Models

The systems transdisciplinarity is based on the philosophic principles of unicentrism. In a broad sense, unicentrism is a position in philosophy and in science that is based on the problem of the correlation between the unity and its fragments. This position is based on the isomorphism (similarity) of the general order of the structure of fragments of space, the attributes of information, and the periods of time that are able to describe the one and only world. Any objects at all levels of the reality of the one and only world are its natural elements and fragments. Therefore, the main condition for the existence of the one and only world is the existence of a general order in it (transdisciplinary system). As the name implies, it follows that this order must manifest itself everywhere: in every element and fragment of this world and in every interaction of these elements and fragments at every level of reality. As a result, the same order should ensure the achievement of activity goals and results of all these elements and fragments. In addition, it should synchronize these goals and results. For this reason, the one and the only world is One Orderly Medium [25].

The major attribute of this One Orderly Medium is the potency, which is naturally present in it, or was put in by the human (for Artificial Orderly Mediums). Potency is the prospective futurity of the One Orderly Medium. Within the framework of the unicentric concept, the definitions of main philosophical categories are as follows:

Space – as a form of existence of potency of the One Orderly Medium;

Information – as a form of manifestation of potency of the One Orderly Medium;

Time – as a form of transformation of potency of the One Orderly Medium.

The universal order plays the role of a transdisciplinary system in relation to the forms of potentiality of a single world. This particular universal order manifests in the forms themselves, in the interaction of these forms, as well as determines their unity.

Therefore, the order determining unity is not revealed in the course of systems transdisciplinary research of a complex object. It is not formed subjectively as it is done in other types of systems approach. It is postulated through systems transdisciplinary models of the spatial, informational, and temporal units of order.

The model of a spatial unit of order is a logically complete construction of space fragments in a transdisciplinary system, which makes it possible to substantiate the physical boundaries in which the potential of an object exists, manifests and transforms [26].

The model of an information unit of order is a logically complete sequence of main types, subtypes and features of complete information in a transdisciplinary system, which makes it possible to substantiate the content boundaries of the manifestation of the object's potency [27].

The model of temporal units of order is a logically completed sequence of time periods in a transdisciplinary system, which makes it possible to substantiate the semantic boundaries of the duration of an expedient (consistent with the goal) transformation of the object's potency [28].

Models of a spatial, informational and temporal unit of order are isomorphic, that is, they have the same principles of structure. These principles implement the logic of the philosophical substantiation of unicentrism.

Within the framework of the unicentric concept, it is argued that the fact of the existence of any object is due to its belonging to a certain functional ensemble of objects. There are two types of functional ensembles. The vertical functional ensemble consists of horizontal functional ensembles of objects. For example, the planet can be considered as a vertical functional ensemble, which determines the diversity of object types. A horizontal functional ensemble consists of objects of the same type. For example, the human society, the animal community, and also the plant community can be considered as horizontal functional ensembles within a planetary vertical functional ensemble.

The world in the form of vertical functional assembly and the system in the form of the general order, which makes the condition for the unity of this assembly, are close to the vision of L. Bertalanffy with respect to the general systems theory. L. Bertalanffy wrote that a unitary conception of the world may be based, not upon the possibly futile and certainly farfetched hope finally to reduce all levels of reality to the level of physics, but rather on the isomorphy of laws in different fields. Speaking in “material” language, it means that the world, i.e., the total of observable events, shows structural uniformities, manifesting them-selves by isomorphic traces of order in the different levels or realms [29]. In this article, the temporal units of order was used. More precisely, its two subspecies: the staged model and the multiplex model [30].

8.4.1 Staged Model

A stage is a period of time during which objects, their properties, connections, relations and results of activity undergo quantitative and qualitative changes necessary for the implementation of expedient development. These changes cause a consistent acceleration of the process of expedient development. The staged model demonstrates such an acceleration.

The staged model consists of four stages of different sizes: Identification, Communication, Stabilization and Invariant (see Figure 8.2).

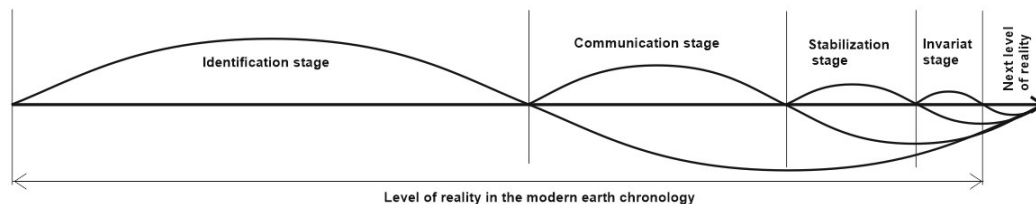


Figure 8.2: *Staged model.*

Identification stage. Within the framework of the identification stage, the formation of objects takes place, which will take part in the expedient transformation of matter. Under the influence of various factors, objects acquire the necessary properties and functions (identify themselves).

Communication stage. In order to fulfill their purpose, within the framework of the communication stage, objects build special types of connections and relationships. These links and relationships will allow objects to form horizontal functional ensembles. Within the framework of functional ensembles, the objects themselves become more complex, and possible complex types and forms of their activity are realized. At this stage, there is a large-scale accumulation of transformed matter, which is the result of the activity of horizontal functional ensembles.

Stabilization stage. Within the framework of the stabilization stage, only those objects and functional ensembles of objects, as well as their connections and relationships, are further developed that are capable of endowing the overall development of a vertical functional ensemble with a pronounced resilience.

Invariant stage. Within the framework of the invariant stage, the inevitable achievement of the results of the expedient transformation of a certain amount of matter takes place - the goal of sustainable development.

At the end of each stage, there is a synchronization of the results of the transformation of matter within each horizontal functional ensemble, as well as a general synchronization of the results of this transformation within the vertical functional ensemble. Thus, the staged model plays the role of the level of reality. The level of reality is a conditionally isolated period of time with a long-term goal.

8.4.2 Multiplex Model

The multiplex model demonstrates the fragmentation of the influence of soft and hard programs and the synchronization of the results of the expedient transformation of matter. In the multiplex model, each period is represented by a certain wave or set of waves. Therefore, the multiplex is a "momentary photograph" of a specific unit of physical or historical time. In such a "photo" one can see the entire set of periods of development, demonstrating its meaning, its past, present, and future. The multiplex consists of long and short waves (see Figure 8.3).

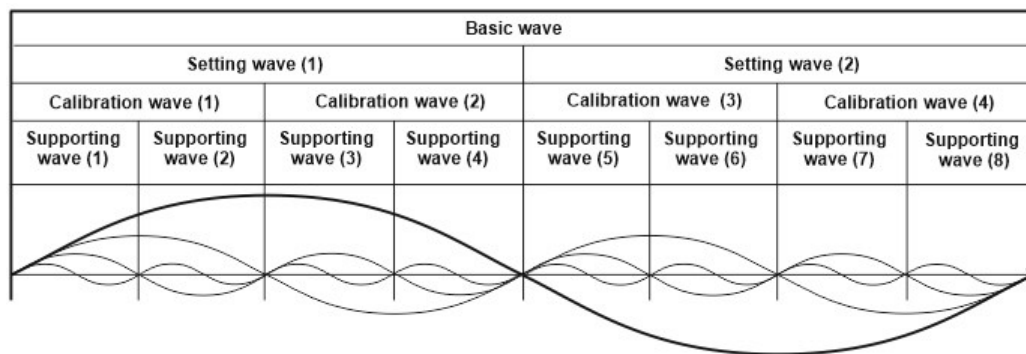


Figure 8.3: Multiplex model.

The long waves of the multiplex include the base and installation waves:

- Basic wave is a reflection of the sustainable development of an object and a functional ensemble of objects, which determines the achievement of a long-term goal (long-term sustainability) within the constancy of the composition of the internal environment and functions (resilience).
- Setting wave is a reflection of the sustainable development of an object and a functional ensemble of objects, which determines the achievement of a medium-term goal (medium-term sustainability) within the constancy of the composition of the internal environment and functions (resilience).

Within the framework of short waves, the development of an object has the character of a *predisposition* (a tendency to show one's individuality in the course of activities). Therefore, the current results of the individual development of objects and the functional ensemble of objects are forced to periodically synchronize and distribute in an orderly manner within short waves, demonstrating obvious signs of development. As such, the multiplex short waves play the role of a soft development program.

8.4.3 Analysis of the Past, Present and Prospective Future Based on a Staged Model

It should be noted that in our study, the philosophical conceptual concepts of "**existence, manifestation and transformation of potency**", for methodological purposes, are associated with **the expedient transformation of planetary matter**. This goal determines the appearance of objects and the formation of them, earthly horizontal functional ensembles. The accumulation of planetary matter transformed by one horizontal functional ensemble causes the appearance of new horizontal functional ensembles in the hierarchy of the planetary vertical functional ensemble of objects. The movement of the planetary vertical functional ensemble from one long-term goal to another is fragmented by the corresponding levels of reality. In this case, the information provided by the reality level models can be used to refine the sustainability (long-term goal) of sustainable development in the present and in the future. It is important to note that modern earth chronology was used to determine the calendar dates for models of all levels of reality. High accuracy of the calendar dates in models of reality levels is important for substantiating and forecasting sustainable development goals. However, in historical perspective, this accuracy may be approximate.

In accordance with the rules for constructing systems transdisciplinary models of units of order, eight levels of reality were formed. These levels of reality fully revealed the meaning of the expedient transformation of earthly matter by horizontal functional ensembles.

First Level of Reality

The calendar date for the beginning of the first level of reality is the probable date of the origin of the universe - approximately 15 billion years ago [31] (see Figure 8.4).

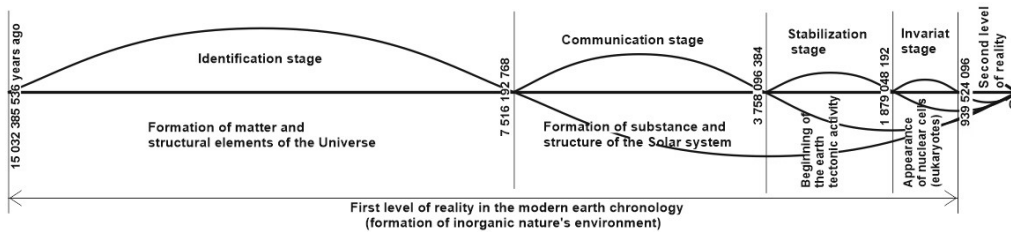


Figure 8.4: Staged model of the first level of reality.

The staged model of the first level of reality demonstrates the logic of the formation of an environment of inorganic nature. In the identification stage, the matter of the Universe (atoms and simple molecules) was formed, as well as its main structures: galaxies and stars. In the communication stage, the solar system and the planet Earth were formed. In the stabilization stage, tectonic activity arose on Earth, which began the process of the expedient transformation of planetary matter. And finally, in the invariant stage, the first nuclear cells appeared.

Second Level of Reality

The calendar date for the beginning of the second level of reality is the beginning of the processes of formation of multicellular organisms - approximately 940 million years ago (see Figure 8.5).

The staged model of the second level of reality demonstrates the logic of the formation of an organic nature environment (from the simplest multicellular organisms to ape primates). During the identification stage of the second level of reality, the formation of diverse primary multicellular organisms took place. During this period, mechanisms for the transmission of hereditary traits of these organisms were formed. At the next stages, primitive vertebrates and the first plants appeared among these organisms, then dinosaurs and the first mammals. And, finally, in the invariant stage of the second level of reality, placental mammals were divided into groups: ungulates, insectivores, carnivores and primates.

Third Level of Reality

The calendar date for the beginning of the third level of reality is the beginning of the separation of the lines of large apes and hominids (great apes) - approximate 58,7 million years ago (see Figure 8.6).

The staged model of the third level of reality demonstrates the logic of the formation of the environment of great apes. The third level of reality is characterized by the gradual formation of human progenitors, first Ramapithecus, and then Australopithecus, the progenitor of two groups of hominids: paranthropes (monkeys) and humans.

The Fourth Level of Reality

The calendar date for the beginning of the fourth level of reality is the beginning of the process of formation of the genetic line of the Homo species - approximate 3,7 million years ago (see Figure 8.7).

The staged model of the fourth level of reality demonstrates the logic of the formation of the environment of the predecessors of modern man. The forces of planetary nature caused the great apes to straighten up at first (Man Erectus), then, use the simplest tools (Man Antecessor), learn how to make tools, as well as master the skills of collective action (Heidelberg man). In the invariant stage of the fourth level of reality, the last predecessor of modern man appeared - Neanderthal Man, who began to use fire in everyday life, and also created the first social organization - an early tribal community.

Fifth Level of Reality

The calendar date for the beginning of the fifth level of reality is the beginning of the process of the formation of Man reasonable - approximately 229,000 years ago (see Figure 8.8).

Milestone model fifth level reality demonstrates the logic of formation of morphological human characteristics of Man reasonable. Simply put, in this level of reality, planetary nature purposefully selected and stored in human genes information about the optimal length of arms, legs, skull and torso sizes, etc. In the future, these morphological human characteristics contributed to the successful development of Man reasonable in a vast geographical environment - the area in which modern humanity will carry out the transformation of planetary matter. This circumstance explains the sequence of important events that characterize the fifth level of reality. Mitochondrial formed first Eve - a woman, the morphological characteristics of the female body, which could be nurtured by modern people. And, Approximately 114,000 years ago, Y appeared - chromosomal Adam is a man whose genetic material contributed to the formation of modern humans. The results of the two previous stages allowed the emergence of Cro - Magnons - European Early Modern Humans. In the invariant period, the resettlement of this type of person, as well as its inclusion in the vertical functional ensembles of various biogeocenoses, contributed to the formation of human races.

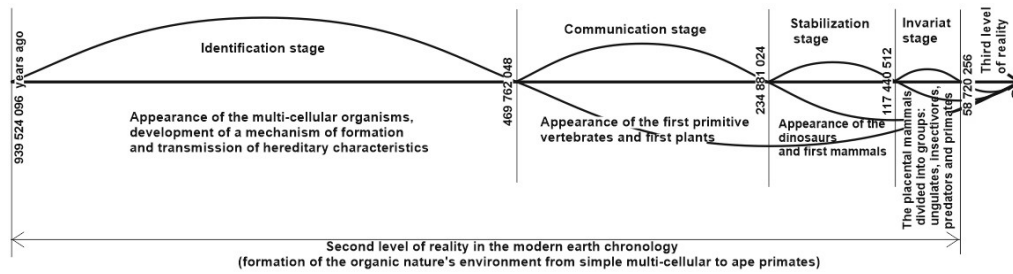


Figure 8.5: Staged model of the second level of reality.

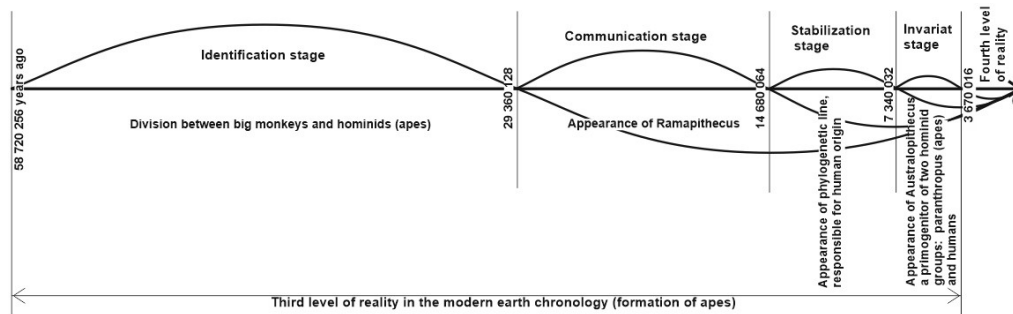


Figure 8.6: Staged model of the third level of reality.

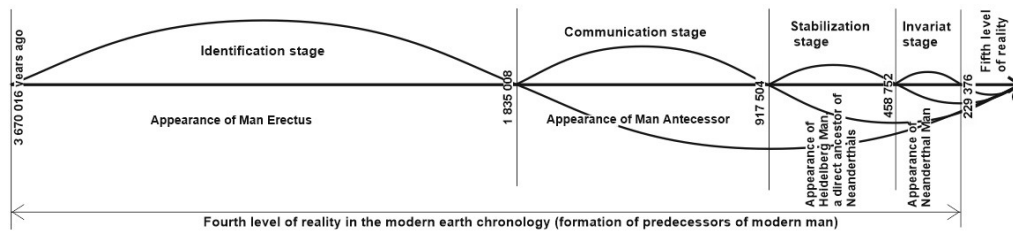


Figure 8.7: Staged model of the fourth level of reality.

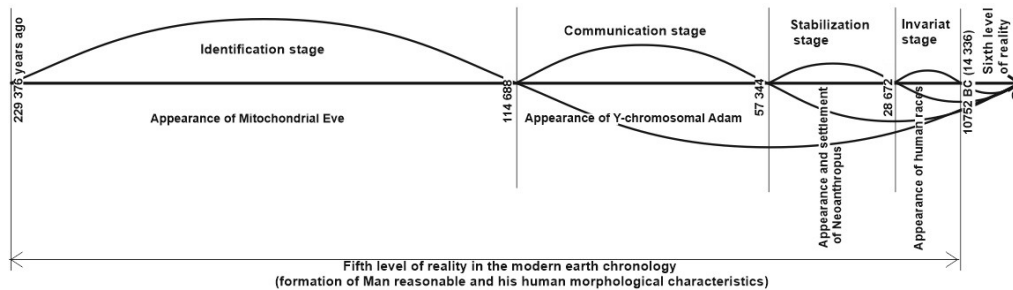


Figure 8.8: Staged model of the fifth level of reality.

The Sixth Level of Reality

For practical purposes from the sixth level onwards, calendar dates are given in years BC and AD. The calendar date for the beginning of the sixth level of reality is the beginning of the process of formation of Sedentary Man - 10752 BC (see Figure 8.9).

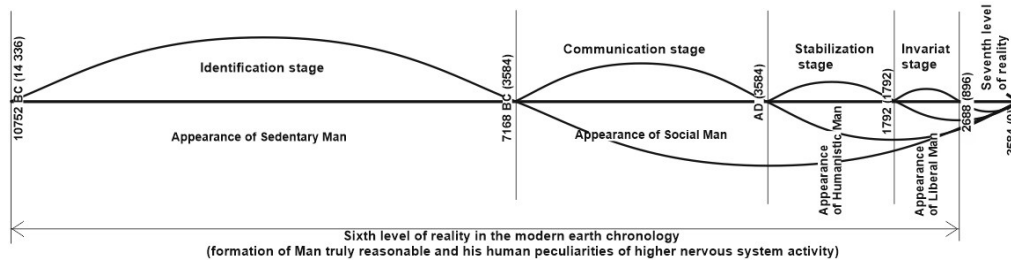


Figure 8.9: Staged model of the sixth level of reality.

Experts have not established the reason why Man reasonably stopped wandering, began to cultivate the soil, domesticate animals and extract minerals in certain areas. People had to learn to understand the emerging geographic environment. They had to create a social environment - society; create and test its laws; create human culture. Therefore, the sixth level of reality demanded the active formation subspecies of Man truly reasonable and his human peculiarities of higher nervous system activity. These tasks successively decided and decide subspecies of Man truly reasonable: Sedentary Man, Social Man, Humanistic Man, and Liberal Man. It was at this level of reality that all the components of sustainable development appeared, as well as the need for sustainability and resilience. In the invariant stage (1792-2688), this need contributed to the search for ways to organize sustainable development, and ways to predict and manage this development.

