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Composing Worlds: Exploring the Metamorphosis of the World in the Age of Climate Change and Its Implications for Health

Diogo Guedes Vidal
Centro de Ecologia Funcional – Ciência para as Pessoas e para o Planeta, Laboratório Associado TERRA, Departamento de Ciências da Vida, Universidade de Coimbra, Coimbra, Portugal/Departamento de Ciências Sociais e Gestão, Universidade Aberta, Lisboa, Portugal/Rede Compor Mundos, Humanidades, bem-estar e saúde – Fundação Fernando Pessoa, Porto, Portugal
Conceptualization, data curation, formal analysis, investigation, methodology, supervision, writing – original draft, writing – review & editing

Marina Prieto Afonso Lencastre
Instituto de Investigação, Inovação e Desenvolvimento, Universidade Fernando Pessoa, Porto, Portugal/Rede Compor Mundos, Humanidades, bem-estar e saúde – Fundação Fernando Pessoa, Porto, Portugal
Conceptualization, data curation, formal analysis, investigation, methodology, project administration, supervision, writing – original draft, writing – review & editing

Hélder Silva Lopes
Laboratório de Paisagens, Património e Território, Instituto de Ciências Sociais, Universidade do Minho, Braga, Portugal/ Laboratório Associado para a Investigação e Inovação em Património, Artes, Sustentabilidade e Território, Instituto de Ciências Sociais, Universidade do Minho, Braga, Portugal/ Institut de Recerca de l'Aigua, Universidade de Barcelona, Barcelona, Espanha/Rede Compor Mundos, Humanidades, bem-estar e saúde – Fundação Fernando Pessoa, Porto, Portugal
Data curation, formal analysis, investigation, supervision, writing – review & editing

Susana Magalhães
Instituto de Investigação, Inovação e Desenvolvimento, Faculdade de Ciências Humanas e Sociais, Universidade Fernando Pessoa, Porto, Portugal/Instituto de Investigação e Inovação em Saúde, Universidade do Porto, Porto, Portugal/Rede Compor Mundos, Humanidades, bem-estar e saúde – Fundação Fernando Pessoa, Porto, Portugal
Conceptualization, data curation, formal analysis, investigation, methodology, writing – original draft, writing – review & editing

Rui Estrada
Instituto de Investigação, Inovação e Desenvolvimento, Faculdade de Ciências Humanas e Sociais, Universidade Fernando Pessoa, Porto, Portugal/Centro de Investigação Transdisciplinar Cultura, Espaço e Memória, Faculdade de Letras, Universidade do Porto, Porto, Portugal/Rede Compor Mundos, Humanidades, bem-estar e saúde – Fundação Fernando Pessoa, Porto, Portugal
Conceptualization, data curation, formal analysis, investigation, methodology, project administration, supervision, writing – original draft, writing – review & editing

Abstract

Climate change (CC) is the greatest evidence of the "metamorphosis of the world" and is changing the temperature and rainfall patterns, but also the social, cultural and health systems on planet Earth. The unpredictability of climactic phenomena and their multidimensional impacts on human and environmental health contribute to making our understanding of the world increasingly difficult. Moreover, history has proven that technoscience alone is not enough to deal with these problems. A global appeal is now emerging for the humanities and social sciences to also deal with the human and non-human issues raised by CC, notably through their integration with the areas of health and sustainability. The aim of this article is to present and discuss some of the first results of the *Composing Worlds: Humanities, Well-Being and Health* transdisciplinary network, which consists of a network of experts in the humanities, social sciences and health who think about issues of well-being and health in contemporary technological societies. The methodology used in the first phase of the project consisted of an interview with open questions, made by the network of 12 researchers. This was an exploratory study that used thematic analysis to

identify the original key ideas of each author and corresponding main themes. The themes were then organised into semantic groups or thematic clusters. It is hoped that some of these clusters will contribute to discussing how CC has already altered our ways of being, living and thinking about the world, and will also contribute to dealing with the challenges related to the risks of CC on health and well-being throughout the 21st century.