It is important to note that in the invariant stage of each level of reality, the inevitable extinction of the dominant species took place. In the invariant stage of the first level of reality (see Figure 4), there was a mass extinction of subspecies of prokaryotes (pre-nuclear cells); in the invariant stage of the second level of reality (see Figure 5) - the extinction of terrible lizards and dinosaurs; in the invariant stage of the third level of reality (see Figure 6) - the extinction of the main subspecies of hominids (apes); in the innovative stage of the fourth level of reality (see Figure 7) - the extinction of the main subspecies of Man Erectus; in the innovative stage of the fifth level of reality (see Figure 8) - the extinction of intermediate lines of Man reasonable, which allowed this species to form the necessary morphological characteristics of the body. These natural extinctions created opportunities for the emergence of new species of plants, animals, and human ancestors, which were intended to achieve the goal of the next level of reality. The manifestation of this general pattern should be expected in the invariant stage of the sixth level of reality.

The invariant stage of the sixth level of reality began in 1792. Consequently, the stage from 1792 to 2688 will be characterized by at least two grandiose evolutionary events. First, there will be a natural extinction of subspecies of Man truly reasonable. Secondly, expedient changes in the social environment will begin, which will form the conditions for the subsequent emergence of the Man ideal type.

Seventh Level of Reality

The calendar date for the beginning of the seventh level of reality is the beginning of the Just Man formation process - the year 2688 (see Figure 8.10).

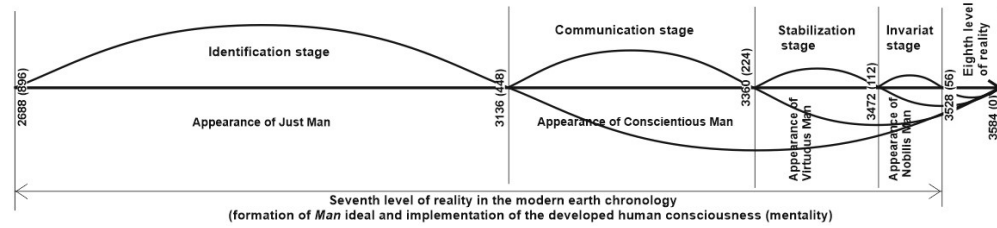


Figure 8.10: Staged model of the seventh level of reality.

Milestone model seventh level reality demonstrates the logic of formation of Man ideal and implementation of the developed human consciousness (mentality).

The seventh level of reality represents the society that utopians describe. It is at this level that a fully conscious understanding of sustainability, resilience, and sustainable development by all members of society. Possessing fully formed features of higher nervous activity, people will have the opportunity to realize themselves as participants in a planetary vertical functional ensemble. They are aware of the needs of this ensemble and will take a conscious part in meeting its needs.

Eighth Level of Reality

The calendar date for the beginning of the eighth level of reality is the beginning of the formation of Sacral Man - the year 3528 (see Figure 8.11).

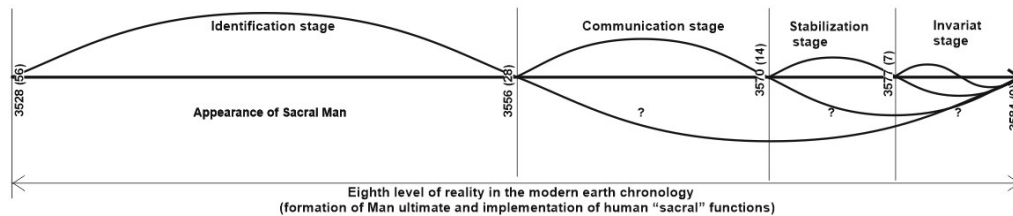


Figure 8.11: Staged model of the eighth level of reality.

Staged model of the eighth level of reality demonstrates the logic of formation of Man ultimate and implementation of human "sacral" functions 56 years before the expected end of the expedient process of transformation of planetary matter by the human horizontal ensemble.

It can be assumed that the process of expedient transformation of the terrestrial planetary matter also has a sacred function. This function consists in the formation of nucleotide molecules and RNA molecules (technological programs) by the participants of horizontal functional ensembles, which ensured the achievement of the results of this expedient transformation. It is quite probable that in 3584 the mass accumulation of such nucleotides and RNA will be completed. Over the next years, the planet will have to melt in magma the entire volume of nucleotide and RNA molecules that have accumulated in the oceanic crust over past levels of reality and form non-biological RNA molecules in the process of forming the last supercontinent on the planet. The remaining nucleotide and RNA molecules can be called sacral molecules. After the solar system ceases to exist, these molecules will become part of the molecular protosolar clouds of fourth and fifth generation stars. In turn, these molecules will set the potential for the emergence and development of

biological objects of horizontal ensembles of stone planets of these stars. Thus, the process of evolution of biological objects in the Universe will be continued from a certain level.

The reason why the process of transformation of planetary matter by biological objects in 3584 will be completed will have to do with the formation of the earth's core. Experts suggest that this reason may be an increase in the concentration of oxygen that will occur in the atmosphere due to chemical reactions of the next stage in the formation of the earth's core. You can read more about this in the books [32, 33]. For the purposes of this article, we have used brief information about the events of each level of reality. A detailed description of these events, as well as references to literature that confirms the indicated calendar dates for these events, can be found in the book [34].

In the staged models of the levels of reality, the emphasis is on the expedient formation of a person and a human horizontal functional ensemble. However, in parallel with the development of the human horizontal functional ensemble, a similar development of the horizontal functional ensembles of plants and animals took place. The similarity consisted in the fact that at the same levels of reality, certain species were formed in plants and animals, which, by certain calendar dates, achieved appropriate results in the transformation of planetary matter. New types of plants transformed the substance of rocks and sedimentary rocks more qualitatively. New animal species learned to feed on new plant species and on their fellows in the functional ensemble. And people ate plants and animals. Thus, the sustainable development of the entire planetary vertical functional ensemble was supported. It is important to note that the synchronization of the results of the development of horizontal functional ensembles led to the fact that by the transition of humans to a sedentary lifestyle (10752 BC), plants and animals acquired morphological characteristics that made it possible to begin their domestication and cultivation [35].

Not only man must learn to understand the emerging geographic environment and society. Animals that were domesticated had to learn to understand humans. In turn, the animals that remained wild began to build and decorate their dwellings, use objects as the simplest tools, etc. That is, in the sixth level of reality, in animals, within the framework of a horizontal functional ensemble, the formation of features of higher nervous activity also began.

8.5 Analysis of the Present and Future Based on the Multiplex Model 1792 – 2688

After determining the calendar duration of the sixth level of reality, it became possible to move on to obtaining the information that is necessary for planning and forecasting sustainable development today. To do this, it is necessary to determine the internal relationship between the long-term goal of the invariant stage 1792 - 2688 (see Figure 9) and the general logic of events that leads to the achievement of this goal. This problem can be solved by the model of multiplex 1792 - 2688 (see Figure 8.12).

The invariant stage 1792 - 2688 has two goals: to complete the formation of the features of the higher nervous activity of Man truly reasonable, and also to create conditions for the emergence of a new kind of man - Man ideal. It is logical that the long-term goal of the development of society in 1792-2688 will be the formation of quantitative and qualitative parameters of the resilience of the rule of law, which, in turn, will ensure the formation in people of a natural feeling and the right to moral responsibility.

The foundations of a modern state of law were laid by the Great French Revolution (1789-1799) [36]. Many of the ideas of the revolution are considered fundamental principles of liberal democracy [37]. The model of multiplex demonstrates the interaction of soft and hard programs for the sustainable development of human society in the invariant period. The results of achieving the medium-term goals of sustainable development, which lead to tough programs, are far from us. These results will form by 2240 (Setting wave 1) and by 2688 (Setting wave 2). Closer to us are the results of the short-term goals that lead to soft programs. These results have already formed by 2016 (Calibration wave 1), and should also form by 2240 (Calibration wave 2), 2464 (Calibration wave 3) and 2688 (Calibration wave 4).

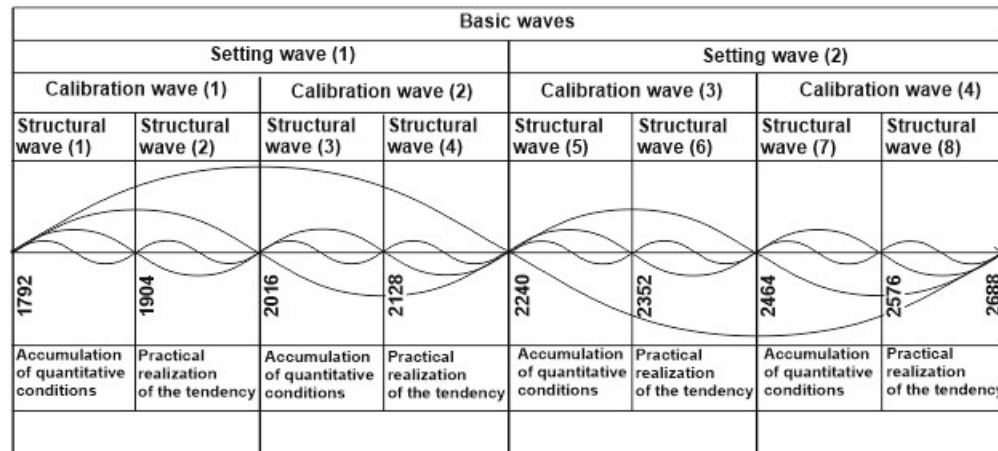


Figure 8.12: Model of the multiplex of the Invariant stage of the sixth level of reality.

It is important to note that in order to achieve the long-term development goal, the level of rigidity (predetermination) of soft programs increases. In this case, this increase in stiffness will be observed in the direction from Calibration wave 1 to Calibration wave 4. The same increase in stiffness will be observed in the direction from Structural wave 1 to Structural wave 8. An increase in the stiffness of programs will affect the quantitative and qualitative parameters of Resilience. General description of the goals of Calibration wave s that will affect these parameters will be.

Calibration wave 1 (1792-2016): The transition of the state structure from the imperial form to the form of sovereign nation-states, exercising the right of nations to self-determination, including as part of federations.

Calibration wave 2 (2016-2240): Unification of sovereign nation-states into interstate unions based on the same understanding of the content and meaning of the value system (the principle of "sense of moral responsibility").

Calibration wave 3 (2240-2464): Unification of interstate unions within the framework of inter-union social formations that ensure the effective implementation of a system of true values and moral norms. Calibration wave 4 (2464-2688): Unification of inter-union social formations in a single legal state based on the principles of "the right of moral responsibility".

After determining the long-term and medium-term goals of sustainable development in the invariant stage of the sixth level of reality, it is necessary to move on to models of multiplex that correctly reveal the content of the sustainable development of modern society. In our case, the Structural wave 3 (2016-2128) model of multiplex was formed (see Figure 8.13).

On this model of multiplex, we are interested in Structural wave 1 (2016-2030). It is important to note that the events accompanying Structural wave 1 (2016-2030) will set the stage for achieving the long-term goal of 2128.

At the end of the differentiation, a model of the multiplex Structural wave 1 (2016-2030) was built. This model of multiplex made it possible to describe the content of everyday events that will contribute to the achievement of the 2030 goal (see Figure 8.14).

Recall that since 2016, the process of unification of sovereign nation-states into interstate unions has begun, based on the same understanding of the content and meaning of the moral value system (the human

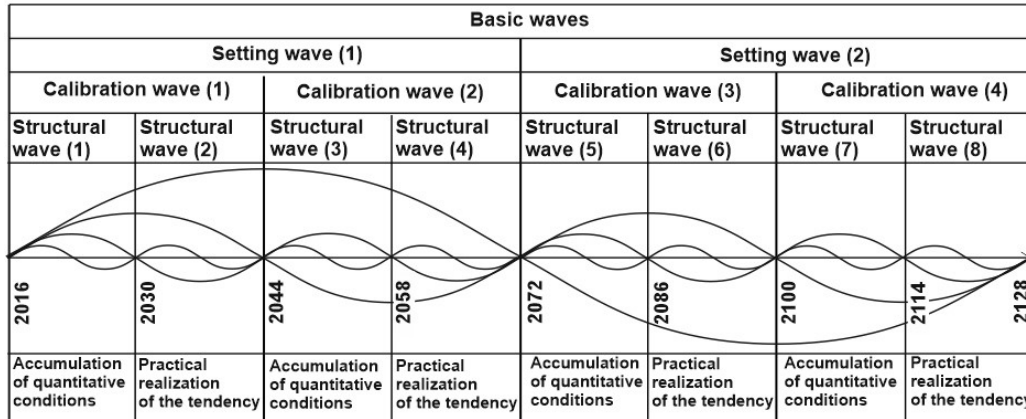


Figure 8.13: Model of multiplex of Structural wave (3) 2016-2128.

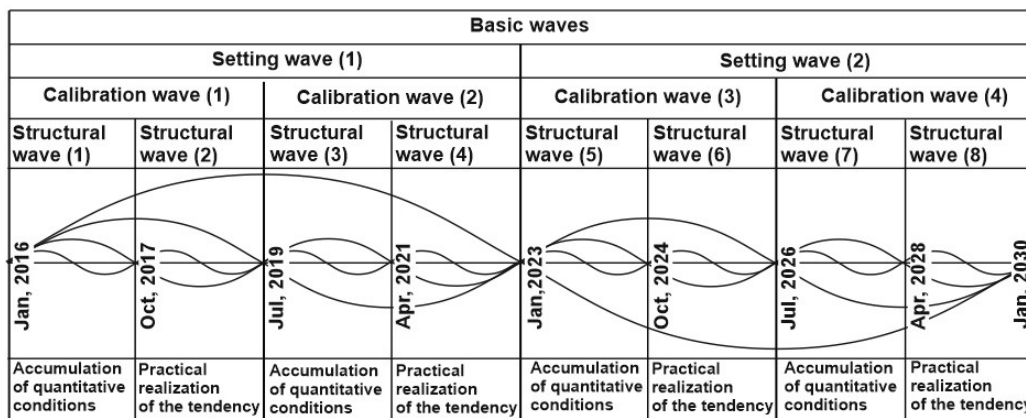


Figure 8.14: Model of multiplex of Structural wave (1) 2016-2030.

conscience). Therefore, between January 2016 - January 2030 in society, there will be a need for a new model of the world socio-economic order. Under the influence of the tough Setting wave 1 (January, 2016 - January, 2023) program, a statement of the destruction of the old model of the world socio-economic order will be fixed within society. Influenced by the tough program Setting wave 2 (January, 2023 - January, 2030) activities should begin in society to form the main provisions of a new model of the world socio-economic order. This information is essential for sustainable development planning.

8.6 Discussion of the Results of the Analysis of the Past, Present and Future Based on Staged Models of Levels of Reality and Models of Multiplexes

Systems transdisciplinarity is not the only scientific discipline that studies the general patterns of development of nature and society. This topic is also dealt with by the academic discipline - Big History. This discipline studies history from the Big Bang to the present day [38]. The main task of Big History is to group scientific discoveries and existing knowledge of chemical evolution from the moment of the Big Bang into a big picture, and then, to explore human existence in the context of this big picture [39].

However, this picture only states the fact of events, but does not define their natural long-term, medium-term and short-term goals. It does not provide philosophical foundations and methodological apparatus for the study of the past, present and future. Therefore, the Big History discipline is not applicable for planning, forecasting and managing sustainable development.

In turn, systems transdisciplinarity does not reduce the evolutionary development of the Universe to the appearance of an earthly person. It only reveals the logic of the formation of earthly humanity on the corresponding levels of reality, manifested with the help of modern earthly chronology. In this logic, humanity is just another horizontal functional ensemble of the planetary vertical functional ensemble. Simply put, humanity is a natural instrument by which the planet completes the active transformation of planetary matter, which has already been transformed by other horizontal ensembles. Therefore, the sustainable development of each planet in the solar system should be considered within the levels of reality based on individual planetary chronology. This will make it possible to correctly describe the development of the planets, as well as the goals of their horizontal functional ensembles. It is quite probable that from the standpoint of the participants in these horizontal ensembles the Universe will be perceived differently than it is perceived by modern earthly man.

Such research results allow us to assert that the Universe did not create a person so that he would become its observer. Man was purposefully created by the planet Earth so that he could transform the planetary matter in accordance with the universal law that determines the unity of the Universe [40]. This position undermines the content of the anthropic principle [41, 42]. The application of the stage model and the multiplex model proves this assumption. As a result, it was possible to correctly identify the period in which humanity should begin to consciously plan, predict and manage sustainable development.

As shown above, this period is Calibration wave 2 (2016-2240) (see Figure 12). This wave has a new long-term target. Therefore, approaches and ways to achieve sustainable development goals before 2016 will be ineffective after 2016. It can be expected that under the influence of the Setting wave (2) (January, 2023- January, 2030) there will be calls from the leaders of various groups of states for the formation of the main provisions and principles of a new model of the world socio-economic order. Based on the multiplex model, this period should be the beginning of the practice of planning, forecasting and managing sustainable development. Therefore, in the period January 2023 - January 2030, the world community, a group of interested states or international public organizations need to take the following constructive actions:

- January 2023 to October 2024 – to create an international analytical group of narrow disciplinary specialists (economists, sociologists, ecologists), as well as to acquaint the members of the group with the methodology of a systems transdisciplinary approach;

- October 2024 to July 2026 - by the members of this group to form a concept of the main provisions and principles of a new model of the world socio-economic order and sustainable development;
- July 2026-January, 2030 – to form complementary concepts of the components of sustainable development and a new model of the world socio-economic order (systems transdisciplinary economics, systems transdisciplinary sociology, systems transdisciplinary ecology), as well as to form short-term, medium-term, and long-term sustainable development goals up to 2072 and 2128.

8.7 Conclusions

Before the beginning of the invariant period of the sixth level of reality (1792-2688), in 1784, the founder of German classical philosophy, I. Kant, formulated the main provisions of the “Ideas of Universal History in the World-Civil Plan”. I. Kant argued that manifestations of the will, human actions, like any other natural phenomenon, are determined by the general laws of nature. A history which studies these manifestations could reveal its regular course, and what appears to be confused and unruly in individual people could be recognized in relation to the whole human race as an unchanging development of its primary inclinations. Someday the human race will reach that state when all its natural inclinations can fully develop and its purpose on Earth will be fulfilled. This justification of nature, or rather providence, is no small motive for choosing a particular point of view of the world [43].

Such a “special” point of view, generalizing the knowledge of the natural, social and human sciences, is systems transdisciplinarity. With the help of systems transdisciplinary models of the temporal unit of order, it was found that the concepts of sustainability, sustainable development, resilience have a consistent meaning. This meaning is consistently manifested in eight levels of reality. Each level of reality is associated with the era of the evolutionary development of the near space and planetary nature.

The invariant stage of the sixth level of reality (1792-2688) completes the development of one of the “natural inclinations of man” - the features of higher nervous activity. Higher nervous activity includes not only physiology, but also mental functions: thinking, consciousness, and mind. These functions provide adequate human behavior in changing natural and social conditions. Improvement of higher nervous activity occurs in the learning process. As a result, a person acquires the ability to justify and choose the best possible options, to foresee the results of their activities, to change the conditions surrounding it, to create new, unparalleled material and spiritual values, that is, to carry out mental activity. Contemporary humanity consists from subspecies Man truly reasonable: Sedentary Man, Social Man, Humanistic Man and liberal man. Each subspecies has formed a unique content of the concepts on which mental activity is based. These concepts are: needs, benefits, values and goals. In the states of the Sedentary type, State of the Social type, State of the Humanistic type, State of the liberal type has accumulated experience in their practical use. Today, sustainable development and a new model of the world socio-economic order are impossible without the generalization of this content and experience [44]. Thus, a natural need arises in society for new scientific approaches to solving complex problems, for scientific forecasting, planning and managing the sustainable development of individual countries and the entire human community in the short term (until 2072) and in the long term (until 2128). Today this need can be satisfied.