Keywords

climate change, health, humanities, sustainability

Compor Mundos: Explorando a Metamorfose do Mundo na Era das Alterações Climáticas e as Suas Implicações Para a Saúde

Resumo

As alterações climáticas (AC) são a maior evidência da "metamorfose do mundo" e estão a mudar os regimes de temperatura e de pluviosidade, mas também os sistemas sociais, culturais e de saúde no planeta Terra. A imprevisibilidade dos fenómenos climáticos e os seus impactes multidimensionais na saúde humana e ambiental contribuem para tornar a nossa compreensão do mundo cada vez mais difícil. Além disso, a história provou que a tecnociência, sozinha, não é suficiente para lidar com estes problemas. Um apelo global está agora a despertar para que as humanidades e as ciências sociais também lidem com as questões humanas e não humanas levantadas pelas AC, nomeadamente através da sua integração com as áreas da saúde e da sustentabilidade. Este artigo tem como objetivo apresentar e discutir alguns dos primeiros resultados da rede transdisciplinar *Compor Mundos: Humanidades, Bem-Estar e Saúde*, que consiste numa rede de especialistas em humanidades, ciências sociais e da saúde que pensam sobre as questões do bem-estar e da saúde nas sociedades tecnológicas contemporâneas. A metodologia usada na primeira fase do projeto consistiu numa entrevista com perguntas abertas, construída de forma participativa pela rede de 12 investigadores. Tratou-se de uma pesquisa exploratória que utilizou a análise temática para identificar as ideias-chave originais de cada autor e a indução dos temas principais correspondentes. Os temas foram então organizados em grupos de correspondência semântica, ou clusters temáticos. Espera-se que alguns destes clusters contribuam para discutir como as AC já alteraram as nossas maneiras de ser, viver e pensar sobre o mundo, e contribuam também para lidar com os desafios relacionados com os riscos das AC na saúde e no bem-estar ao longo do século XXI.

Palavras-chave

climate change, health, humanities, sustainability

1. Introduction

Climate change (CC) represents a significant threat to human health, encompassing global challenges, influenced by changes in the environment and ecosystems, which have an impact on the health of human populations. In addition, there are also localised problems, such as respiratory or autoimmune disorders, linked to chemical air pollution, an increase in cases of low birth weight and a rise in miscarriages.

Forest fires cause air and water pollution, population migrations, mental health

disorders and deaths; extreme temperatures lead to heat exhaustion, heatstroke and hyperthermia; changes in the distribution patterns of disease-transmitting insects and factors cause new epidemics in previously secure places (Gage et al., 2008).

In addition to these direct impacts, CC has indirect effects on human and non-human health. Food shortages result from changes in agriculture caused by droughts or floods, mediated by changes in social systems that can cause violent conflicts and population movements between different geographical regions. Rising sea levels and their unpredictability affect the functioning of large cities and even their existence (Vidal et al., 2022), contributing to the emergence of "secondary states" inside another nation's territories. It is clear that the most vulnerable socio-economic groups will bear the greatest risks, with disproportionate impacts on the most vulnerable countries, children and the elderly (Costello et al., 2009). These new realities generate a sense of strangeness in the face of a changing world. To understand the fundamental changes we are facing, Beck (2016) described these massive transformations as the "metamorphosis of the world". In this context, Seixas et al. (2021) proposed various descriptions of endangered "critical zones of the anthropocene" and organised them by colour: grey zones, resulting from a process of urbanisation that has devastated nature; blue, where the socio-ecological problems resulting from river pollution are compounded by the rise in the average level of sea water and the threat to infrastructure and equipment; green, where the unbridled exploitation of resources entails various negative impacts on environmental preservation; and brown, sacrificial zones, with impacts generated by mining and waste.

Although there are practical solutions to specific problems, the situation is paradoxical and to change it is complex. The necessary restructuring can't be confined to the concrete, but also exploring new conceptual ideas to implement innovative practices. As psychologist Kurt Lewin said in the 1950s, "nothing is more practical than a good theory" (p. 169): the metamorphosis of the world also implies a metamorphosis of the mind and thought. The aim of this article is therefore to propose theories and practical frameworks that re-examine some conceptual aspects of CC-related health risks. This proposal is based on the results of research carried out by the transdisciplinary network *Composing Worlds: Humanities, Well-being and Health* (Fundação Fernando Pessoa, s.d.). This project brings together experts from the humanities, social sciences and health, and reflects on ideas that can inspire the kind of "worlds" we want to build, promoting global health, strengthening the humanisation of cultures and supporting well-being in our shared living environments. The project began at the Fernando Pessoa University and initially brought together a group of 12 specialists from three different universities. The relevance of this project lies in the growing evidence that most of the problems that the 21st century will face, particularly in the area of health and well-being, are related to how human beings affect the climate and adapt to different environments, interact with other species, use technologies, develop cultures and policies, and promote social inclusion.

In this context, the period in which we live has enormous responsibilities, especially in terms of reconfiguring the relationship between humans and non-humans, the latter commonly associated with the concept of "nature" in our culture (Descola, 2005).

2. Theoretical Framework

This work is based on Beck's (2016) premise that we are experiencing a metamorphosis of social life and environmental dynamics, making it more difficult to understand them. The author states that the world is facing events that challenge stability, such as terrorist attacks, nuclear disasters, economic crises and wars. To a large extent, technoscience controls the technical and economic processes, overriding humanist and democratic values (Lencastre et al., 2023). Beck (2016) explores the social and environmental application of the concept of "metamorphosis", relating it to the need to move beyond "methodological nationalism" towards what he calls "cosmopolitan nationalism", since humanity is pervaded by a global realism that is independent of its own will. Latour (2022) reflects on cosmopolitics as a project that seeks to equivalently navigate a multiplicity of worlds. Based on these authors, we propose a conceptual framework for understanding the complex dynamics between CC and health risks. This framework integrates nature and culture, updating previous work by Lencastre and Leal (2006) and Vidal et al. (2023) and fulfilling the *sociogeobiological* requirements and cosmopolitics of the anthropocene.

The conceptual dimensions presented below were originally devised for the *TERRA* project[1], developed in 2006 by Lencastre and Leal. This project to integrate socio-environmental issues into the curriculum at primary school level incorporated ethical, social and environmental issues, seeking to highlight them in the curricula in the subject areas where they are implicitly contained, or by introducing them through relevant socio-environmental issues worked on at micro, meso or macro level in the schools involved. The *TERRA* project included teacher training in interdisciplinarity and school/year wide project methodology, emphasising local action and a deeper understanding of the importance global environmental literacy (Lencastre & Leal, 2006). Vidal et al. (2023) updated these conceptual dimensions taking into account Beck's (2016) concept of "metamorphosis of the world" and its application to CC's health impacts:

- *Co-evolution, change and metamorphosis of the world* — Earth has always undergone great changes interspersed by long periods of stability, in which species have succeeded each other and transformed habitats and, in general, ecosystems and biomes. Associated with geological and climatic phenomena, these processes have given rise to the current situation, which interacts with anthropogenic effects, giving rise to the anthropocene. Human cultures, in their diversity, contribute in different ways and with different weights to the global co-evolutionary process. Modern societies are confronted with the externalities of their actions and values (more consumption and volatility), and there is increasing evidence of an urgent need to change our ways of life and politics in general. Modern individuals feel that their world is undergoing a fundamental change, a profound metamorphosis of life (Beck, 2016) and this situation affects health and well-being above all.

[1] Projeto *TERRA* — transversalização curricular e consciência ambiental, 2.º e 3.º ciclos, financed by the Fundação para a Ciência e a Tecnologia (POCTI/CED/42610/2001).