It is important to note that every modern scientist, specialist and politician is the bearer of a certain (disciplinary) worldview. This worldview is effective in solving low-threshold current (trivial) problems. Such problems constitute the bulk of the problems in every state. For that reason, they can be addressed by the bulk of professionals who have a bachelor’s degree. Philosophical knowledge does not play a decisive role in the worldview of such professionals. The problems of sustainable development and the new model of the world socio-economic order are high-threshold problems. To solve such problems, a new level of scientific worldview is required [45]. Systems transdisciplinarity can provide a new level of scientific worldview. It is systems transdisciplinarity training that will make it possible to form specialists (generalists) - carriers of the necessary level of scientific worldview, capable of solving high-threshold problems. Different types of states will not accept a solution to the problem of sustainable development and, moreover, a new model of the world socio-economic order, if such a model is proposed by narrow disciplinary specialists from one

state. In this case, in addition to the International Analytical Group, it is advisable to create by 2026 at the universities of different countries the discipline department - systems transdisciplinarity. This will allow create an international standard of transdisciplinary education and systems transdisciplinary competence. In the near future, specialists in systems transdisciplinarity (generalists) will strengthen of narrow disciplinary specialists in teams involved in solving high-threshold problems [46].

Thus, it can be stated that in 2016 the era of a disciplinary expert approach to solving high-threshold problems, based on intuition and foresight of brilliant specialists, ended. The era of a systems transdisciplinary approach has begun, based on the methodology of systems transdisciplinarity.

It should be recalled that if the problems of sustainable development and the new model of the socio-economic order are solved by narrow disciplinary specialists, then the near future will be associated with large material and human losses. Modern mankind has the opportunity to take advantage of the objective moment of the evolutionary development of the planetary vertical functional ensemble and ensure a promising future. For this, as physicists say, it is necessary to create a center of crystallization of such a future. We are talking about the desire of a group of interested states in 2023 (see Figures 13, 14) to create a special International Analytical Group. This group will have until 2030 to form complementary concepts of the components of sustainable development: systems transdisciplinary economics, systems transdisciplinary sociology, systems transdisciplinary ecology; the main provisions of the new model of the world socio-economic order; non-coercive ways to enforce peace in the international relations of groups of states. In this case, for the first time, it will be possible to comprehensively scientifically substantiate the general complementary quantitative and qualitative parameters of sustainability, sustainable development, and resilience of a promising future until the year 2688. Society must take advantage this chance.

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CHAPTER 9

HPTD-M for Public Management Sustainability: A Proposal for Brazil

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This paper aims to study Brazilian public management through the HPTD-M theory (Holopraxis Transdisciplinary Management). The excess of analysis, bureaucracy, and rationality is a Brazilian bottleneck. The concept of transdisciplinarity is abbreviated in this article as TD. The HPTD-M approach is based on the principles of duality, i.e., interaction and integration of opposites, especially the analytical and synthetic methods, and four requirements, namely rationality, feasibility, reasonableness, and meaning. Complexity can be transformed into simplicity through deep studies and discussions with all actors involved. The methodology to achieve the four requirements comes from Jungian psychological functions: sensation, feeling, thinking, and intuition, respectively, which are translated into four skills or types of intelligence, namely empirical, emotional, rational, and intuitive. Our Findings involve dialectics as a sustainable duality required to improve the managerial aspects of the public organizations in Brazil: The dialogue between specialists and generalists, analytical and synthetic methods, academics and executives, technicians and managers, and techno-bureaucrats and politicians, through education and change in legislation. In this context, four major groups of disciplines: technoscience = technology + science; bureaucracy, which covers law and legislation; psychology, which includes the behavior of all actors in public administration and their relationship; and politics, which involves dialogue and complete information to subsidize higher instances decision, as opposed to political ideology or dogmatism. The HPTD-M applied to sustainable public management is simple, as a result of the sophistication of complexity through studies and discussions. In that sense, simplicity can be considered a requirement in public administration, owing to dialectic models for solving the complexity of human phenomena. These HPTD-M concepts can hopefully help other open systems of knowledge as well, such as in sciences, economics, law, psychology, and politics. New approaches for governance and internal sustainability could emerge in other countries with similar problems of bureaucracy, with direct implications for the quality of public expenditure.

Keywords: HPTD-M, transdisciplinarity, public management, sustainability, complexity.

9.1 Introduction

In this article, the concept of transdisciplinarity is abbreviated (TD), and HPTD-M is an abbreviation for the Holopraxis Transdisciplinary Management theory. Complexity is part of the HPTD-M nature. Sustainability has close connections with HPTD-M as well that involves balance, especially for public administration. In the Brazilian approach, holistic TD is the interaction and integration of opposites, i.e., between the specialists and generalists or the analytical and synthetic method. The main objective of HPTD-M, in our vision, is the union of multiple ways of understanding reality, not only through the intellectual view but also through other

types of intelligence. This author's professional experience in engineering, business administration (with MBA), and public management have been corroborating the HPTD-M in praxis.

The main HPTD-M vision is derived from modern physics: At the start of the 20th century wave-particle duality was discovered both theoretically and empirically. It was established that everything has a particle (something concentrated) and wave (something expanded) character. Light is diverted by gravitational fields due to its particle character (i.e., mass, which is a feature of physical matter). However, the wave character in light is predominant. Thus, the wave-particle principle does not apply to mechanical phenomena, Newtonian classical physics, Cartesian paradigm, and Aristotelian logic.

In modern physics, pure rationality does not work, considering the duality and complementarity principle that provoke logical contradictions. Even in human phenomena, this dual character is intrinsic. A subject and object cannot be separated in an interaction, which implies that the observer interferes in the experiment. In praxis, scientific "exemption" does not exist; it belongs to rationalists, reductionists, and scientificists, who only understand mechanical phenomena.

Modern physics and Jungian psychology invite human phenomena comprehension. A holistic perspective of reality is the basis for the Brazilian holistic TD approach from Weil, Crema, and D'Ambrosio, mainly holopraxis (holistic practice). In our opinion, complexity is inherent to human phenomena, which cannot be reduced to mechanical phenomena (when there are few well-predicted variables).

The HPTD-M approach applied to sustainable public management is simple, as a result of the sophistication of complexity through studies and discussions. Simplicity can be considered a requirement in public administration, as a result of dialectic models for the complexity of human phenomena, based on the principles of duality, i.e., interaction and integration of opposites, especially the analytical and synthetic methods, and four troubleshooting requirements, namely rationality, feasibility, reasonableness, and meaning. This paper aims to study Brazilian public management through a HPTD-M view. The excessive presence of analytical method and bureaucratic rationality fails to consider the four archetypical elements translated into the four requirements mentioned above.

The methodology to achieve those requirements is borrowed from Jungian psychological functions, i.e., sensation, feeling, thinking, and intuition, respectively, which are translated into four skills or types of intelligence, namely empirical, emotional, rational, and intuitive. According to Weil, D'Ambrosio, and Crema's approach for holistic TD and open systems of knowledge, the four epistemic ways are related in the following context: technoscience (sensation + thinking), philosophy (thinking + intuition), tradition (intuition + feeling), and art (feeling + sensation).

The findings involve dialectics as a sustainable way to improve the managerial aspects of public organizations in Brazil, i.e., between the specialists and generalists or analytical and synthetic methods through education and change in legislation.

9.2 Theoretical Framework

HPTD-M can be seen initially through Nicolescu's theories, which include disciplinarity, multidisciplinary, interdisciplinarity, and TD given the fertile complementarity between **disciplinarity and TD**. This complementarity, like in modern physics (wave-particle duality considering the properties of matter and radiation, respectively), is evidenced in Nicolescu's concept of Third included. [1]

Besides Nicolescu's viewpoint of duality, as a Ph.D. in physics with the idea of *Third Included*, this paper's theory is based on the Brazilian holistic TD developed by Weil, D'Ambrosio, and Crema [3]. In 1987, Weil and Crema founded UNIPAZ in Brazil, which is the "University of Peace", a private Brazilian foundation declared of public interest, connected to holistic transdisciplinarity education. D'Ambrosio, by his turn, a signatory of the 1986 Declaration of Venice, is an element of connection between Brazilian UNIPAZ and French CIRET, of which Nicolescu was the founder and still the *Président d'honneur du CIRET*, the International Center for Transdisciplinary Research.

Weil was a psychologist, university professor pioneer of transpersonal psychology in Brazil, human resources consultant, author of many books, and dean of UNIPAZ from 1987 to 2008 when he deceased.

Weil has developed a TD model through a pyramid of four epistemic ways (technoscience, philosophy, tradition, and art) and three levels of conscience: waking, dream, and transpersonal. [3, 4]

Crema is an anthropologist, psychologist, and psychotherapist, creator of the Fifth Force in therapy, author of many books, and currently the dean of UNIPAZ and instructor of the *holistic basic training, a lato sensu* post-graduation course in UNIPAZ, Brasília, Brazil.

Finally, D' Ambrosio was a university professor of mathematics and history of science, who focused on didactics, especially a humanized face of math and education. Deceased in 2021.

In this paper, HPTD-M is a paradigm based on the integration and balance of opposite points of view (dualities), i.e., dialogue or dialectics of human phenomena [4]. In this context are sustainability issues and the complex nature of human phenomena, which is made simple through feasible management processes. However, humanity tends to apply the mechanical phenomena of linear logic to human phenomena, thereby causing praxis problems.

The holistic view is divided into two parts, namely holology, which is the study of the whole, and holopraxis, which is the practice of the whole. This Brazilian approach is connected, not only with studies but mainly with the praxis, especially in education and psychotherapy. Two archetypal¹ principles form the framework of our Brazilian theory, namely duality and four elements, which, in connection to Jungian psychological functions [6], are shown in the following epistemic ways [3]: **technoscience**(sensation + thinking), **philosophy**(thinking + intuition), **tradition** (intuition + feeling), and **art** (feeling + sensation).

These are ways of understanding reality through the four basic disciplines. These connections between the four disciplines and Jungian functions are relative, as art has intuitive aspects, tradition has developed rational foundations, and science often initiates its theories on an intuitive level. Furthermore, technoscience involves a duality of technology and science. The discovery of scientific theories can create methods of action, i.e., technology. Much like with quantum and relativistic mechanics, science avails technology as an empirical reference for corroboration. This establishes a feedback relationship, which often makes it difficult to separate technology from science. The term “technoscience,” which relates to this idea, means technology linked to the Jungian function of sensation (empirical intelligence) and science connected to thinking (rational intelligence) as presented in Table 9.2, which denotes the relations to Myers-Briggs Type Indicator (MBTI system) [7], an improvement of the Jungian psychological typology.

9.2.1 Duality Principle

Considering duality as evidenced in the four disciplines, our approach for applied sustainable HPTD-M involves duality, which implies dialectics and dialogues between opposite points of view.

De Broglie, who empirically discovered the duality of **wave and particle** in modern physics in 1924 postulated that both **matter and radiation**, which are fundamental constituents of the universe, behave simultaneously as a wave and particle through an experiment with electrons [8]. On the other hand, at the macroscopic level, mass is concentrated energy as evidenced by the famous equation, $E = mc^2$ (energy is equal to mass times the square of light speed). Thus, as Einstein said in one of his speeches, there can be a duality of **mass and energy** as different manifestations of the same thing [9]. From this “concentrated” and “expanded” principle, other dualities emerge in physics, philosophy, and Jungian psychology, such as subject-object, introversion-extroversion, and conscious-unconscious. [10]

Besides, we can conclude that the two branches of modern physics, namely quantum and relativistic mechanics (micro and macro) are another set of duality, as one theory complements the other, and both are empirically confirmed. About mathematics, Newton invented calculus almost at the same time Leibniz did in the 17th century. Thus, in formal history, both are considered creators. Calculus derivatives are instantaneous rates of change, which are, in turn, the ratios of small changes. In Newton notation, the primary objects are functions such as $f(x) = x^2$, and derivatives are written with a prime as in $f'(x) = 2x$. Whereas in Leibniz notation, the primary objects are relationships such as $y = x^2$, and derivatives are written as a ratio as in

¹Archetypes are universal images or patterns, culture-independent models or scripts. The initial concept comes from Plato, but Jung explored the idea in his theory of the collective unconscious.

$dydx = 2x$ [11]. Thus, we can conclude that the two approaches, Newton and Leibniz, show a type of duality and complementarity, i.e., **function and relationship**.

In that sense, the abstract math and abstract meaning can be close to symbols of traditions, such as the European Alchemy (under subsection 1.2). It is no coincidence that most of Newton's work is about the Alchemical tradition. Thus, **technoscience and tradition** are a type of duality and complementarity. An example is traditional Chinese medicine. Although it is more than five thousand years old, many doctors incorporate it with Western medicine.

Furthermore, the philosophy of science is an important issue about intuition (abstraction) before rationalizing it in a structured concrete theory. Einstein supposedly said once: "*The intuitive mind is a sacred gift and the rational mind is a faithful servant.*" It is a controversial statement, which is denied in formal aspects by many rationalists or reductionists, who tend to confuse this remark with mystical or esoteric ideas. The same happened to Jung several times. HPTD-M is not a clear business. Jung was accused of not being concise, although that is how human phenomena work. It cannot be a rational and clear mechanical formula; it involves dialectics. Jung takes it a step further than Western science: he shows its limitations like Einstein and other modern physicists. Jung developed a model that compares causality (cause and effect of the Western logic) and synchronicity (the way of seeing reality from the East, based on meaning). [12]

Causality can be translated from *stricto sensu* (strict sense) to rationality in our model as given in Figure 9.1. Furthermore, "meaning" in Jungian synchronicity has the same significance as "sense", which is used in the same figure. An easy example to understand the idea of meaning: Someone says "It doesn't make sense" after a suggestion or proposal has no connection to the reality to be faced. Furthermore, **causality and synchronicity** would be in *lato sensu* (broad sense) closer to the **analytical and synthetic** methods in Figure 9.1.

Einstein and Jung did not have problems with scientific consistency. Those who tend to see reality only through a mechanistic lens are the ones who get confused. From the HPTD-M perspective, it is a sound argument for **technoscience and philosophy** to have a dialogue. Great scientific discoveries can come from insights (intuition or intuitive intelligence), for instance, when the chemist, Kekulé, pictured the ring structure of benzene after dreaming of a snake biting its own tail. Naturally, Kekulé conducted a lot of rational work and research before reaching that point. Intuitive intelligence and rational intelligence complement each other and create a synergy. Those who know Einstein's philosophy of science recognize his psychological pattern in that statement, even if taken in the literal sense. In HPTD-M, content tends to be more important than formal aspects of texts or statements as is usual in law doctrine about the reasonableness principle over literal interpretation (when the literal hermeneutic is unacceptable or does not make sense).

Thus, reasonableness should not be confused with rationality as the study of the law reveals (see Figure 9.1). Law is considered a science by Wiviurka, a Ph.D. specialist [13]. However, in a *lato sensu* approach, a generalist such as a manager could consider law as an art, philosophy, or legislation technique, but not a science. Furthermore, in HPTD-M, instead of contradictions between viewpoints, a fertile complementarity in connection to the dialectics of human phenomena is formed. As an example, a possible form of HPTD-M dialogue in public administration is shown in Table 9.1.

Also considering Table 9.1, **Efficiency** "To do things right" in a double meaning i) process compliance and ii) lowest cost. In Brazilian Federal Constitution, "efficiency" is mentioned in articles 37 and 74. **Effectiveness** is "To do the right thing" in the sense of achieving goals. In Brazilian Federal Constitution, "effectiveness" is mentioned in article 74, in the form of "efficacy".

Capra, a Ph.D. in physics, is very persuasive when pointing out that humanity, in general, tends to mirror themselves in the Newtonian classical models and the Cartesian way, which are typical of mechanical phenomena [15]. In our opinion, Capra's systemic view that is based on modern physics closely links to HPTD-M in terms of understanding human phenomena.

Finally, the duality principle has a direct connection to sustainability, since, in a lack of dialogue between *lato sensu* (broad sense - management and generalist view) and *stricto sensu* (strict sense - specialist viewpoint), solutions won't be sustainable in terms of human phenomena.

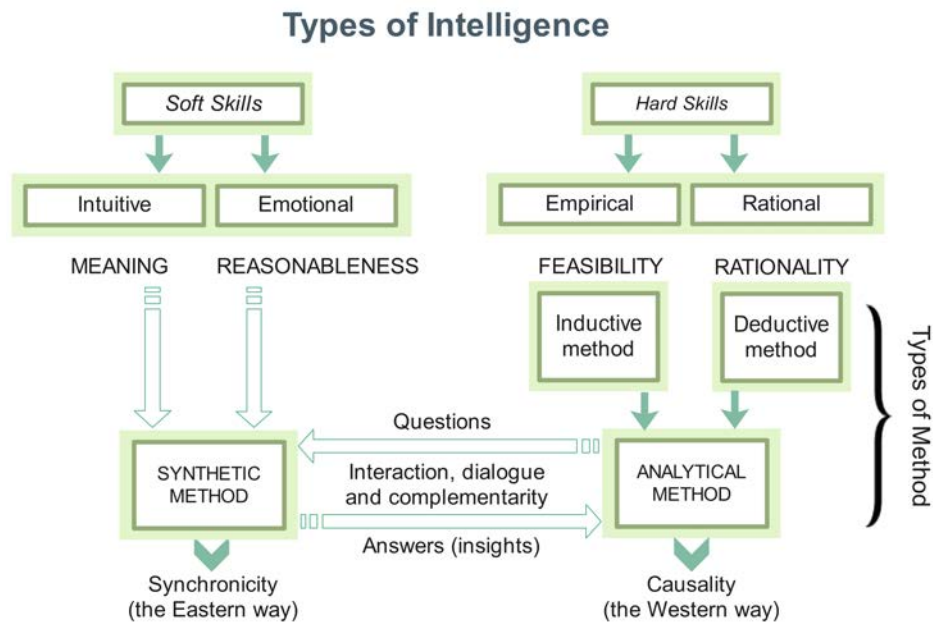


Figure 9.1: Nature of dualities in public administration [14].

Table 9.1: Nature of dualities in public administration [14].

Nature	Strito sensu	Lato sensu
Academy	Academics: Ph.D., MSc	Executives: MBA
Technic	Specialists	Generalists
Administration	Technicians	Managers
Indicator of	Efficiency	Effectiveness
Political science	Techno-bureaucrats	Politicians

9.2.2 Dualities and Four Elements Model

Dualities are the basis for the troubleshooting instruments in our model that is developed in Table 9.2. The four elements are connected to dualities by their combination of pairs considered the dialectics process as a whole (see also Figure 9.1) given the MBTI system, which is an evolution of Jungian typology that is based on four psychological functions, namely **sensation, feeling, thinking, and intuition**.

Figure 9.1 was structured as a reflection on how to deal with solutions to managerial problems or other human phenomena troubles in terms of dualities or polarities and the four element requirements, namely meaning, reasonableness, feasibility, and rationality. This figure is a result of our conception, and it is developed based on Jung's psychological typology [6] and the MBTI system, which improved the Jungian classification. [7]

Finally, HPTD-M represents a view of TD not only as scientific knowledge but as an interaction and integration of many human phenomena aspects:

- a) Technology (mostly inductive and practical) and science (mostly deductive and theoretical) interact

Table 9.2: The four epistemic ways or disciplines.

Discipline [3]	MBTI system [7] (based on Jungian Functions)	Jungian functions [6] (based on Jungian Functions)	Type of intelligence [17] (based on Jungian Functions)
Technoscience	concrete + objective	sensation + thinking	empirical + rational
Philosophy	objective + abstract	thinking + intuition	rational + intuitive
Tradition	abstract + subjective	intuition + feeling	intuitive + emotional
Art	subjective + concrete	feeling + sensation	emotional + empirical

and are integrated by the idea of technoscience (hard skills).