- *Non-linear complexity and relations between humans and non-humans in "critical zones"* — CC is traditionally described as complex systems involving a large set of variables in non-linear interaction, giving rise to final states described as the "chaotic attractors" of a probabilistic outcome. Realistically and when faced with local socio-environmental problems that require urgent intervention, these systems are best described as relational entanglement of human and non-human beings inhabiting "critical zones" in finite territories. Describing these "critical zones" requires a realistic inventory of the conditions of existence (Latour, 2017), as well as specific scientific knowledge that allows decisions to be made. Returning to the local context is an essential condition for the pragmatic organisation of community cooperation in the face of environmental risks that affect the health and well-being of groups, moving away from exclusive dependence on the decisions of central governments.
- *Uncertainty* — the local entanglements of humans and non-humans imply high levels of uncertainty in scientific, social, cultural and political knowledge about collectives. When the uncertainty of the systems and the risks of the decision are high, controversy over necessary decisions becomes likely. This is the post-normal process of applied science (Funtowicz & Ravetz, 1994), which makes the democratisation and public knowledge of science an obligatory stage. In order to make practical decisions, these authors recommend setting up extensive communities of peers from diverse social and techno-scientific perspectives, who can deal with the high levels of uncertainty inherent in socio-environmental metamorphosis with their plurality of values and legitimate perspectives.
- *Risk, precaution, prevention and reflexivity* — complexity and uncertainty traditionally refer to the capacity of science to identify risks and precautions associated with decision-making. But the clear ideas of causality, temporal retroactivity and independence of variables that characterised the chains of determination of traditional science have now been abandoned. Ignorance often permeates scientific knowledge with the prediction of global physical, biological and social phenomena, which in turn interfere with local ecological, economic and political dynamics. The idea that modern life has lead to and now permeates global and local territorial profiles is generally accepted. Public awareness, personal reflexion and the establishment of means of prevention are the results of the current situation, even if action doesn't immediately follow thought. Despite the relative awareness of the facts, individual and collective action seems insignificant in the face of the magnitude of the externalised natural dangers. However, it should be clear that every cultural decision is inherently natural: we live in techno-natural worlds (Roqueplo, 1993).
- *Regenerative landscaping and modes of coexistence* — the concept of "sustainable development" and its desirable environmental, social and economic integration is one of the main concerns and major challenges of recent years. But sustainability has not lived up to its promises, because its objectives were centred

primarily on satisfying fundamental human needs, trying not to jeopardise the possibility of future generations, a position heavily dependent on economic interests and funding (Piteira et al., 2023). As an alternative, "regenerative landscaping" and "regenerative agriculture" have emerged as new concepts that invest in the restoration and revitalisation of local territories, both urban and non-urban, based on their endogenous sources of energy, materials, climate and local species profile. The idea is to create resilient and equitable ecological communities, and systems that integrate the needs of human and non-human populations. Regenerative design (Wahl, 2016) is inspired by biomimicry and biophilia (Lencastre et al., 2022), the circular economy, as well as ideas of rewilding and restorative justice. Its focus is on mapping relationships between humans and non-humans and promoting harmonious coevolution through a co-creation approach in which people are part of a collective social project.

- *Territories and human and non-human diversity* — in the context of discussions about critical zones and CC's health impacts, it is crucial to also consider local diversity, both human and non-human. Diversity seems to be one of the most important adaptive characteristics of resilient natural and cultural systems, and is an important concept for describing various levels of living beings: molecular, genetic, physiological, ethological, psychological, social, cultural and ecological diversity. The ecological diversity of cultures is evident when associated with local and traditional ways of life. Human miscegenation, based largely on past, current and future migrations, could increase genetic and cultural diversity and constitute one of the most important axes of human demographic dynamics in the 21st century. However, this diversification has an inverse influence, leading to homogenisation as a result of the natural/cultural selection that dominant cultures exert on minority cultures. Local territories are also subject to the mobility of non-human species in search of living conditions. In order to describe the local dynamics of nature/culture, such as water use, food distribution and energy or shelter needs, it is important to look at diversity through an ecological and dynamic lens that allows for a global perception of these different relationships with geographical space.
- *Cosmopolitics and multicultural and multispecies equity* — "equity" consists of a differential concept of justice that distributes wealth and material or symbolic resources in a way that is adapted to the local needs of human groups (Tsing, 2015). In a globalised world with finite resources, where different populations compete for them, there is growing concern about sharing territories with other beings. This concern requires rethinking the "critical zones" of territories, with their human and non-human inhabitants, intertwined in conflicting interests (Latour, 2016). In the anthropocene, the "critical zones", where life unfolds, often seem disorganised, sometimes strange and unpredictable, imperfectly attuned to old or new local narratives, to common politics, practices and social habits, as well as to the mobilities and compromises established with other

species. Cosmopolitical thought and action aim to address these diverse experiences and histories, using a description of modes of existence in order to understand the relationships at hand and create new strategic possibilities for action (Stenghers, 2005).

- *Modes of action and controversy* - one of the central characteristics of the application of contemporary sciences is its urgent and potentially controversial nature, subject to different rationales from different valid actors. For Latour (2016), when health risks are publicly discussed, such as the adverse effects of industrial chemical food additives, it is important to clearly describe what is at stake, that is, the modes of action of the different agents involved in the controversy. In this case, it's the chemicals, the allergic reactions caused by them, the perceptions, attitudes and behaviour of industrialists, citizens, local government and other interested groups, such as non-human animals or plants. All these entities occupy a common space and have unique ways of relating to other entities and to the other elements that make up the collective. Different facts and values are intertwined and deliberative procedures must first clarify modes of action to allow for discussion that then leads to decision-making.
- *Inventory, diplomacy and action* — decision-making on complex issues in uncertain collectives makes collaborative consensus-building processes one of the essential points of contemporary cosmopolitics. This should be based on "empiricism and radical irreductionism" (Latour & Muecke, 2021, p. 12), opening up the discussion to ontological and disciplinary pluralism. For practical disputes, Latour (2016) proposes a new diplomacy that negotiates in the intermediate space between the players, looking closely at the description of things and avoiding abstract concepts such as "society" or "nature". For this author, the pragmatic inventory of beings must lead to a concrete description before proposing an explanation. Diplomatic mediation between modes of existence aims to lead to the construction of a common world.

As we have seen, the complexity of CC and its multidimensional impacts on the health and well-being of humans and non-humans shows that quantitative approaches can calculate the effects, but cannot deconstruct the meanings and discourses associated with them. Thus, a reflexive approach based on realistic descriptions and participatory methods can contribute to a deeper understanding of this complex phenomenon. The methodological steps of the *Composing Worlds* network, described in the next section, are intended as a contribution to solve this problem.

3. Methodology

The methodology used in this project is based on data obtained from primary sources, using an interview survey with an open response script (see Appendix 1). This script was created by a network of 12 experts from a wide range of disciplines (male — nine; female — three) from three Portuguese universities, including areas such as

bioethics, literature, cinema, psychology, anthropology, sociology, ethology, medicine, communication, geography, landscape architecture and scientific and technological studies. This interview was sent in writing to each of the experts, who also responded in writing, with the recommendation that they answer each of the questions in the most reasoned and personal way possible. The aim of the interview, divided into four dimensions, was to bring to light personal and grounded knowledge and perceptions towards the major issues surrounding the humanities, health and well-being in contemporary societies, including CC and its health risks. The *Composing Worlds: Humanities, Well-Being and Health* network was formed from this founding moment, developing its identity from this initial work of mapping knowledge, perceptions and concerns. The texts collected from the interviews were subjected to thematic analysis and organised by key ideas and themes, which sought to identify semantic correspondences in main groups of meaning (Lencastre & Estrada, 2022).

This research is characterised by being inductive, realistic and semantic; its aim is to identify original themes emerging from each interviewee, not to analyse their historical, critical or psychological contexts. By adopting this approach, the survey questions were formulated in an open and broad way, without a direct link to CC in order to allow for an exploration of the participants' perceptions and experiences, without restricting the dialogue to just one specific topic. Furthermore, the research carried out an in-depth analysis of the words and meanings associated with the topics covered, in order to explore the semantic implications of the issues of health, well-being and humanities in contemporary times, without necessarily addressing CC directly.