- b) Technoscience (hard skills) is connected to the analytical method and causality.
- c) Other epistemic ways (soft skills) must dialogue with hard skills: These are the synthetic method and the synchronicity (the meaning of a solution before its rationality).
- d) So, the four requirements for troubleshooting in any HPTD-M project are MEANING, REASON-ABLENESS, FEASIBILITY, and RATIONALITY.

In this connection, sustainability and complexity transformed into simplicity come out as a result.

9.2.3 Sustainability and Complexity

The HPTD-M can be considered sustainable as far as the complexity connected to human phenomena is concerned. Human phenomena differ from mechanical phenomena, as the variables are much more unpredictable. Thus, rather than the viewpoint of causality (cause and effect of the mechanistic approach), the dialogical way takes over in our model.

Considering sustainability concepts developed by Capra's systems paradigm [14A, 17], in our opinion, as an engineer with experience in business management and public management (which uses several business administration techniques), sustainability is an idea that is often ecological or related to social issues, like with Environmental Social Governance (ESG), which is mainly related to the external environment of public organizations – governability. However, the internal environmental issues are not any less important as regards the quality of public expenditure and all the actors involved in the processes of PA – governance.

Sustainability and dialectics are connected, which means listening to all the actors involved in the processes including the techno-bureaucrats (for technical and governance issues) and politicians (for legitimacy and governability issues), managers (for an executive viewpoint), and academics (for a theoretic approach), and generalists (for a synthetic vision) and specialists (for an analytical vision). This dialogical view minimizes the risk of not seeing some requirement for the best solution possible, as the tendency is to find a balance between governance and governability.

Complexity is a part of Nicolescu's TD [1] as well. In our empirical perspective, the complexity of human phenomena can be made simple with duality and the four elements shown in Figure 9.1. Leonardo da Vinci once said, "simplicity is the ultimate sophistication." Experienced managers know that complex formal processes for decision-making are not sustainable in the long term. Complexity must be gradually transformed to simplicity, but not simplism with gullibility. This implies that the processes must be feasible in praxis after being exhaustively studied and discussed with many actors from different perspectives.

9.3 Review of the Literature

9.3.1 Capra and D'Ambrosio – Sustainability

Our HPTD-M research commenced in 1987 with Capra's systems approach, *The turning point*, which was based on modern physics, just before our graduation as a civil engineer with an emphasis in sanitary engineering. Besides comparing the duality, of Yin-Yang, with the wave-particle in modern physics, in connection to his idea, Capra said the following:

*Ecosystems **sustain** themselves in a dynamic balance based on cycles and fluctuations, which are nonlinear processes. Linear enterprises, such as indefinite economic and technological growth or, to give a more specific example, the storage of radioactive waste over enormous periods will necessarily interfere with the natural balance and, sooner or later, will cause severe damage. [16]*

In *The Web of Life*, Capra continues in the same systemic view:

*Not only do our leaders fail to see how different problems are interrelated; they also refuse to recognize how their so-called solutions affect future generations. From the systemic point of view, the only viable solutions are those that are “**sustainable**”. The concept of **sustainability** has become a key concept in the ecology movement and is indeed crucial [...] the great challenge of our time: to create **sustainable** communities – that is to say, social and cultural environments in which we can satisfy our needs and aspirations without diminishing the chances of future generations. [18]*

D'Ambrosio himself, as one of the holistic TD theorists [3], has an article on sustainability connected to education and TD. For sustainability, the author defends the solution of recognizing the relationship between knowledge systems and human values, i.e., to think of ethical values and TD knowledge at the same time, which is a state of real conscience only possible when both human knowledge and behavior are solidary. In the author's paper abstract in English, this viewpoint is clear [19]. This paradigm is very similar to our idea of duality dialogue in HPTD-M.

9.3.2 Nicolescu – Complexity

In accounting for Nicolescu's TD theory, the idea of complexity in connection with our HPTD-M view of turning complexity into simplicity through managerial solutions, the following can be said:

The complexity axiom: The structure of the totality of levels of Reality or perception is a complex structure: every level is what it is because all the levels exist at the same time. [2]

9.3.3 Holistic TD

The Brazilian paradigm developed by Weil, Crema, and D'Ambrosio [3] is one of the bases of the HPTD-M theory (see 2.5).

9.3.4 Public Administration

Bureaucratic bias in PA can be seen as the excessiveness of the rational and empirical types of intelligence and the analytical method. The synthetic method of intuitive and emotional intelligence needs to be stimulated for problem-solving. This dialogical model is our HPTD-M point of view through dialectics, which is applied to human phenomena, where variables have a high level of uncertainty, as opposed to the mechanical phenomena perspective in bureaucratic bias.

Italy: In 2008 a study on active and passive waste of public expenditure was conducted [20]. Although it is not a TD article by itself, the research can be connected to HPTD-M theory, considering the duality of active vs. passive: the trade-off and interaction of those two opposites.

Romania (author Nita): The public administration education needs to necessarily be transformed to a TD viewpoint [21]. Emotional and intuitive types of intelligence need to be included in public administration education

South Africa (author Uwizeyimana): Disciplines involved in the TD approach to public administration, namely political science, economics, jurisprudence, psychology, sociology, geography, criminology, anthropology, history, education, philosophy, and religion [22]. In our approach, public administration involves four major groups of disciplines, namely politics (in the broad sense of coordination and human interactions, not only political science or partisanship ideology), economy (technoscience), law (bureaucracy), and psychology (humanities). There must be a dialog between all of them.

Brazil: Our research on quality of public management [14] from 2021, in the context that was one of the bases of our 2022 HPTD-M theory.

Italy, Romania, South Africa, and Brazil have similarities, partly due to the Latin culture (prevalent in Italy, Romania, and Brazil), but mostly due to bureaucracy and excessive statutory law, with fewer discretion for managers (Italy, Romania, South Africa, and Brazil).

9.3.5 HPTD-M

The Holopraxis Transdisciplinary Management is our theory released in April/2022, based on the holistic TD of Weil, Crema, and D'Ambrosio, as already mentioned [4].

Considering all the references in this subsection 2.6, our HPTD-M framework goes in the direction of:

- a) **Sustainability** – the promotion of dynamic balance between opposites through the dialectics process, including all actors.
- b) **Complexity** – is transformed into simplicity (not to be confused with simplism) through deep studies and exhausting discussions involving all parts.

Besides those three concepts applied to HPTD-M, a synthesis of our TD view from different sources can demonstrate how our HPTD-M theory was developed throughout many years, as a result of the dialogue between all those approaches.

In Table 9.3, the term “vs.” must be understood as “interaction and integration”, not simply an opposition of polarities, considering this duality TD main principle in the HPTD-M viewpoint.

9.4 HPTD-M as an Effective Instrument for Public Administration

9.4.1 Public Administration Described by four Disciplines

According to Uwizeyimana & Basheka, TD applied to public administration, the history of public administration can help understand how disciplines related to public management were formed, starting from the duality politics vs. administration at the beginning of the 20th century, through the scientific administration of Taylor and Fayol in the early 20th century, until when history becomes more complex as human issues in public administration began to be considered, and culminating with e-governance and the 4th Industrial Revolution in 2017 [22].

In our opinion, the four key disciplines can be evidenced by the consolidation of the twelve disciplines enumerated under Figure 9.1 in the South African paper to facilitate the vision of the whole system of public administration. Our idea of reducing the twelve disciplines from the South African paper to the following

Table 9.3: Synthesis of TD approaches in this article

Author	Type of TD	Reference
Nicolescu	General theory (originally from physics)	[1]
Weil, Crema, D'Ambrosio	Holistic transdisciplinarity: General theory (psychology, anthropology, math, sciences, and education)	[3]
Weil	TD pyramid of 4 disciplines and 3 conscience levels	[3, 4]
Crema	The power of encounter: Analysis vs. synthesis	[15, 24]
D'Ambrosio	Education for sustainability: Knowledge vs. human values	[17]
Capra	Systems theory (originally from physics)	[14A, 16]
Jung	Synchronicity theory: Causality vs. synchronicity	[12]
Max-Neff	Ecological Economics: Understanding vs. knowing	[23, 24]
Viparelli	Politics: "Transpolitics"	[23]
Wiviurka	Law: "Trandisciplinarization of law"	[13]
Nita	Public Administration: New TD education	[21]
Uwizeyimana & Basheka	Public Administration: Interaction of 12 disciplines	[22]
This author	HPTD-M theory: TD as hard skills vs. soft skills	[4]

four groups came from the four epistemic groups of disciplines shown by Weil, D'Ambrosio, and Crema. [3]:

- **Politics:** Includes not only traditional politics but also intuitive leadership. It involves dialogue and articulation between the various actors with different ideas for solutions, whether in the internal or external environment of organizations. Here it applies to go beyond the mere technicality of political science. Also, this is not to be confused with partisan ideology.
- **Technoscience**, starting with **economics**: The interaction between technology and science including economics, administration, and other natural sciences. Economics is the dominant discipline in public management, as technoscience is involved with the discipline of general administration.
- **Bureaucracy – law** and legislation: Law is essential to understand bureaucracy, which often becomes self-centered and dysfunctional when the ends become the means.
- **Psychology – humanities**: Psychology includes other humanities, which are not technoscience in lato sensu; this implies that they are not "exact" or biological. Technical leadership is included in this context, it is vital for understanding the interactions between the internal and external environments of organizations, the actors involved in the processes, and the relationship of public servants at an individual and collective level.

Example: This study expresses a dialog between the theory and praxis of public management in Brazil. Interdisciplinarity means "between disciplines", i.e., showing the results in six dualities, considering the four groups of disciplines in public administration. Our take on interdisciplinarity slightly differs from that of Nicolescu's theory, as the former is more empirical compared to the latter [1]. Thus, the following are the **six interdisciplinaritys** (or connections between the combination of each two groups) that we identified empirically by order of importance:

- A) **Technoscience with bureaucracy:** The techno-bureaucratic risk refers to the gullibility of not understanding the vital aspects of politics and psychology that interfere with public administration.
- B) **Bureaucracy with psychology:** As demonstrated under section 5, managers tend to be paralyzed as a consequence of perceiving a high risk of personal accountability if there is an excessive presence of bureaucracy in the public administration system.
- C) **Technoscience with politics:** Public servants tend to be prejudiced against politics, but at times forget that a merely technical approach with their superiors would not suffice to show the whole picture of the projects and concrete proposals in public administration. Emotional intelligence must be used to convince their superiors to ensure that the information reaches higher instances until it gets to the politicians in Congress. In this context, politics is not an ideology, but a dialogue between lower and higher instances to subsidize the decision of the decision makers accordingly.
- D) **Technoscience with psychology:** The executive business management idea, where risk is involved in not observing the legislation of bureaucracy and its limits to managers' discretion.
- E) **Psychology with politics:** Communication bias can result in manipulation if certain ethical milestones of governance and compliance are not observed.
- F) **Bureaucracy with politics:** This is the party ideology that can contaminate public management if considered with a dogmatic bias.

The six interdisciplinaritys above show the risk of each approach, namely gullibility, management inertia, little information in higher instances, excessive management discretion, manipulation of information, and lastly partisanship and dogmatism. To conclude, HPTD-M that is applied to public management is portrayed as an alternative to balance all the limits of the disciplinaritys (technoscience, bureaucracy, psychology, and politics) and the six interdisciplinary interactions. Concrete examples, in this case, are very delicate to be disclosed as far as ethics is concerned, but evidently, the techno-bureaucratic bias tends to harm the psychological sustainability of managers, and consequently, the subordinates, which tend to leave politicians, who are the final decision-makers in public administration, not informed accordingly.

9.4.2 Four Types of Intelligence in a Perspective of Education in Public Administration

From another perspective, Nita proposes a new type of education in public administration, which consists of learning to know, do, live, and be. [21]

Analogies with the four types of intelligence from a Jungian point of view would be rational, sensitive, emotional, and intuitive, respectively. Here, a dialogue between the author's approach and our HPTD-M vision is possible based on Jungian psychology and the MBTI system. Note the following: [7]

- **To know** in the form of research and intellect: objective **rational intelligence**.
- **To do** in the best possible way: concrete **empirical intelligence**.
- **To live** in a society with self-control and relationship capacity that is appropriate to the norms and rules of coexistence: subjective **emotional intelligence**.
- **To be** in terms of self-knowledge, which the author understands as spirituality – we understand as **intuitive intelligence**.

Moreover, intuitive intelligence involves, as a counterpart, the learning that is required in terms of innovation, as innovation is a characteristic that is derived from intuitive insights of new ideas from the unconscious to the conscious in the Jungian paradigm. In this sense, spirituality relates to intuitive intelligence, which is abstract.

In addition to this, at the personal level, as opposed to collective or organizational, there is a fifth integrative element. In ancient traditions such as European alchemy, it was considered quintessential for conscientious or beginning development, which is the concept of individuation in Jungian psychological

theory. Conscientious development is closely linked to the cultural and behavioral transformations that are relevant to the management of public organizations or institutions.

According to Crema, the integration of the four types of intelligence is manifested in a fifth Jungian function, the Self, which is intelligence of psychic totality. [15]

Example: To understand the Self principle, the four types of intelligence need to be integrated into a duality of methods analytical (rational + empirical) and synthetic (emotional + intuitive). This duality represents the integration and interaction of opposites. Owing to the excessive analytical presence in the Brazilian organs of public administration, the sustainability of managers is unbalanced. Brazilian public servants have stability and can't be dismissed, except for crimes and other issues of personal responsibility. Many tend to abandon the idea of taking up management positions and prefer to stay in the original career of techno-bureaucrats, controllers, or consultants in the public administration. The excessive controls placed in all public procedures make civil servants embarrassed, fearful, reactive, and not proactive. Rather than focusing on the core business of the organizations, these public servants tend to consider mainly bureaucracy owing to personal accountability.

9.5 HPTD-M Reflected in Economics, Law, Psychology, and Politics – Governance and Governability

Max-Neef criticizes the dominant **scientificism in economics** [24], and asserts that he would define our time as having reached a point in our evolution as human beings where we know a lot, but understand very little. While it makes sense in the field of knowledge that I (subject) represent a problem and look for its solution (object), in the domain of understanding, there are no problems, but only transformations that integrate a subject and object. It can be concluded, therefore, that knowing and understanding belong to different levels of reality.[25]

Regarding legislation, Wiviurka analyzes the possibility of applying the epistemological practice of TD to the science of law. For this, he first presents some characteristics of HPTD-M thinking, highlighting the complexity and form of development of the TD research (as opposed to disciplinary, interdisciplinary, and multidisciplinary research), which can be approached more easily from the law. Thomas Kuhn's thinking about the evolution of science is presented to emphasize the scientific revolutions, a process by which one paradigm succeeds another model in which the **idea of "transdisciplinarization" of law, a neologism** from Wiviurka. [13]

Considering psychology, for Crema, there is a hypertrophy of information and knowledge of broad, unrestricted, and immediate access, and simultaneous atrophy of the process of discernment and understanding. As Heidegger denounced aptly, we have never been more alienated from the human issue. Moreover, Crema presents the concept of normosis, which he developed together with Pierre Weil and Jean-Yve Leloup. It implies the **pathology of normality: "knowing" much more than "understanding" reality**. [26]

About politics, Viparelli adopts the **concept of "transpolitics"** and corroborates our opinion in the following manner: subjectivity and objectivity are inseparable; recognizing the humanistic core of politics to overcome reductionism and an excessive analytical presence in human sciences; rationalism is insufficient; reductionism needs to be removed and the issue around the meaning needs to be centralized. This corroborates our idea from Figure 1, i.e., a dialogue between synthetics (meaning and reasonableness) and analysis (feasibility and rationality). [23]

In public administration, Baesso provides the example of five people describing a traffic accident. According to the perspective of each one, there will be five versions. Hence, the varied versions of dialectics and discussions for the common good of Aristotle through an agreement between the different world views. In this connection, technical public servants influence important policy decisions. Politicians are always placed amid technical rationality and public opinion. Finally, the scholar asserts that technicians will never have the neutrality that Max Weber and others imagined for rational bureaucracy. For Baesso, governance (internal organizational environment) and governability (external environment) are a duality of

complementary processes. [27]

In the context of public sector bureaucracy, in December 2018, the outcomes of the technical discussions in the Brazilian Government were disclosed for preparing a guide for the governance policy of the direct, local, and foundational federal public administration as presented by the Civil House of Presidency of the Republic. The following excerpts stand out:

While the law is obviously important as a means of legitimizing public action and guaranteeing citizens' rights when overused it can slow down government processes and produce the seemingly endless red tape. The argument here is for the simplification of procedures, allowing discretion and weighting of possible alternatives to be considered when evaluating the performance of public officials [...] By basing efforts to promote integrity on a rational decision-making process model, in which unwanted practices are combated through positive and negative incentives, without taking into account the individual dimension of human behavior, the results have not been the most satisfactory [...] [28]

The 2018 publication of the Organization for Economic Co-operation and Development (OECD) corroborates the Brazilian Government's publication in the following manner:

Common policy recommendations derived from this include control and sanctions and reducing the discretion of decision-makers to diminish their scope for misbehavior. Sometimes, this has led to over-regulation, the establishment of paralyzing controls, and distrust in the public administration. [29]

9.6 Quality of Public Expenditure

An analytical approach based on a study conducted in Italy [20], where active waste (corruption) implies direct or indirect benefit to the decision-taker, while passive waste – 83% of the estimated total – does not imply benefit to the decision-taker, derives the following conclusions:

- An inability to minimize costs.
- An absence of incentive to minimize costs.
- Presence of excessive regulatory burden (increase in fixed costs).

There are similarities between Brazil and Italy regarding the positive Law and Latin culture, such that an extrapolation of this Italian situation to the Brazilian scenario can be considered reasonable.

Therefore, it is necessary to evaluate the control and compliance instruments according to:

- reasonableness, in a broad sense (*lato sensu*), includes acceptability and feasibility; and
- the cost and benefit for the effective quality of expenditure.

About PA, Brazil is a very peculiar country. Public servants are technically well-prepared, but the following circumstances are terrible for quality expenditure:

- statutory law (excess of written legislation);
- a small margin of discretion for managers;
- legislation with no incentive for innovation; and
- excessive use of control and analytical methods as a predominant paradigm (only hard skills are stimulated).

In this aspect, a simple equation can evidence the problem of these two contrasted variables, namely active (corruption) and passive (mismanagement) waste. It is necessary to evaluate the compliance and control instruments to observe the following: reasonableness – in a broad sense, acceptability and feasibility; and the cost and benefit for the effective quality of expenditure. In numbers [14]:

- a) positive effect on the prevention of corruption $\sim 17\%$ of x ;

- b) negative effect on passive waste $\sim 83\%$ of y ;
- c) then, $x > 0$, $y < 0$ and Total Cost or Benefit $\sim 0.17x + 0.83y$.
- d) Hypothetical example: If $x = 30\%$ and $y = -6.14\%$, Total $\sim 17\% \times 30\% - 83\% \times 6.14\% \sim 0\%$.

In this hypothetical exercise, the actions against corruption reduced it by 30%, considering corruption itself, but all of this would be nullified if there was negative feedback of 6.14% in terms of inertia, defensive actions, fear, or embarrassment of managers in the public administration, which would result in mismanagement. However, it should be emphasized that the loosening of the fight against corruption is not defended here, but systemic criteria for action that takes into account the balance of feedback on the defensive behavior and inertia of goodwill managers.

In our opinion, this is a bottleneck of the problem of quality of the public expenditure in Brazil, which is considered by taking into account the excess of bureaucracy and controls, especially against corruption as prevention, without evaluating its negative effect on the proactivity of managers.