This exploratory research uses thematic analysis with various levels of reading and codifying of the text to identify the original key ideas of each author, and the induction of the corresponding main themes, according to the methodological indications developed in Braun and Clarke (2006) regarding thematic analysis. The experts' responses to the interview survey were subjected to six levels of reading, analysis and synthesis:

1. Global reading and familiarisation with each specialist's text;
2. Global reading of each text, underlining the key ideas;
3. Global analysis of each text, coding the key ideas by term;
4. Partial analysis of each text, organising the key ideas into themes;
5. Taking up the overall text, key ideas and themes, reviewing them and synthesising them into nine main themes;
6. Final revision of the corpus of key ideas and main themes by the experts.

The topic types covered included, among others, news and well-being, ecology and relations with non-human animals, the regenerative landscape, social networks and smart digital devices, identities, gender, education, diversity and values, brain health and medical and psychological technologies, evolution and mental health, transdisciplinary research, subjectivity and the place of narrative, aesthetics, ethics and spirituality. Subsequently, they were organised into correspondence groups, or thematic clusters, decided by semantic proximity.

4. Results and Discussion

From this grouping, the following thematic groups were identified: (a) public knowledge and post-normal science; (b) critical thinking and ethics in health; (c) well-being, health, democracy and social justice; (d) holistic (transdisciplinary) approach to health and well-being; (e) health systems, diversity, cultures and nature; (f) technologies, artificial intelligence, health and well-being; (g) environment, health, sustainability and equity; (h) evolution, organisms, time and mental health; (j) health as a proto-value produced in relationships between/with people.

In general, based on these interviews, it became clear that postmodernity seems to have given rise to new narratives and new ethical and even metaphysical questions. Themes such as happiness, love, compassion, kindness and beauty, and universal concepts such as the "anthropocene" and "human rights", associated with local thinking/personal action, seem to have replaced the relativism of thoughts and practices, the constructivism of feelings, the localism and immanentism of values and community multiculturalism. Based on his work on the image, Descola (Fondation Louis Vuitton, 2018) tells us that we may be witnessing a slow shift from the naturalist paradigm to a more analogist conception of the relationship between humans and non-humans.

Although all the clusters are relevant, we chose five specific clusters to further discuss the risks of CC on human and environmental health. This choice is based on criteria aimed at establishing a direct and substantial connection with this theme. The selection is based on the above theoretical principles, as well as scientific concepts related to the impact of CC on health. The other clusters will be analysed in due course. We present the clusters in the following subsections.

4.1. Public Knowledge and Post-Normal Science

According to Latour's seminal work (1993), the idea of science has been replaced by a more flexible and realistic idea of developing sciences within networks of scientists, technologies, objects, people and interests. In fact, for Latour, science and modernity are mutually tied, leading to the idea of an arrow of time that inevitably leads to progress. But today's environmental situations, particularly CC, show that this idea of progress leads to a confused state of affairs in which the traditionally separate concepts of "science", "nature" and "culture" are intertwined and produce externalities that inevitably affect the "objects" and "subjects" of modernity. CC and its effects on health call for a more flexible and open conception of the sciences, interacting with the collectives of humans and non-humans who are affected by them.

This state of affairs is also recognisable in the context of the transmission of science between experts and laypeople. The linear model of transmitting knowledge has been replaced by a more complex idea of "negotiating meanings" that arise during the collective process of socialising science. These hybrid eco-socio-cultural spaces between sciences and collectives include not only experts from different backgrounds, but also interested parties, non-human beings such as animals, plants, geological elements or

ecosystems, which are represented by human speakers. *Latourian* diplomacy operates in this hybrid space and is based on what Latour calls (a) "radical empiricism", meaning a description that is close to what actually happens, in a real place or territory; also (b) "irreductionism", which is the inclusion of everything relevant to a concrete inventory and explanation of a collective living in a real space (the opposite of scientific reduction, which isolates entities in a laboratory and is interested in simplified causal chains); and finally (c) "consensus", that is the negotiation in the intermediate space between the players, looking closely at the description of things and avoiding abstract concepts. In this hybrid space, critical and ethical thinking find their greatest relevance for applied science. This means that specialised laboratory sciences are incorporated into the real world, where real things operate, where living beings, including humans, strive to inhabit. Diplomacy, in the context of this extensive cosmopolitan conception of earth's living places, represents an endeavour to mediate and reach consensus in order to build a common world that is habitable for all.