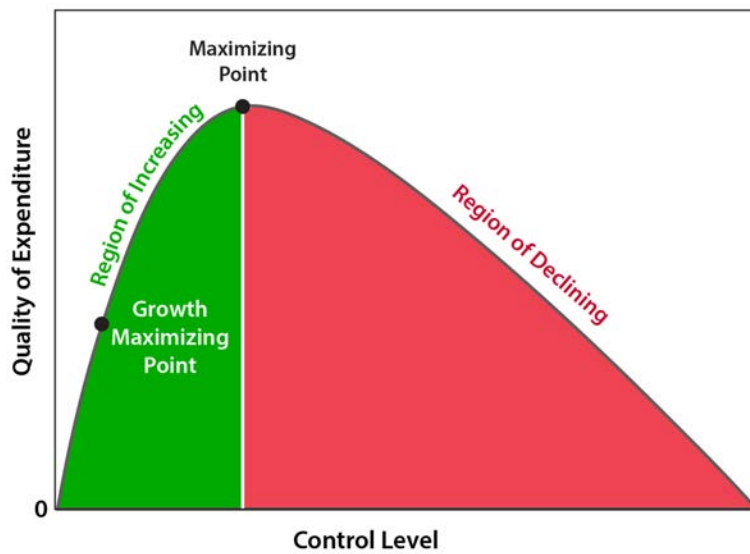


Figure 9.2: *Quality of expenditure as a function of control level [14].*

Figure 9.2 represents a complementary and synthetic approach to the numeric example, and shows a theoretical point that maximizes the quality of expenditure versus the level of control. It was conceived based on an analogy with the de Laffer curve for economics. Brazilian managers are insecure to make decisions, defensive, and mainly without proactivity. The negative effects on the quality of public expenditure draw attention to the incentive proposals that allow managers to act effectively. Thus, this is a matter of **trade-off between quality and control**.

Finally, this model is not only based on the 2009 study conducted in Italy, which focused on economics [20] and our analytical/synthetic managerial view of HPTD-M applied to the quality of public expenditure, based on our 2021 monograph [14].

A 2022 article by a political scientist and anti-corruption professor, Johnston, is very close to our approach. For the author, a strict and mere fight against corruption is not feasible. In a broad sense, we could say that “corruption prevention” is part of “control” as a variable in our 2021 monograph (see Figure 2). Johnston’s *Zero tolerance for “zero tolerance”* is very provocative in that sense, as shown in the following quote:

Rather than launching a broadside against all forms of corruption at all levels, we should focus selectively on government functions and services citizens receive [...] For reform to

be sustained and to have a chance to succeed, citizens, activists, leaders, and international partners must resist the temptation to seek immediate once-and-for-all solutions, and instead will all have to prepare for a lengthy struggle—one that may involve major reverses and aim at results for which it may be difficult to claim credit. [30]

9.7 Proposal of a Model for Brazil (Sustainability and Quality of Public Expenditure)

The Italian study denotes a public expenditure waste of 17% due to corruption and 83% due to mismanagement. There are similarities between Brazil and Italy in the positive Law and Latin culture, such that an extrapolation of this Italian situation to the Brazilian scenario can be a reasonable viewpoint. Therefore, it is necessary to evaluate the control and compliance instruments to observe the following:

- reasonableness – in a broad sense – includes acceptability and feasibility; and
- the cost and benefit for the effective quality of public expenditure.

Regarding public administration, Brazil is a very peculiar country. Public servants are technically well-prepared, but the following circumstances are terrible for quality expenditure:

- statutory law (excess of written legislation);
- a small margin of discretion for managers;
- legislation with no incentive for innovation; and
- excessive use of controls and analytical methods as a predominant paradigm (only hard skills – technical skills – are stimulated).

Note that the intention here is not to blame anyone for the problem. Any attempt in that sense is unintelligent and naive, as the question involves mistaken mental models, reductionist behaviors, and dysfunctional interactions between the two key actors in the process that results from the institutional system itself (i.e., managers and controllers). Thus, the following four points of view need to be considered for sustainability: managers, controllers, the interaction between managers and controllers, and a system or status quo with various institutional dysfunctions. Among these dysfunctions, the most important, in our opinion, are the following:

- The legislation only provides punishment to the public agent for a deed or gross error, without any express provision for an isonomy of opinions or a dialogue between managers and controllers.
- The lack of instruments to provide legal certainty or support to the decisions of the manager, like those that exist for executives in the state, including D&O – liability insurance, statutory protections, and specialized lawyers to defend the manager in good faith.
- It is necessary to study the ways to value a manager who delivers effective results to public administration. While a manager with bad faith relies on judicialization indefinitely and pays for the best lawyers, a manager in good faith has to pay specialized and expensive lawyers out of his pocket. Therefore, specialized lawyers should be paid by the Union for every manager in good faith, as those in bad faith already tend to pay out of pocket for the most expensive. Still, if found to be misconduct or gross error, the manager would have to reimburse the costs. Family tragedies can be avoided with those proposed changes in legislation, such as public servants head of a family eventually having to sell their home or their property mortgage to pay lawyers.
- Managers and controllers are encouraged to gain training through master's degrees or academic doctorates. While there is nothing wrong with master's and doctorate academic studies, they should be seen as a specialist approach, which should sync with the generalist managerial viewpoint. Both are important in terms of HPTD-M and management sustainability. However, in Brazil, there is no incentive for courses such as the MBA model in the USA with a management focus, or small-term

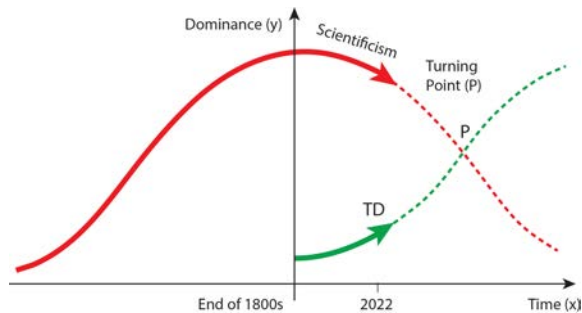


Figure 9.3: Cultural transformation and the turning point adapted from Capra [15].

management training programs that promote a more pragmatic view from the day-to-day praxis. The exceptions include an excellent training program for managers promoted by the National Treasury. It is necessary to understand that academic courses are for the development of specialists, and not generalist managers in praxis. There seems to be a great deal of confusion in this regard, between the public servants themselves, managers, and controllers.

For all the above, it is urgent to discuss proposals to solve this bottleneck of sustainability and quality of Brazilian public expenditure through dialectics among managers, controllers, academics, and legislative advisors. The following two measures seem to be essential in this sense:

- A) **Bottom-up - promoting cultural and behavioral transformation.** Development of a managerial paradigm through short-term training programs for managers and controllers, including encouragement for training programs with a more managerial focus as a complementary approach to master's and doctorate degrees, which are considered most important to the development of public administration. The academic specialist tends to be distant from the pragmatism of management. Only **synergy and dialectics between the specialists and generalists** will make it possible to catalyze transformations in the culture and behavior of managers and controllers. In this regard, the physicist and systems theorist, Fritjof Capra, once said, "*The time has come for other sciences to broaden their underlying philosophies.*" *Capra's The Turning Point* [15] gives an excellent perspective to those most connected to the scientific method as a facilitating instrument for understanding the TD sphere, especially the necessity for cultural transformations to overcome the Newtonian and Cartesian paradigms as the mainstream way of portraying reality (see Figure 9.3).
- B) **Top-down - change in legislation.** This measure includes the following: the transformation of focus by adjusting art. 28 of LINDB, and a study of the institutional provisions of support to the manager, such as D&O and statutory protection, which already exists in some state-owned companies.

As a guideline for the proposals, top-down and bottom-up, Figure 9.4 was conceived based on Jungian psychology [6], the MBTI system [7], and the complementarity of governance and governability [27].

In the figure, the circle separates the internal environment of the **subject** or introversion of each institution, i.e., **governance**, from the external environment of the **object** or extroversion of each institution, i.e., **governability**. As seen in modern physics, subject and object can't be separated; one complements the other.

Inside the circle, the psychological functions of the institution can be classified according to the MBTI system in the following manner: **judgment** on the horizontal axis and **perception** on the vertical axis.

Thinking and **feeling** are opposite functions of judgment that complement each other.

Sensation and **intuition** are opposite functions of perception.

Thus, the four types of intelligence can be correlated to the four Jungian functions in the following manner:

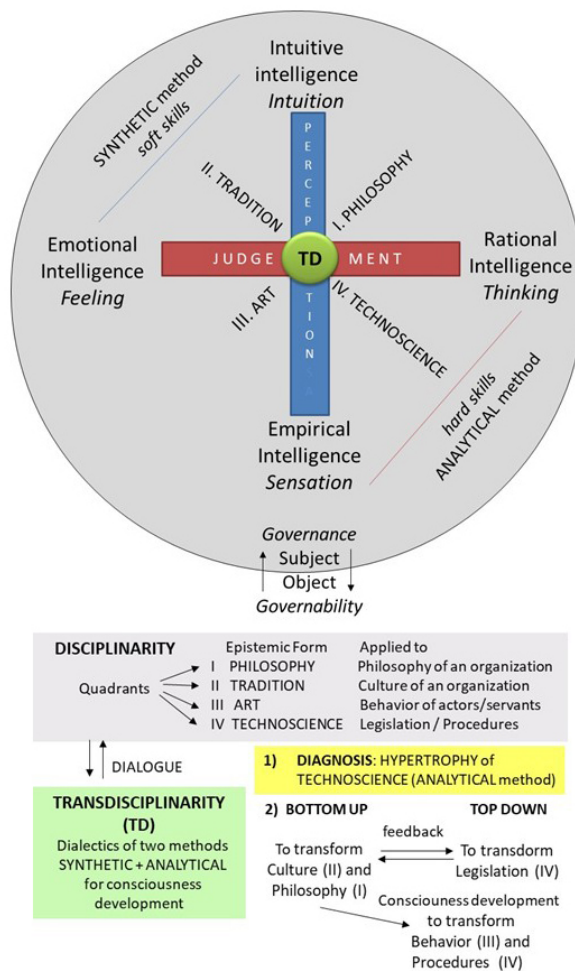


Figure 9.4: Sustainable management: diagnosis and proposals of bottom-up and top-down [4].

- thinking with rational intelligence;
- feeling with emotional intelligence;
- sensation with sensitive intelligence; and
- intuition with intuitive intelligence.

Finally, Figure 9.4 represents the following four types of dualities in terms of dialectics, the basis of HPTD-M, and the interaction and integration of opposites:

- Subject and Object;
- Judgment and Perception;
- Thinking and Feeling; and
- Sensation and Intuition.

The four epistemic ways or disciplines, namely technoscience, philosophy, tradition, and art are also to be considered, as they are in the four quadrants of the Cartesian plane.

- I. philosophy** (thinking + intuition),
- II. tradition** (intuition + feeling),
- III. art** (feeling + sensation), and
- IV. technoscience** (sensation + thinking).

Moreover, technoscience is the result of interaction between technology and science, such that it is sometimes difficult to separate one from the other. [3]

Considering our original approach for troubleshooting in Figure 9.1, the following details of Figure 9.4 can be presented:

- Synthetic and analytical methods are connected to soft and hard skills, respectively.
- The four epistemic ways of technoscience, philosophy, tradition, and art are shown in each quadrant of the Cartesian plane.
- Emotional and empirical types of intelligence are at the extremes of the judgment axis.
- Intuitive and empirical types of intelligence are at the extremes of the perception axis.
- HPTD-M considers TD as the green circle in the center.

9.8 Conclusions

The HPTD-M approach that is applied to sustainable public management is simple, as a result of the dialectic models for the complexity of human phenomena, which is converted to simplicity through the sophistication of studies and discussions. In praxis, something very complex won't work in terms of process design. Furthermore, our HPTD-M view is flexible if based on the principles of duality (interaction and integration of opposites, especially the analytical and synthetic methods) and four requirements (rationality, feasibility, reasonableness, and meaning). However, the holistic view of reality cannot be confused with ideology or dogmatism, which is something that happens very frequently to rationalists and scientists, who consider themselves "exempt" and "impartial" and tend to not recognize psychology and politics as a bottleneck of public administration. HPTD-M only incorporates those two as relevant disciplines in the internal and external environment of public organizations. These disciplines include the following: technoscience – technology and science; bureaucracy – law and legislation; psychology – the behavior of all actors in public administration and their relationship; and politics in *latu sensu* – dialogue and complete information to higher instances, which is different from ideology, partisanship, or dogmatism. Currently, there is an excessive analytical presence between managers, controllers, and academics in Brazil, which can be seen by the dominantly scientific profiles, technicians, bureaucrats, or technobureaucrats, who tend to disregard human phenomena.

On the other hand are some business managers from the private sector, who try to be public managers, but fail to consider the peculiarities of public administration, such as the bureaucracy of doing only what the legislation allows in Brazil. In this aspect, there are some concrete cases of entrepreneurs not listening to various public actors and stakeholders. They tend to be self-centered and fail to understand the operating public system as a whole.

Therefore, the solution for public management sustainability involves dialogue, a dialectical process between generalist public managers and various specialists, so that culture and behaviors can be transformed. That is not the present scenario in Brazil, where hard skills (technical, scientific, and bureaucratic skills) are insufficient to provide instruments for dealing with management in an effective broad sense. Instead of being focused on the core business of the organizations, Brazilian managers tend to consider bureaucracy in the first place due to personal accountability. Pragmatic education could be a good way to catalyze transformations of the culture of managers and controllers. Change in legislation could support managers and encourage them to be more proactive, with instruments such as D&O, statutory protection, expert lawyers at their disposal in case of a personal lawsuit, and a bonus for good results. Some of these instruments for the protection of good managers already exist in Brazilian state-owned companies.

The subtlety of this problem requires that nobody be blamed. It is necessary a solution to cultural transformation through practical education with effective legislation to support the new behavior. It is clear the gullibility and naivety of those who tend to blame the Government, managers, controllers, or academics who influence the controllers in a techno-bureaucratic bias. There is no one to blame, but the status quo.

Our applied HPTD-M approach to sustainable public management is simple, as a result of dialectic models for the complexity of human phenomena. Hopefully, these HPTD-M concepts can help other open systems of knowledge as well, such as in sciences, economics, law, psychology, and politics. New viewpoints for governance and internal sustainability could emerge in other countries with similar problems of bureaucracy, with direct implications for the quality of public expenditure.

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CHAPTER 10

Integrative Transdisciplinarity: Explorations and Experiments in Creative Scholarship

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Throughout the world there has been a sustained criticism of current educational systems, which are viewed as unsustainable because inappropriate for an age of complexity. In this article I reflect on the development of what I call Integrative Transdisciplinarity, an approach to inquiry for individual scholars. Integrative Transdisciplinarity is grounded in systems and complexity thinking and frames inquiry as a creative process. I discuss the theoretical foundations of this approach with references to some of the ways in which it has been applied in a transdisciplinary doctoral program for almost 20 years.

Keywords: Complexity, complex thought, graduate education, creativity, integrative transdisciplinarity, systems theory.

10.1 Introduction

In this article I reflect on the development of what I call Integrative Transdisciplinarity and discuss the experience of preparing students for serious transdisciplinary research based on over 20 years experience teaching courses in transdisciplinarity and in an explicitly transdisciplinary doctoral program. I first taught a graduate course on Transdisciplinarity in 1998, at the California Institute of Integral Studies, with my dear friend and colleague Sean Kelly. We had been introduced by Edgar Morin, and we were both fascinated and inspired by his wide-ranging work and in particular his concept of complex thought. We both had diverse disciplinary backgrounds and wanted to introduce our graduate students to ways of doing creative research that stepped beyond disciplinary boundaries and hyper-specialization.

In the late 1990s transdisciplinarity was still a fairly mysterious concept that did not have much traction in academia. Our assigned readings for the course included works by Edgar Morin, Basarab Nicolescu, Julie Thompson-Klein, and Ian Barbour, among others. Students enjoyed the class but in the end struggled to understand how to apply the material to their doctoral research. Since those days, the field of transdisciplinarity has boomed, and there are now different schools and multiple approaches to transdisciplinarity (Augsburg, 2014; Martin, 2017; Pohl, 2010). Teaching in a transdisciplinary doctoral program (Montuori, 2010) has given me the opportunity to work with students and find out what the challenges and opportunities are, and what happens when the rubber hits the road, when they actually have to do transdisciplinary research, but also more broadly when they learn how to become scholars and scholar practitioners. In this sense, the agenda is to articulate and develop creative transdisciplinary scholarship. I see Integrative Transdisciplinarity as a broader reframing of academic inquiry that is grounded in systems/complexity principles, and taps into the

joy of inquiry that springs from the natural curiosity and creativity that drew many people to research in the first place, but that is often driven out of students and inquirers from school days all the way to university.

University education has been extensively criticized for many years now, and for any number of reasons. The traditional disciplinary approach that was at the heart of the industrial age reflected an attempt to apply the larger scientific worldview of modernity and hierarchical, authoritarian principles of social organization going back much further in history, to education in much the same way that Frederick Taylor attempted to apply to management. This approach is no longer sufficient in an age of complexity and has indeed become very counterproductive (Aronowitz, 2001; Bocchi & Ceruti, 2004; Bocchi et al., 2014; Laszlo, 1972; Morin, 2008c; Morin & Kern, 1999; Taylor, 2009; Wilshire, 1990). As Banathy argued, *We enter the twenty-first century with schooling designed in the nineteenth* (Banathy, 2001). Nicolescu has argued that in the context of a globalized world there is an urgent need for a much more integral, transdisciplinary view of education (Nicolescu, 2012). Morin has offered 7 lessons towards a new education for a complex world (Morin, 2001). With an assembly line approach, schools all over the world have historically emphasized the importance of what I have called the reproductive approach to education (Montuori, 2011c), a way to create docile students and eventually docile workers and bureaucrats that could function in a fundamentally authoritarian setting, reproducing the power structure and organization of the larger system. This reproductive approach is no longer sustainable in an age of complexity and rapid change.

The process and content of current education are therefore not sustainable because rooted in the Industrial Age, but also in an earlier, hierarchical, authoritarian form of organization. They also do not provide the need resilience for this historical moment, a time of transition when one age is dying and a new one has not yet emerged. Students are learn how to obey and follow instructions but not how to respond to the unexpected, the unforeseen, and as a result are unprepared for the many shocks that occur from pandemics to wars to economic struggles.

The unsustainability extends to educational institutions. As an example, in the United States university departments are increasingly reliant adjunct faculty who in turn are being exploited in an effort to lower operating costs. As a result, teaching at the university level is becoming unsustainable for many. Siloed education preparing hyper-specialized students is no longer appropriate for work or for life, and there is an emerging interest in breaking down disciplinary barriers, the role of generalists, polymaths, and transdisciplinary education (Burke, 2020; Epstein, 2019; Martin & Mikkelsen, 2019; McGregor & Volckmann, 2011; Tett, 2015).

Roots and words

I have always been drawn to scholars in the systems/cybernetic tradition, like Edgar Morin, Gregory and Mary Catherine Bateson, Gianluca Bocchi, Mauro Ceruti, Magoroh Maruyama, Basarab Nicolescu, Joanna Macy, Anthony Wilden, Riane Eisler, and others who emphasize the need to approach topics in a fundamentally different way. I was particularly interested in the scholars who focused on the epistemological dimension, emphasizing the importance of reflecting on knowledge, the construction of knowledge, and viewing topics from a multiplicity of perspectives. I believe this is partly related to the fact that I grew up as a third culture kid (Pollock & Van Reken, 2001). My father was Italian, my mother Dutch, and I always lived in a third country—Lebanon, Greece, England, and then on my own in the USA and the People's Republic of China. I couldn't help but notice how different cultures had different ways of making sense of the world, different ways of thinking and expressing ideas, as well as different kinds of ideas and practices. I saw that this diversity of perspectives could be a source of conflicts and confusion, but that it could also be very generative, and a way to step outside of blinkered 'single vision.'

Systems, Complexity, and Context

Anybody with a background in systems theories, anyone approaching an issue systemically, will almost by necessity have to cross disciplines. Studying any system in context will likely require stepping out of disciplinary boundaries and comfort zones. Some of the founding systems/cybernetics thinkers, such as von Bertalanffy (Von Bertalanffy, 1976), as well as the participants of the Macy Conferences and the Alpbach symposium, saw the emerging systems/cybernetic approaches as a way to create a way of thinking and a language that could allow researchers to move across disciplines (Bateson, 2004; Koestler & Smythies,

1969). Edgar Morin has most notably followed this original inspiration and developed his epistemology of complexity (not to be confused with complexity theory, associated with the Santa Fe Institute) to present a different way of engaging scholarship that draws on the fundamental insights of systems, cybernetic and information theories as well as philosophy (Heath-Carpentier, 2022; Morin, 2008a, 2008b). Compared to the 1950s and 1960s when the Macy and Alpbach conferences were held with their call for unification and breaking down of silos, there is now a vast amount of research being generated in a dizzyingly expanding number of journals. The pressures of academia to publish contribute to this situation, with many faculty knowing they have to publish to survive. There is much more focus on generating specialized knowledge than on contextualizing, interpreting and integrating (Morin, 2008c). In the field of creativity research, for instance, Glaveanu has bemoaned the fact that enormous amounts of new research are being generated, but in the end little of it is discussed or integrated, developed into new theoretical frameworks (Vlad Petre Glăveanu, 2014).

Integrative Transdisciplinarity was developed to prepare scholars to engage in this work of contextualizing, interpreting, integrating, and providing new perspectives. It is a form of what Boyer would call *scholarship of integration*. Cronin makes the important point that the use of the term transdisciplinary *scholarship* rather than transdisciplinary *research* points to the broader implications of transdisciplinarity and makes it clear it is not one of any number of research *methods*: it is a form and practice of scholarship, a broader context and approach to inquiry which incorporates any specific research methods a scholar might use (Boyer et al., 2015; Cronin, 2014). Scholarship of integration draws on existing empirical and theoretical research, contextualizes and connects, interprets, and integrates knowledge that is often buried in specialized journals in multiple disciplines to address a particular topic. I will often use creativity as an example throughout this article because creativity is itself central to Integrative Transdisciplinarity, and because creativity research now is moving in a more complex and systemic direction from its original individual-centered view (Glaveanu et al., 2020; Montuori, 2020). This offers an opportunity to compare and contrast the two approaches.

Integrative Transdisciplinarity

Integrative Transdisciplinarity begins with an issue of interest. This is followed by a rich description of the topic, usually in the form of a narrative, the articulation of questions and connections that arise from that narrative which establishes what questions and connections need to be addressed and explored, and then the integration of pertinent knowledge that may be found in a plurality of disciplines to provide a way to develop the inquiry. I call this an inquiry-based rather than discipline-driven approach (Montuori, 2005a). The term Integrative here refers to the integration of knowledge across disciplines, the integration of the inquirer, of theory and practice, of scholar and practitioner, of inquiry and self-inquiry, and, as Gregory Bateson put it, rigor and imagination (Bateson, 2002). Fundamentally, it is to provide scholars with a complex, generative frame for their work, restoring the joy of inquiry which is all too often lost in some of the more traditional ways of framing scholarship. I refer to it as aspirational because it makes considerable demands on scholars, it is still in its infancy, and is an attempt to open up scholarship to the aspects of inquiry that may initially have brought students to their academic work, the passion, the reflection, the conversations, the exploration and are often not accounted for in the ways that scholarship is articulated.

Integrative Transdisciplinarity has 5 major interconnected dimensions which serve as heuristics and scholarly practices to orient researchers. They are:

- a) A view of the world as interconnected, interdependent, and creative which therefore should be researched using perspectives which acknowledge and incorporate that reality, namely *systems theory and complex thought*.
- b) Framing *inquiry as a creative process*, and drawing on the extensive research on creativity to inform scholarship.
- c) *Inquiry-based* rather than discipline-centered, meaning the inquiry begins with a “thick” description of the topic in the form of a narrative, questions are then developed from that narrative, and pertinent knowledge is then sought across a range of relevant research in various disciplines.

- d) *Meta-paradigmatic*, or recognizing that there are a multiplicity of ways of approaching a topic, and there may already be one or more theoretical frameworks in use in the literature on one's chosen topic. Also essential is understanding the fundamental assumptions underlying the different theoretical positions and the fundamental assumptions of one's own approach to inquiry and to a specific topic.
- e) *Integrating the inquirer* means developing the ability to reflect on one's own choices and assumptions as a scholar, the development of integrative complexity and epistemic cognition, metacognition, cultivating one's creativity, as well as situating oneself socially and psychologically (the sociology and psychology of knowledge), and reflecting on the way they influence one's research. This dimension also addresses the self-creation of individuals as scholars.

These dimensions are closely interrelated and interconnected. As an example, the way one understands and approaches creativity is informed by systems principles (a complex view of creativity as a networked phenomenon). The integration of the inquirer leads to reflection on one's own creative process and one's self-creation as a scholar. The meta-paradigmatic dimension involves the ability to differentiate and integrate multiple perspectives (integrative complexity) and also weave together existing research to create new perspectives and theories. We begin our review of the five dimensions with systems and complexity.

10.2 Systems/Complexity

The movement towards a more complex understanding of the world has been building in the west and found throughout the 20th century.

The demand for "seeing things whole" and seeing the world as an interconnected, interdependent field or continuum is . . . a healthy reaction to the loss of meaning entailed by over compartmentalized research and piecemeal analysis, bringing in particularized "facts" but failing in relevance to anything of human concern (Laszlo, 1972, p.6).

Fundamental to Integrative Transdisciplinarity is a view of the world as a complex, interconnected, interdependent, and in many ways unpredictable phenomenon. This also means viewing knowledge and knowledge production as interconnected, interdependent, and creative. This view reflects some of the key findings of the new science and its understanding of the nature of the universe and human existence (Bocchi & Ceruti, 2002; Capra & Luisi, 2014; Peat, 2002; Swimme & Tucker, 2011). Zen master Albert Low (Low, 2002) explains that

The old view was based upon clear and distinct ideas and was ushered in by Descartes, among other thinkers. It gave birth to the belief that concepts could be clearly and uniformly defined, that the world could be considered a closed system and understood in the same way that a machine could be understood. Underlying the old view was a single, unified point of view; a viewpoint originally attributed to God but subsequently adopted as the objective eye of science. The new view, on the other hand, will be based upon ambiguity, upon alternate realities, as well as upon multiple points of view of observers who cannot be abstracted from what they are observing (p.5).

The systems view of the world creates a different fundamental starting point for inquiry, one based on complexity rather than simplification. Rather than assume that to understand a phenomenon one has to take it apart to its simplest components, a complexity approach views any phenomenon in context and in terms of its connections, stressing that in order to understand the whole we must understand the parts, but in order to understand the parts we must understand the whole (Heath-Carpentier, 2022).

The systems/complexity view can be a challenge for students who are not used to reflecting on the underlying philosophical assumptions and paradigms of the material they're working with. They are also invited to reflect on the fact that there are different ways of understanding the world, different worldviews, different theoretical lenses, and different assumptions, that their own view is informed by an underlying

paradigm, and that this has implications for research. One of the key aspects of this work is to see how these complex historical developments, new theories, and new approaches apply directly to the work that the students will be doing in their doctoral studies. More specifically they are invited to look at the underlying paradigms of thinking, research, and disciplinary organization, comparing the paradigm of simplification of modernity to the emerging paradigm of complexity (Heath-Carpentier, 2022). Students have to understand, reflect on, and also see the implications of a systems/complex view of the world for their own work and learn to apply it to their research. The development of complex thought—understood as a fundamental epistemology, rather than the more limited use of systems model to map and model the world—is at the heart of Integrative Transdisciplinarity.

In order to become familiar with the roots of the systems view of the world, students begin with a review of the foundations of classical science and social science. It is clear that in the 20th century there were great changes, in science, philosophy, the arts, and the social sciences, all pointing towards an emerging worldview (Peat, 2002). The orderly, deterministic, mechanistic physics that social science had modeled itself on was challenged by what Erwin Schrödinger, in a letter to Einstein, called “die verdamnte quantumspringerei,” or that damned quantum jumping. But what is most relevant for the students is the way that the paradigm of simplification, or analysis, was—by definition—not able to address the complexity of the world.

With Modernity and the Cartesian/Newtonian paradigm, the world was understood through the metaphor of the machine (Capra & Luisi, 2014). To understand a machine, it was taken apart to its constituent elements. This action of *simplification*—taking a machine apart—has its corollary in human thought in the process of *analysis*. In popular parlance, to *analyze* something means to give it sustained thought and the term has also become a synonym for inquiry. In social science the *unit of analysis* refers to the focus of our study. Of course this assumes that the “unit” will be “analyzed” or taken apart. As an example, the study of the psychology of creativity focused on the individual person as the unit of analysis, and searched for the personality traits, motivation, and cognitive processes associated with creative persons compared to persons deemed less creative.

Analysis involves a process of separation and reduction, separating out the constituent elements of the phenomenon being studied. Reductionism is the assumption that scientific explanation of complex phenomena occurs through of process of simplification to its component, more basic phenomena. The whole is explained from the knowledge of its parts. Reductionism, fundamental to the paradigm of simplification, seeks to reduce to the most basic elements of study. As a result, in this view sociology can be reduced to psychology, to chemistry and ultimately everything can be reduced to physics. In this view the universe and human beings can be reduced to nothing but particles. Love can be reduced to *nothing but* the operation of hormones. At the Alpbach symposium that focused on going *Beyond Reductionism*, the psychologist Viktor Frankl had already pointed out that the result of this “nothing butness” of reductionism is nihilism (Frankl, 1969). This is clearly not a satisfactory view of the world.

Barabasi states the problem succinctly (Barabasi, 2003):

Reductionism was the driving force behind much of the twentieth century’s scientific research. To comprehend nature, it tells us, we must first decipher its components. The assumption is that once we understand the parts, it will be easy to grasp the whole. Divide and conquer; the devil is in the details. Therefore for decades we have been forced to see the world through its constituents. We have been trained to study atoms and superstrings to understand the universe; molecules to comprehend life; individual genes to understand complex human behavior; prophets to see the origins of fads and religions. (p. 6)

The machine universe was orderly and deterministic, governed by scientific laws, and anything that appeared disorderly was simply considered a function of human ignorance. These assumptions were foundational in much of social science research, which aimed to emulate the successes of physics.

A way of understanding the world that was new for western science emerged in the 20th century with General System Theory, Cybernetics, Information Theory, and later Chaos and Complexity theories (Peat, 2002). One unifying thread in these approaches was the search for a way to go beyond reductionism, beyond analysis, beyond the paradigm of simplification. It became clear that as Morin (Morin, 2008b) put it, “(T)he

modern pathology of mind is in the hyper-simplification that makes us blind to the complexity of reality” (p. 6). The paradigm of simplification was extremely successful in certain domains. It led to the Industrial Revolution, great advances in science, medicine, and other areas. But it also had its limitations, as Morin points out, and in the 21st century, complexity is perhaps the greatest challenge facing humanity.

There is a parallel between the dominant way of thinking in science and the way knowledge was organized institutionally. Thinking dominated by analysis leads to increasing focus on smaller and smaller aspects of a subject. We can see the parallel in university departments with the ever increasing specialization into disciplines, then sub-disciplines, and even more specific sub-sub-disciplines. A key problem is that there often is little or no communication between disciplines and sub-disciplines, and as a result there is a fragmentation that makes it harder for new findings to be integrated and applied. Larger questions are increasingly side-lined and forgotten, connections are ignored, and specialization can lead to a blinkered view where the part becomes the whole. One popular example is health, where there is a strong movement to augment the specialization of western medicine with more holistic approach that take into account the patient in their context, with factors such as diet, stress, psychological health, and so on (Martins, 2018).

Terms such VUCA (Volatile, Uncertain, Complex, and Ambiguous) and Postnormal are used to describe the unstable and perplexing new global condition (Montuori, 2011a; Sardar, 2010). It is increasingly evident that the planet itself has become interconnected, interdependent, and unpredictable. A shift is required to a way of thinking that can account for complexity and uncertainty rather than eliminate it. It has become necessary to recognize the importance of learning to live with uncertainty. The goals of certainty and omniscience are a chimera.

Transdisciplinarity is widely associated with the need to address “wicked problems,” problems so complex (because they are interdependent, interconnected, and dynamic) that they cannot be addressed exclusively from one disciplinary perspective (Brown et al., 2010). A transdisciplinary approach is needed in huge urban projects and many environmental issues (Byrne et al., 2017; del Cerro Santamaría, 2020; Moore & Mitchell, 2015). The full extent of many environmental problems may require addressing ecological, economic, political, technological, and a host of other issues that may include, for instance, the historical sub-cultures associated with various professions such as mining or logging or heavy industry. It is possible to study aspects of these environmental issues from a disciplinary perspective, even though environmental studies itself has always drawn on multiple disciplines. But in order to address these complex issues in a thoughtful and wise manner that does not leave out key issues and stakeholders, a systemic approach is needed that does justice to the complexity of the issue and includes second-order integration of the inquirer into the inquiry, another dimension of Integrative Transdisciplinarity (Moore & Mitchell, 2015).

Integrative Transdisciplinarity, with its systemic foundation, is appropriate for scholars wishing to draw on existing empirical as well as theoretical research and develop new ways of framing, seeing, and understanding topics. A transdisciplinary approach can also be used to revisit subjects which have already been studied extensively but not systemically. Creativity research in the 20th century was predominantly found in psychology. I call psychology the Dominant Disciplinary Discourse of creativity, because it was the discipline where most of the relevant research could be found (Montuori, 2005a). Until the 1990s, this research focused almost entirely on individuals. The study of creativity was broken down into three main areas—creative person, process, and product, or “PPP” (Runco, 2007). This already established that the “who” of creativity was always by definition an individual—the person—and not a group, a relationship, or anything else. As a result there was no research on creative teams, relationships, collaborations, or how environments fostered or hindered creativity (Montuori & Purser, 1995). A systems approach to creativity draws the researcher’s attention to contexts, relationships, and the social dimensions of creativity. As we shall see, this approach also changes the understanding of the individual who is now contextualized and viewed as an open system in constant interaction with its environment. Previously the individual was viewed as a closed system and the environment considered epiphenomenal. The closed system view of the creative individual was part and parcel of a whole romantic mythology of innate genius, genius without learning, and genius overcoming all obstacles (Montuori & Purser, 1995). Only the individual mattered. If the other people did anything at all, they merely got in the way of the genius with their mediocrity (Montuori & Purser, 1999b). In the discussion of the Creativity dimension we will also see how the decontextualizing strategy of

simplification can also lead to very problematic and simply mistaken views of a topic.

It should be pointed out that the focus on the individual is connected to the strategy of simplification but this in turn can be traced to the broader focus on individualism in the United States (Montuori & Purser, 1999a). Whether in social science research or in the dominant culture, it was all about the individual, and a form of methodological individualism. The United States is after all the country of the “self-made man,” the lone cowboy, the lone private investigator, the country of John Wayne and Clint Eastwood (Stewart & Bennett, 1991). The resonance between the focus on the individual in research—on the methodological individualism—and the culture in which the researchers are situated is very interesting and relevant, particularly when we note that in France, Italy or Japan, creativity research has historically been much more focused on teams and collaboration (Montuori & Purser, 1999a). Part of the challenge of complexity is to dig deeper and find the traces of powerful influences that are due to historical and cultural factors not often considered in academia—particularly when a topic is studied in a very individual-centered way— but nevertheless exert their influence in the ecology of ideas.

Analysis and Synthesis

If the paradigm of simplification focuses on the role of analysis—breaking down into the simplest constituent elements—the paradigm of complexity thrives on synthesis, connecting and contextualizing. We recall also Arthur Koestler’s definition of bisociation, central to the creative process, the simultaneous mental association of an idea or object in two fields ordinarily not regarded as related (Koestler, 1990). Morin (Morin, 2008b) writes that

If the paradigm of simplification relies on disjunction and reduction, the paradigm of complexity relies on distinction and conjunction – ‘to distinguish without disjoining, to associate without identifying or reducing.’ Complex thinking seeks to account for experience in a unified manner and, accordingly, conjoin concepts by overcoming disciplinary isolation. Complex thinking, however, does not lead to know-it all thinking. To take complexity seriously means that one realizes the irreducible ambiguity and uncertainty of the world, which presents inquirers with the ongoing need to complexify their thinking. (p. 6).

“Complex thinking,” Morin’s integration of systems theory, cybernetics, and other related approaches as well as their philosophical predecessors from Heraclitus to Hegel (Morin, 2011), is very much at the heart of Integrative Transdisciplinarity. Unlike Complexity Theory, it is an *epistemology of complexity* (Heath-Carpentier, 2022). The principles of reduction and disjunction operate in the organization of thinking and also in the organizations of institutions. We have seen that there is a process of taking complex phenomena apart and then separating the individual elements. The individual elements are then treated as if they are *separate* from the others and can be understood in isolation. We see this in the way university disciplines are separated, with little or no communication between them. In fact, Bruce Wilshire has shown the rites of disciplinary purification that occur in American universities, a process of decontaminating junior faculty from the influence of other disciplines (Wilshire, 1990).

Fundamental concepts that take the form of binary oppositions in western culture, such as Objective and Subjective, Reason and Emotion, Male and Female have been framed as separate and in opposition to each other—a hierarchical opposition, with the first term always the superior in the discourse of academia, whereas the hierarchy is inverted in Romanticism and later in the New Age (Code, 1991; Montuori, 2006; Wilden, 1980). From a systems/complexity perspective, this clear separation (in service of Aristotle’s logic and Descartes’ goal of clear and distinct ideas) is replaced with distinction, thereby retaining awareness of the connection and interaction and of a much more complex relationship. As an example, it is only fairly recently with the work of Antonio Damasio and others that there has been a recognition of the way emotions and thought are profoundly interconnected rather than separate. In fact, when Damasio started out in the 70s emotions were not even considered a proper field of inquiry, and certainly clearly separate from reason. This once again raises questions about the way in which culture (and gender) affect the fundamental assumptions researchers make (Damasio, 1998). As a result, as Morin states,

We need a kind of thinking that relinks that which is disjointed and compartmentalized, that respects diversity as it recognizes unity, and that tries to discern interdependencies. We need

a radical thinking (which gets to the root of problems), a multidimensional thinking, and an organizational or systemic thinking. . . (Morin & Kern, 1999, p. 130).

Challenging reductionism, emergence occurs when a system displays properties that the parts do not have on their own but are the result of their interaction (Johnson, 2001). This view rejects the position that “the really real,” if you will, is at lower and lower levels (particles, hormones) and the “higher” levels can be reduced to them. In this view, love—falling in love—might be viewed as an emergent of the interaction of any number of aspects of a human being, including hormones, but also any number of other psychological and sociological factors, to name a few, and a good dose of mystery too, since there appears to be a lot we don’t truly understand about love. The point is that instead of reducing every phenomenon to its components, this view recognizes the way that interactions among components, and their organization, can lead to increasingly complex phenomena (Johnson, 2001; Morin, 2008a).

Love is not, as a result, trivialized as “nothing but” (hormones, genetic programs, reproduction, etc.) but viewed in its full complexity, including the vast variety of offered by the experience itself which as is known can range from the wondrous to the devastating (Morin, 1997). In this view, a love poem is not just a bunch of ink scribbles triggered by hormonal changes. A transdisciplinary approach may include—if pertinent to the question being researched—a range of “levels” all of which are significant in their own way. It is therefore multi-dimensional rather than reductionist.

The Fear of Totalizing Narratives

So much research is generated in so many often non-communicating disciplines and sub-disciplines, that knowledge has become scattered and fragmented. As a result there is a need to connect and weave together existing research to create new wholes, new frameworks, perspectives, theories and ways of researching. In recent years, particularly with postmodernism, there has been a rejection of grand synthetic efforts that are viewed as attempts at creating totalizing theories or metanarratives. But weaving existing research together does not need to be with a view to creating totalizing theories of everything. It can rather be done in an effort to address existing issues, topics, and problems, “wicked” or otherwise, and a reassessment of complex phenomena such as creativity about which there already exists a substantial research literature.

Synthesis involves weaving together empirical research and/or ideas and theories to create new ways of understanding phenomena. Unlike analysis, it is a process that has a creative dimension through the process of making connections, often between ideas or data have not been connected before, Koestler’s bisociation. Key questions are what is being connected, how and why, and the choices are up to the inquirer to create something new and interesting through novel combinations. This is a second order process which will be addressed both in the discussion of the Integrative Transdisciplinarity dimensions of Creativity and the Integration of the Inquirer

Limitations of the Paradigm of Simplification

The paradigm of simplification and its disciplinary isolation has clear limits. In his book on genius, the noted psychologist Hans Eysenck (Eysenck, 1995) wrote that

Creativity, particularly at the highest level, is closely related to gender; almost without exception, genius is found only in males (for whatever reason!) (p. 127).

I will focus only on one major aspect of this is highly problematic statement, namely the throwaway last sentence, “for whatever reason.” Let us step back and look at this from the perspective of complexity. In order to be referred to as a genius, historically one had to participate in certain specific domains such as the fine arts and physics, which popularly conjure up names like Van Gogh, Picasso, Einstein and Hawking. Women were for the longest time excluded from the domains in which recognition of “genius” was possible (Eisler et al., 2016). If one is prevented from receiving the appropriate education in the fine arts or science, and if, even with that education, one is not viewed as a fully legitimate participant in the enterprise, but rather as a handy note-taker or coffee-maker, one is unlikely ever to come into the running for the label of genius. That this should not be taken into consideration by Eysenck can be traced—if we want to side-step for now an accusation of sexism—to the fact that as psychologist, he studied what psychologists of creativity study (hence *discipline-driven* rather than *inquiry-driven*). Broadly the topics of the psychology of creativity have included

personality, motivation, conscious and unconscious processes, more recently aspects of neuroscience, and so on. But the social environment was never seriously studied or taken into consideration by psychologists. It should be noted that Eysenck's book is simply called *Genius: The Natural History of Creativity* (Eysenck, 1995). There is no recognition of the disciplinary limitations of the psychological study of creativity, and the limitations they place on the author's assessment of the topic. In sociology and Women's Studies there is, of course research on what Germaine Greer has called *The Obstacle Course* for women's creativity (Greer, 2001), but in psychology it was not considered, because this was just not what psychologists study. This creates a form of disciplinary blinkers, in which vital dimensions of a phenomenon can be completely ignored but apodictic statements are made nevertheless. With a systems approach any phenomenon has to be studied in its context and relationally, leading to a radically different view of the issue.

10.3 Creativity

Creativity has historically largely been excluded from the way the scientific method has been formulated, understood, and taught, and more broadly in the way inquiry and research have been characterized. Popper (2002) explicitly stated that the creative dimension of scientific discovery was not a proper subject for scientific or philosophical attention. It was simply too unpredictable, contingent, and subjective and did not involve a logical method. What mattered for Popper was what could be subjected to logical analysis, namely the testing of the idea. The reality of the "how"—often messy, contingent, imaginative, exciting, serendipitous, and so on—has always been relegated to auto-biographies and biographies. What has been presented in its place is a "reconstructed logic" that removed any hint of creativity and focused on logic, methodical steps, objectivity, and a largely implicit assumption that what happened *had* to happen because of the logical unfolding of knowledge and the correct method was followed. Indeed 'methodology' often serves as a handy cover story for the realities of inquiry (Devereux, 1968; Feyerabend, 1993). Science focused on the rational and the universal in a dispassionate way, whereas creativity meant flirting if not actually getting intimate with the irrational, the intuitive, particular and aleatory. And it was always associated with somewhat unseemly passion.

This sad split has had an effect on educational systems. Ken Robinson's popular *Do Schools Kill Creativity* brought to popular attention the way in which schools around the planet not only do not address creativity but in fact "kill" the creative spirit in students (Robinson, 2017). The reality is that in the educational system that emerged at least since the Industrial Revolution in the West, schools were never meant to foster creativity. Creativity was considered undesirable, disruptive, fundamentally threatening of the authority to the teacher, and more broadly of the status quo. In education the absence of creativity can be found all the way to the doctoral degree. In the United States, the doctoral dissertation is broadly defined as an original contribution to one's field (Montuori & Donnelly, 2013). One would think that if the doctoral dissertation is supposed to be "original" then surely that implies that doctoral research should be a creative process. But doctoral programs, from the natural sciences to the social sciences and humanities, generally spend very little time if any exploring what "original" means, beyond a warning about the evils of plagiarism, and they certainly do not frame research as a creative process.

On average 50% of the students who start doctoral programs in the United States don't finish them (Lovitts, 2008). Besides inevitable personal and economic setbacks, a key reason was a lack of creativity. Doctoral students struggled to make the transition from being good course-takers to becoming scholars and *independent researchers*, meaning they were unable to come up with a suitable research topic, and unable to work without the kinds of explicit directions telling them what to do such as the ones they had received in earlier educational experiences (Lovitts, 2005). After twenty years or more of following the teacher's guidelines and not being allowed to cultivate their creativity in an academic context, these students were—perhaps not surprisingly—unable to suddenly turn on their creativity.

Lovitts spelled out the obstacles very clearly (Lovitts, 2005):

graduate students must make a crucial shift from the familiar realm of course-taker (a consumer of knowledge that is 'carefully doled out in the form of courses or modules, course outlines and

reading lists, lecture topics and assessment tasks' in tightly bounded and controlled environments (Delamont et al., 2000, p. 1)) to that of independent scholar/researcher (a producer of knowledge that often results from uncertain processes that take place in unstructured contexts) (p.138).

Lovitts (2005) found that successful scholars

must acquire a high degree of the related self-discipline and self-control, ability to delay gratification, resilience in the face of frustration, independence of judgment, tolerate ambiguity, autonomy, have a willingness to take risks, and a high level of self-initiated, task-oriented striving for excellence. (p. 147)

What becomes very clear reading Lovitts's research is that the current educational system does not lead to students who are resilient enough to make the journey of doctoral studies. This also shows the importance of creativity and the ability to improvise, to respond to *the unforeseen*, which is the etymological root of the word improvisation (Montuori, 2003). Current educational systems do not cultivate the capacities listed by Lovitts, capacities which are very much associated more generally with creativity. In fact they actively inhibit creativity.

In the American educational system, with its neoliberal assumptions about efficiency and what constitutes good pedagogy, instructors evaluate students, but are also in turn evaluated by students (Aronowitz, 2001). As a result, getting good course evaluations—“pleasing the customer”—becomes a major issue for a successful academic career, and grade inflation is endemic (Boretz, 2004; Hunt, 2008). The neo-liberal, consumer approach to education fails students, faculty, and education in general because it emphasizes exactly the opposite of what Lovitts's research shows students need. There is an insistence on making every step of a student's work crystal clear, spelling every process out in great detail, and an over-emphasis on the role of methods to the point of fetishization. This gives students the illusion that they are being prepared to become independent researchers and ready to embark on their dissertation. But once the course work is over, and the dissertation writing phase begins, the student is fundamentally alone writing their dissertation, with no classes to attend, no hand-holding from instructors, and little guidance. And that's where Lovitts' research shows many students crash and burn. They only know how to follow instructions, but they are unable to creatively improvise, rally from setbacks, use their creativity to solve problems large and small and are generally not able to navigate the complexity and existential challenges the dissertation process involves. Forced by the educational system to focus on following instructions students lose their capacity to take initiative, to be self-motivated, to creatively explore, to be resilient in the face of setbacks. Education becomes a mechanical chore, with the focus on passing the test and getting an A, and the joy of inquiry is lost.

Creativity in this context is not just being able to come up with a great idea for a topic, although that is clearly an important aspect of doctoral research. It is a much more systemic process that involves the ability to face frustration, be disciplined, persistent, able to engage in self-directed work, face setbacks, confusion, overwhelm, ambiguity, and disappointment. In order for creativity to go from a good idea to a reality—a completed dissertation, for example—it is necessary to develop resilience and what Duckworth has called grit, or a passion and perseverance for long-term goals (Duckworth, 2016). As Barron's research has shown, creativity also requires an ability to rally from setbacks, and as anyone who has written and chaired dissertations knows, there can be plenty of setbacks in the process. Reflecting on creativity in this academic context also points to the need for a reassessment of creativity as a systemic process (Csikszentmihalyi, 2015; Montuori, 2011d), which we will address below.

In Integrative Transdisciplinarity creativity is central. I have called creativity in the context of scholarship Creative Inquiry, and contrasted it with Reproductive Learning and Narcissistic Learning (Montuori, 2006; Montuori & Donnelly, 2013). This differentiation emerged because of the need to articulate an alternative to Reproductive Learning. I also saw that the alternative was often framed in opposition to Reproductive Learning, thereby throwing out the baby of scholarship and imagination with the water of industrial, assembly-line, authoritarian, rote learning, so I thought it important to articulate clearly what I wanted students to avoid. Reproductive Learning is the kind of passive rote education that is too often the case in the industrial

model of education (Montuori, 2011c). It *reproduces* the content, process, social structures, power relations, and individual roles that conform to what are perceived to be societal needs and norms, mostly derived from the need of industrial countries to train workers at various levels of expertise. It is an educational approach centered on testing and assessment. The acquisition of existing information and conceptual frameworks is central, as suggested in Freire's term "banking" education (Freire, 2000). Learners and their values, experience, affect, personal history, creativity, and identity are not included in the educational process. Creativity, and therefore the original generation and application of information and conceptual frameworks, is not valued. Reproductive Learning therefore becomes a vehicle to reproduce prescribed societal roles, values, hierarchies and systems of control (Giroux, 2007, 2010; Kincheloe, 1993). The teacher has the answers to all the questions. The teacher is the authority and knowledge travels top down.

What I call Narcissistic Learning emerged for a number of reasons. At the university level, and particularly in graduate school, students who are used to being clear about the authority of texts and teachers to provide the right answer, see that experts disagree about many things, from theories of personality to interpretations of quantum physics to the meaning of the French revolution. Many students struggle to make sense of the multiplicity of perspectives (Salner, 1986). At that point, they may come to believe one view is just as valid as another, and that includes their own view, insight, or "theory." They fail to understand how a multiplicity of perspectives is possible and do not see the scholarship and theory that underlies these perspectives. They view it all as opinion. 'It's a free country, I'm entitled to my opinion.'

Narcissistic learning also shows up in attempts, whether by individuals or institutions, to intentionally develop an alternative to Reproductive Learning. The problem, seen in many attempts at developing "alternative education" in the 1960s, is when it frames itself in opposition to Reproductive Learning. Reproductive Learning privileges analysis, reductionism, disjunction, abstraction and simplicity. Narcissistic Learning privileges everything that Reproductive Learning rejects, such as the students' feelings, imagination, playfulness, and subjectivity, but also academic rigor, immersion in the literature, and other traditional aspects of scholarship as well as the more stultifying. This reflects a mistaken idea of creativity that can be traced to popular interpretations of the Romantics and in the 1960s and 70s to trivializing interpretations of Humanistic Psychology which reject "thinking" in favor of "feeling," and despite good intentions unfortunately just end up with bad thinking (Montuori, 2011b).

Creative Inquiry strives to illuminate the complexity of the world by fostering the development of transdisciplinary complex thought (Montuori, 2005a; Morin, 2008b, 2008c). It stresses the importance of connecting and contextualizing, and the inquirer is recognized as an embodied and embedded participant rather than spectator to life and knowledge. Inquiry, learning, knowing and knowledge themselves are viewed as systemic, relational, processual, contextual and creative processes. Creative Inquiry does not privilege either the external or the internal authority, but rather is always engaged in a creative process, a creative hermeneutic where there is a constant dialogue between text and context, part and whole, "objective" and "subjective."

From the extensive research on the psychology of creativity we also learn about the psychological characteristics associated with creativity, and that these characteristics (or traits) can be cultivated. I can only give a hint of the relevant research here for reasons of space, drawing mostly on the pioneering work of Frank Barron (Barron, 1953, 1963, 1995).

Key characteristics include:

Independence of Judgment, or thinking for ourselves and not automatically accepting consensus views;

Tolerance of Ambiguity, or not experiencing discomfort with ambiguous phenomena and feeling the need to immediately have an answer—whether somebody else's or our own snap decision;

Openness to Experience, a sense of curiosity, acceptance of novel and unusual experience, and general open-mindedness;

Preference for Complexity, or being attracted to complex phenomena rather than wanting to stick with the simple, symmetrical, and orderly.

The creative process includes making connections between ideas and phenomena that have not previously

been connected, challenging the assumptions underlying the way an issue has been addressed, using theories and methods from one discipline in a different one.

Creativity can be cultivated in students. One opportunity is offered by the fact that in the process of teaching transdisciplinarity to students who may all be researching very different topics, it is of course impossible to use examples that will draw directly on each student's research topic. It is not unusual to find students who will switch off if they hear an example that is not directly related to their interests. This can be turned to an advantage by framing the broad range of examples as an exercise whereby students have to make an effort to see the underlying principles in every example and how they can be applied to their own research rather than the focus on the specific subject matter. Students are therefore encouraged to find the underlying principles of a way of thinking or approaching a problem that can then be transferred to their own topic.

Researching creativity

The way creativity was studied traditionally reflected the paradigm of simplification. I summarize it here:

Who: The "person," and in particular the genius, was always an individual, with little or no attention placed on the environment (social political economic, etc.) or relationships and collaborations.

How: The lightbulb, the moment of insight.

Where: Art & Science, definitely not everyday, mundane activities.

What: Major artworks, breakthrough scientific theories.

In this view, creativity is a rare phenomenon possessed by a gifted few that happens in a flash. As a result, schoolchildren were made to read the work of "great men" rather than also developing their own creativity. Doctoral programs generally do not address creativity or creativity research and its relevance to scholarship. Implicitly they give the message that it's best to just get on with one's work, because creativity is something only a few have. Many students express that they don't get flashes of insight like a genius and don't conform to the popular image of the creative person and therefore can't be creative. All these limiting assumptions can be excavated, questioned, and alternatives allowed to emerge which free students from this straitjacket.

This view of creativity perpetuates what Dweck calls a fixed mindset (Dweck, 2007): you either are creative or you're not. This view is still quite pervasive, and certainly does not inspire students to believe in their own capacities. This is the dominant view for students who are inclined to engage in Reproductive Learning. Students who fall more on the Narcissistic Learning side of the spectrum tend to assume they are creative, even very creative, but tend to ignore the fact that deep scholarship is required to ground their views and make them of interest to the larger scholarly community.

The new view of creativity reflects Dweck's growth mindset, meaning that students can develop their creativity as part of their scholarship. Students can expand their conception of creativity and begin to reflect on the aspects of their life that they might not have considered as involving creativity. One related example is how much of what women have done in the home has not historically been considered creative, whereas now there is an increasing recognition of the importance relational and everyday creativity and what Eisler calls caring economics (Eisler, 2007; Eisler et al., 2016). In the new view, the who, how, where and what of creativity are quite different (Montuori, 2011a).

Who: Individuals, but also relationships, groups, organizations. Any system being researched, whether an individual, and dyad, a group, an organization, a community, and so on—is studied in its context. The emerging new paradigm of creativity research incorporates the social dimension: it is relational and contextual. Everyone *can* be creative, but creativity does not appear *ex nihilo*: it also requires skill-building, immersion in the field, and so on. The question becomes, *what* are we creating, and is it desirable, ethical, valuable, life-affirming, etc.

How: A systemic process that begins with preparation, skill-building, and after the insight also involves sticking with the idea and having the grit to complete the project. It is not limited to the moment of insight. This is demonstrated in one of the oldest and most popular models of the creative process, by Wallas (Wallas, 1926). The stages are: Preparation, Incubation, Illumination, Verification. These are intended heuristically rather than as a description of a clearly defined process.

Where: Everywhere, or distributed—in all aspects of life, including the most mundane (V.P. Glăveanu, 2014), and in all aspects of inquiry. Many aspects of research that students find tedious, like writing literature reviews, can be reframed as an aspect of the scholarship of creative Inquiry (Montuori, 2005b).

What: Everyday— not just events or products of great significance, but ways of creatively resolving small problems or framing issues in a new way.

Creativity research is bursting with research that is relevant to academic inquiry (Lovitts, 2005). Not only that, but the exploration of creativity can itself be an interesting entry point for a reflection on transdisciplinarity and how it can inform creativity research.

10.4 Meta-paradigmatic

As I mentioned earlier in the discussion of Narcissistic learning, in college students can be exposed to a multiplicity of theories and viewpoints, and this can lead to a view that one theory is as good as another, and ultimately it's all "relative" or a matter of "opinion." Perry's research on the cognitive development of university students revealed what Salner usefully summarized as three different epistemological "positions," Dualism, Multiplicity, and Contextual (Salner, 1986). To some extent, these positions map on to what I have called Reproductive, Narcissistic, and Creative Inquiry, with the contextual position having characteristics found in creative individuals and complex thinking. In dualism, like in Reproductive learning, students look to the teacher as the authority on what is right and wrong, and believe there is only one right way and one correct answer. In multiplicity, as in Narcissistic learning, students find that experts disagree, their authority is questioned, and "anything goes," in the sense that they can make up their own theories and perspectives, drawing on their subjective experience and opinion. They fail to ground their work in scholarship and thus cannot participate in the larger academic community. The contextual view studies every phenomenon in its context, including an awareness of the academic context and community the student participates in engages in an ongoing dialectic between subjective/objective, reason/emotion, and realizes the need to commit to a view and a course of action they can stand behind (Kuhn et al., 2011; Salner, 1986).

Unfortunately, in the years since the No Child Left Behind policy in the United States and the increased focus on Reproductive Learning in schools, even up to and including the university level, students find it harder to step into the contextual position. When the focus has been so much on "getting it right," where right means finding the one right way and the one right answer, it is harder for students to develop what Maruyama calls a "polyocular" view, one that engages multiple perspectives in understanding a phenomenon and making decisions (Maruyama, 2004). Creative Inquiry requires the cognitive capacity for *integrative complexity*, or the ability to *differentiate* between perspectives and *integrate* them for purposes of meaning-making and action (Suedfeld et al., 1992). Integrative Complexity has strong parallels Morin's complex thought, with Perry's contextual view and Barron's research on creativity. It involves the ability to avoid black and white thinking, or the necessity to immediately label and categorize phenomena, to be comfortable with ambiguity and a multiplicity of perspectives, yet be able to make decisions and chart a course of action that draws from the integration of multiple perspectives (Kuhn et al., 2011; Suedfeld et al., 1992; Tetlock, 1986). This clearly reminds us of the characteristics Lovitts found in successful doctoral students discussed earlier.

Students can be guided to become aware of different cognitive positions and how they influence inquiry. This is an invitation to engage in reflection on their own thinking and develop metacognitive skills (Heath-Carpentier, 2022). Transdisciplinarity by definition involves stepping outside the confines of existing disciplines. One of the challenges of doing this is confronting entirely new worlds, new traditions, new approaches, new journals, new scholars and a potentially vast number of publications. Traditionally one of the main criticisms of interdisciplinary research has been that interdisciplinary researchers are dilettantes. They don't have the in-depth, specialized knowledge considered necessary to do serious research. The "gentleman scholar" of old or the "armchair theorist" is the image of the "dabbler" who is not a professional, not up to date on all the research, and is often viewed as eccentric and speculative at best. There is an aspect of the criticism that can be valid, but it is also the case that "amateur" and "dilettante" can be framed differently. The terms both refer to doing something for the love of it, but without the real commitment that

is necessary to “serious” or “professional.” In fact the professionalization of inquiry has been the subject of serious and increasing critique, as have the resulting joylessness and fragmentation that has resulted from hyper-specialization (Wilshire, 1990). The point, I believe, is to reintroduced love (an amateur being someone who loves to do something) joy and pleasure in inquiry (the dilettante being someone who does something for pleasure).

Nevertheless, the warnings are well taken. One challenge for the transdisciplinary scholar is to learn to work with existing research that is pertinent to the topic at hand but lives in multiple disciplines. This is not an abstruse academic issue. With the emergence of the internet citizens have at their fingertips enormous amounts of information that even 30 years ago would have required extensive trips to the library and specialized access. It is not surprising that access to this wealth of information without either subject knowledge or any sense of how to make sense of the information as an interconnected whole has led to all sorts of “post-truth” epistemological chaos, with bizarre conspiracy theories, misinformation, confusion, and misunderstandings—one only has to think of the many different stories that emerged with the pandemic. The pandemic found citizens reading about a range of related topics and disciplines, from public health policy to immunology to economics, in which the majority of them had no background at all, at a time when even the experts were struggling to keep up with findings, events, and how to translate all that into policies. There is a set of research skills that requires the ability to assess information, understand the underlying theoretical perspectives and paradigms, and integrate that information in a larger context. For the transdisciplinarity researcher this is an essential task, since the knowledge base will not be drawn exclusively within one discipline.

This is why it is important for researchers in Integrative Transdisciplinarity to develop a “radical” background in the philosophy of social science. By radical I mean going to the roots of the various perspectives, their underlying philosophical assumptions. In that way they can familiarize themselves with various ongoing debates such as atomism versus holism and objectivity versus subjectivity, because these are some of the fundamental dimensions of inquiry. I have found Brian Fay’s *Contemporary philosophy of social science: A multicultural approach* particularly useful for this purpose (Fay, 1996). It covers some of the fundamental ways in which knowledge has been constructed in the west using a dialectical approach that stresses distinction, not separation, between historically opposed views such as atomism and holism and realism and constructionism.

An awareness of these fundamental categories gives a better sense of the underlying dimensions of any particular paradigm and theoretical framework. For instance, in the case of creativity, a review of the literature shows that in the 20th century, psychologists approached the topic atomistically, whereas sociologists and anthropologists were holistic. For psychologists, the individual was the fundamental unit of analysis whereas for sociologists and anthropologists it was society as a whole, leading to different understandings of creativity, and specifically different kinds of interventions to foster creativity. An awareness of these different perspectives on creativity also gives insights into the way knowledge is *constructed*.

Developing a transdisciplinary knowledge base is a complex process. We encourage students to use handbooks, encyclopedias, and overviews as part of their research so that when they engage with material in disciplines they may be unfamiliar with they can also contextualize it in their understanding of the larger issues of the discipline they are drawing from and the ways the topic has been approached. The effort is to continually contextualize and not just cherry pick fragments of information. Fortunately there are now more and more handbooks and other volumes that provide researchers with thorough overviews of a field or topic, and point readers to further research. The development of a knowledge base for a transdisciplinary scholar is an ongoing process and one that I have addressed elsewhere (Montuori, 2005b, 2013). There is still much work to be done, but it points to one of the fundamental skills of the transdisciplinary scholar, which is the ability to navigate the overwhelming quantity of research, and find pertinent knowledge, develop the ability to discriminate, always connect the part to the whole, explore the underlying assumptions of any work, and connect relevant research with a view to creative integration.

Transdisciplinary writing

Transdisciplinary has some particular challenges. We can safely assume that if an author is drawing on multiple disciplines, readers with a mono-disciplinary background may not be familiar with all the concepts

and ideas. Perhaps even worse, they may *think* they know what certain terms and ideas mean because they may know the way they are used in their own discipline, which may define and use them in quite a different way. Maruyama calls this “sub-understanding,” or the conviction that we fully understand what someone is saying when in fact we do not because they are grounded in a fundamentally different set of assumptions, as well as terminology that may mean different things in different disciplines (Maruyama, 2004). The challenge for Integrative Transdisciplinarity is writing clearly, and making sure basic concepts and terms are defined and explained succinctly. This should not be misunderstood to be ‘dumbing down.’ On the contrary. It makes extra demands on the author to be able to articulate complex ideas and avoid the tendency to use jargon which can easily obfuscate. The challenge for students here is to become thoroughly familiar with core concepts.

Inquiry-based

How does one begin a transdisciplinary inquiry? In a disciplinary context, a doctoral student or researcher working in the psychology of creativity has an entire history to draw on, with exemplars, multiple research agendas, the specific research agendas of faculty or colleagues, and segmentation into various emphases, such as personality, motivation, and more recently the sociocultural approach. There is a community of researchers with a history, a language, questions they are pursuing, interests, methods, journals, and so on. Being able to participate in that community has great advantages. As we can see comparing reviews of the field over the years in Annual Review of Psychology, there are changes in the topics that are of interest in any particular time. In Barron and Harrington’s 1981 review of psychology (Barron & Harrington, 1981), intelligence and its relationship to creativity showed up as a major research topic. This is now no longer a “hot topic.” In the 21st century, the neuroscience of creativity and the sociocultural approach are generating a lot of interest (Hennessey & Amabile, 2010; Runco, 2004). While it is by no means necessary for students in a disciplinary program to embrace one of the current approaches and agendas, researchers coming into the field cannot help but be drawn into the disciplinary culture, with its specific viewpoints, discussions, and ways of discussing, thinking, and talking about creativity.

How and where does research begin in Integrative Transdisciplinarity? Research often emerges when individuals have a burning question that is not being addressed in the literature, or at least not in a manner that is satisfactory to them. In my own case, I encountered the creativity literature because I had spent a number of years as a professional musician in London, and wondered if the creativity research had anything to say about the volatility of creative groups. To my surprise I found there was hardly any research about creative groups at all. The focus was exclusively on the individual, and I found many people in the United States felt group or social creativity was an oxymoron. This seemed rather odd since music, theater, cinema, and many other artistic, scientific and business endeavors relied on creative groups. My question therefore shifted from “what does the literature tell me about creative groups” to “why has this topic not been researched at all, and what does that tell us about how the topic is being framed, the underlying assumptions and the way the topic is created by the community of scholars,” which led to my still ongoing exploration.

I encourage my students to develop a thorough narrative describing the phenomenon or experience they want to research and a set of questions that emerged out of that narrative. This is what I mean by *inquiry-based*. Rather than starting with the existing topics, frameworks, and languages, found in a discipline, we start with a phenomenon or experience and describe it, preferably in the form of a narrative, and then explore what questions and connections arise (Panico & Dieleman, 2014). Then the search begins for what Morin calls *pertinent* knowledge (Morin, 2001). In any transdisciplinary context, my experience is that students will always be tempted to list a number of disciplines they will be exploring. This is the easy answer, but not helpful in terms of actual research. What does it mean that “I will be drawing on Psychology, Sociology, Cultural Anthropology, Cultural Studies. . .” and so on? Will the student develop expertise in every one of these disciplines? Surely not. What exactly will they be looking for? Nevertheless naming the disciplines seems to be such an automatic initial response that it has been one of the hardest things to disabuse students of in the beginning of their journey. To be clear, the issue is not naming disciplines that may have relevant discussions, but naming them without a strong sense of the initial questions the researcher hopes to address. A related issue is that doctoral students can lose track of their core topic and drift into exploring fascinating but marginal research. The right balance needs to be struck, and the topic needs to remain front and center

throughout.

The aim of writing a narrative is to have something akin to a phenomenological description, with no interpretation, no explicit frame, just as close as possible to a statement of the facts, as they appear to the inquirer. The aim is not objectivity in the traditional sense, but rather a description of what the inquirer perceives and believes is of interest. That description serves as a starting point. Using an iterative process it will be enriched as the research on the questions brings more information and in turn more questions.

As the narrative is revisited it also helps inquirers understand what originally motivated them to begin the inquiry, and what their assumptions were when they began the process. In other words, it allows for a process of ongoing self-reflection, and also a way for the inquirer to see if they have gone off track, pulled in by a particularly fascinating issue that was not central to the original inquiry, but seduced the inquirer into new territory that is not entirely relevant. It could also be the case that the new developments are in fact a more fruitful direction, so this is where the research process requires self-reflection, judgment, and the ability to make contextually appropriate decisions. This, of course is one of the big challenges of transdisciplinary inquiry, the possibility of tumbling down endless rabbit holes. Endless drift is already a temptation in the research process, but it is certainly the case in transdisciplinary research because inquirers may be continually exposed to research, issues, methods, and theories they were completely unaware of.

Integrating the Inquirer

One of the main criticisms of reproductive education is that the learner simply became a container for knowledge that was to be regurgitated on demand. The response came in the 20th century with many attempts to create whole person education that also addressed imagination, the student's history and identity, feelings, and students' creativity. All these aspects of humanity were left out of accounts of the scientific method and of education, but it's become clear to many that they do play a role in inquiry, in education, and in the scientific method, and rather than attempt to eliminate them an effort should be made to integrate them into a more complex understanding and process of learning and education (Hart, 2009; Montuori, 2006; Morin et al., 2003).

A traditional academic article is written in the third person, detached, objective, just the facts. We know nothing about the author, and that is as it should be in this frame. Knowledge was supposed to be in no way dependent on the subjectivity and unique characteristics, of the author, whether psychological, sociological, or cultural. The article is also presented in the form of what is known as the context of justification, the final phase of the research when findings are presented. We know little if anything about the context of discovery, or how the hypothesis was developed, the creative process that led the scientist to this particular work and this conclusion. That aspect is a black box. A brief scan of academic journals will show that there is now quite a range of permissible styles. Some journals still require the very formal writing found in a scientific report, but increasingly there are also journals that are open to first person narrative and reflection.

Integrative Transdisciplinarity stresses the importance of integrating the inquirer into the inquiry. Drawing on second order cybernetics, humanistic psychology, and feminist scholarship, this means that in the process of inquiry the role and experience of the inquirer is highlighted and becomes itself a subject of inquiry. Every inquiry also becomes self-inquiry. Integrating the inquirer requires the development of metacognition and epistemic cognition (Kuhn et al., 2011), or

One important aspect of this dimension is to recognize the creative aspect of perception, and to remind students that what they take for the way things are—"this article is boring"—is also a reflection of the way they have perceived the article, what they have foregrounded and backgrounded, what they may have skipped over, how they contextualized the reading, and so on. This is a starting point into the realization that the inquirer is always already integrated into the inquiry, constructing their own understanding of the subject.

Human beings are all situated in a complex, multi-dimensional context. The sociology of knowledge began by focusing on the social context in which knowledge emerges (McCarthy, 1996). Who is the author, what is their class, race, and gender, and to what extent do they play a role in the author's understanding of a phenomenon? This approach has sadly often been used in a deterministic and dismissive way, suggesting for instance that a "bourgeois" scholar can only have bourgeois things to say (Morin, 1991). But it can also be used self-reflectively by a scholar as a way to consider the inevitable limitations of one's native approach, and as an opportunity to expand one's viewpoint. Cross-cultural research has shown that there are certain

cultural approaches to thought and to research, with scholars from the United States and Northern Europe showing a distinct cognitive preference for analysis versus more holistic approaches other parts of the world, notably East Asia, as well as Indigenous scholarship (Nisbett et al., 2001).

The psychology of knowledge leads to questions about the way an individual's psychology plays a role in the process of inquiry, both in terms of their creativity and their cognitive preferences, defense mechanisms, their quest for certainty, the need to be right, to engage in academic discourse through the metaphor of war, and so on (Devereux, 1968; Maslow, 1969). This offers a potentially very rich opportunity for inquiry into one's own limitations, blocks, fears, inner and outer conflicts, and needs. This is an aspect of scholarship that has largely been buried because it can be quite uncomfortable. One way students can be brought to an awareness of cognitive preferences is through the use of Jungian typology and the popular Myers-Briggs inventory. This can be used to make students aware of potential blind spots. Students who score high on Intuition, for instance can easily make connections between ideas, see the big picture, but might struggle with details and articulating their ideas in a systematic way so that others may be able to understand them. This is a simple and relatively inoffensive entry point to allow students to reflect on their own process, become aware of possible stumbling blocks, and orient towards addressing some of their obstacles to success and areas to pay attention to.

I am by no means suggesting that every work of Integrative Transdisciplinarity should require the author to make all the author's psychology and sociology explicit. It would also course be impossible to publish in many if not most prestigious journals if one had to include such lengthy reflections. It is, on the other hand, an opportunity for the author to frame inquiry as including self-inquiry, and to reflect on one's practice—indeed to make this reflection itself a scholarly practice. This self-reflection is central to Integrative Transdisciplinarity, and sharing the context of discovery with the reader is an important contribution to creating greater transparency.

It is not uncommon for scholars immersed in their work, which in academia involves everything from teaching to administrative roles and more, to simply "get on with it," as it were, and not spend time asking fundamental questions such as why they are focusing on a particular topic, what their motivation is, how they are making their choices, what habits they have developed, what their assumptions are, and so on. It is not hard for the academic dealing with the stress of work to lose sight of these larger questions. These are questions we invite students to explore, and at the doctoral level the choice of dissertation can be an excellent if stressful time to ask these basic questions. We remember that Lovitts found many students who drop out of doctoral studies do so because they struggle finding a suitable topic. In my experience, there is often a "delaying" process that happens to students who are systematically engaged by their faculty to reflect on their topic. An initial topic may be what the student believes they should research. After extensive dialogue they may come to realize there is another topic that has much more resonance for them. And it is not unusual to find a last step where the student after some soul searching remarks that what they really would like to do is X, but they just don't think it's possible, it wouldn't be allowed, and so on. Chairing dissertations for almost 30 years, I have found that the journey is often just as much existential as it is academic. As a result much closer attention needs to be paid to the psychological challenges students face, ranging from impostor syndrome to feelings of inadequacy, direction in life, and doubts about their identity as a "scholar." The journey can be an opportunity for personal growth, rather than simply an academic mountain to climb (Montuori, 2006).

Epistemological Humility

A key factor for successful Integrative Transdisciplinarity is what I refer to as epistemological humility. In a traditional disciplinary context, a scholar can develop deep expertise in a topic. That expertise can also lead to a certain arrogance. One is the "knower," the "expert," and one has one's "positions" which must be "defended" from the impositions of others. The scholarship of Integrative Transdisciplinarity does not involve the kind of deep expertise in every single topic one covers. For instance, if one is studying the social dimensions of creativity one may engage feminist scholarship and its history of research in, among other things, the way women have been excluded from participation in certain fields. One leading researcher of women's creativity, Ravenna Helson (Helson, 1990), stated that

the understanding of creativity in women requires attention to the social world, to individual

differences in motivation and early object relations, and to changes in society and the individual over time. In fact, we believe that the study of creativity in general needs all of these directions of attention (p. 57).

The challenge here is that one cannot be an expert in all of these fields. Interdisciplinary scholars have suffered the slings and arrows of critics who focus on the fact that they are not “truly” experts in one of the topics they’re discussing and are therefore in no position to legitimately discuss it. This starting point would make any effort at integration of knowledge that draws on multiple disciplines a priori futile and amateurish.

Nevertheless, it is becoming increasingly clear that works of synthesis that account for the complexity of a phenomenon are necessary, even vital. My example of Eysenck’s statement shows how it is possible to be a disciplinary expert in a topic and yet make statements that can be deeply misguided. In this case it is not the lack of specialized knowledge that is the issue, but the inability to see the context and complexity of the phenomenon spills over disciplinary boundaries. A single disciplinary specialization can create blinkers.

Epistemological humility requires letting go of the ideal of omniscience, or the *performance* of omniscience (Ceruti, 2015). There is a shift in identity from being the “knower” to being the “inquirer,” and preferably, in my view, the “creative inquirer.” This means remaining open to ongoing learning and exploration, recognizing that one can make mistakes and faulty interpretations, that perspectives other than one’s own may have value, and that self-reflection and challenging one’s own assumptions is an essential aspect of scholarship.

The interpersonal dimension is important here, because the arrogance that is sometimes associated with expertise is directly related to one’s sense of identity and the need to feel “superior,” to be “right.” This requires a degree of self-reflection, openness, a willingness to develop a scholarly identity that is more complex, and an openness to other perspectives as well as to the possibility that one may be wrong and others maybe right (Porter et al., 2021). Integrative Transdisciplinarity invites us to frame interactions as mind-jazz, to use the cultural historian William Irwin Thompson term. These are collective creative explorations and improvisations on a theme rather than a battle for who is right and the best debater (Thompson, 1989, 2016). This is not a rejection of debate and critique, but rather a way to expand, contextualize, and let creativity blossom in dialogue. Many academics know (and many conference organizers have acknowledged) that the most enjoyable and nourishing aspects of a conference are the evenings spent talking over dinner and drinks, exchanging ideas, and meeting new colleagues, rather than the formal presentations. There is an informal dimension to inquiry, one that touches in with the passion for inquiry that motivated scholars in the first place that needs to be brought to the fore and included in the broader understanding of what it means to be a scholar. We must not underestimate the ability to play with ideas, to explore them, to “entertain” them and follow where they take us in a very exploratory way. Being critical, finding problems too soon can be deadly, since emerging ideas can be fleeting and fragile. Premature criticism can cut off the generative potential of a rich dialogue which may take us in directions one didn’t expect, and can turn out to be fruitful and enriching. This mind-jazz, this improvisation with ideas, is a key component to the joy of inquiry and of Integrative Transdisciplinarity.

10.5 Conclusion

Transdisciplinarity is a new frontier that can potentially revolutionize education for a global age (Morin, 2008c; Nicolescu, 2012). The industrial educational model is not sustainable in the 21st century, and has in fact become counterproductive. A transdisciplinary approach, grounded in principles of systems theory and complex thought, and informed by creativity, can point the way towards new academic horizons. Integrative Transdisciplinarity is one example of an attempt to work with graduate students in a way that begins to embody those principles in scholarly research.

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About the Author



Alfonso Montuori is a Professor in the Transformative Inquiry Department at California Institute of Integral Studies. An Italian citizen, Alfonso grew up in living in the Netherlands, Lebanon, Greece, and England and settled in the United States in the mid-1980s. Alfonso has been a Distinguished Visiting Professor in the School of Fine Arts at Miami University in Oxford Ohio, and a Distinguished Visiting Professor in Psychology at the University of Rome. In 1985-1986 he taught at the Central South University in Hunan, China. He is the author of several books and numerous articles on creativity, leadership, complexity, and education, and the co-editor of *World Futures: The Journal of New Paradigm Research*. Alfonso is also a consultant focusing on creativity, strategy, and executive development. An active saxophone and flute player and a voting member of the Recording Academy (The Grammys), he lives in San Francisco with his wife, award-winning jazz singer Kitty Margolis, with whom he performs and records.