Local debates show that there are no right answers or just one application of science in decision-making, and it becomes more complex when we introduce the ecology of other species into considerations about CC, their habitats and their ways of life. The complexity of decision-making increases exponentially. With obvious exceptions, such as indigenous peoples or people living in disadvantaged countries, the modern human way of life is deeply dependent on what needs to change if we want to limit the effects of CC and all its planetary consequences. This search for consensus in plural collectives is very similar to a pre-modern scenario, as Latour (1993) would say, or an extra-modern one, as Descola and Pignocchi (2022) would say.

In contemporary technological societies, which face significant local CC health impacts, a careful survey of local data is as important for the correct exercise of preventive post-normal science as critical and ethical thinking. Nowadays, extended peer communities must also include representatives of non-human animals, as well as natural elements such as fresh water, land and plants. The deeply felt poetic human dimensions, in their relationship with non-human sensibilities, must also be taken into account, because the complexity and novelty of the emerging CC scenarios, and their global impacts, mean that they require new and radical solutions. When these dimensions enter cosmopolitical diplomacy, they can profoundly condition the solutions to new situations. Post-normal science proposes transdisciplinary methodological frameworks and problem-solving strategies that include the uncertainty of natural systems associated with human and non-human interests and values in decision-making in critical areas.

4.2. Critical Thinking and Ethics in Health

Health today is understood as the balance between the different personal dimensions (bio-psycho-social-spiritual), and knowing that this balance interacts with and is affected by other individuals, animals, plants and the shared environment, we consider that healthcare and health management require critical thinking. In today's technological

world, faced with the risk of depersonalisation and "*Undinge*" (Han, 2021) — a world where objects are replaced by information — "challenge" is a key word. We need to challenge assumptions and contexts and (re)imagine alternative ways of living in and with complexity. Furthermore, health is a continuum between being healthy and being sick, where healthy people can live with diagnosed illnesses for a long time and sick people can feel healthier than the hegemonic narrative understands "healthy" to be. This general binary thinking, the pathology of normality (Weil et al., 2017), must therefore be deconstructed in the context of health, and the two main tools for achieving this goal are critical and ethical thinking, both of which are interrelated.

The plural concepts and contexts imply a critical review of knowledge, of self and of the world, as well as an interdisciplinary reflection on health and education issues, focused on knowing to be and how to be, beyond the traditional ways of knowing what to do and how to think. The ageing of populations requires non-binary and critical approaches to care, given that the ageing process often involves comorbidities for which there is no curative treatment, but rather continuous care capable of healing and reducing the underlying vulnerabilities. Unpredictability and uncertainty seem to be at odds with the search for the correct diagnosis and the best course of action/treatment, based on the best scientific evidence, which is the foundation of evidence-based medicine. There is no person-centred care if the person is not recognised as such, being reduced to a category or a label, without the depth of *being* (which is always rooted in meaningful values, preferences, places and people). Ethical deliberation must therefore be promoted in healthcare, establishing safe spaces for reflection on knowing *to be and how to be,* and not just on knowing *how to do and how to think*.

Considering Paul Ricoeur's definition of "ethics" (Martini, 2016) as aiming for a good life, for all involved, in just institutions, it is precisely the meaning of good and justice that health professionals, patients, carers and policymakers must integrate into their deliberative and decision-making processes. The sustainable development goals, as a guiding map of the values that our communities need to achieve, require each stakeholder to take the long road of ethical reflection, answering the fundamental question: how can each of us be an active agent in building peace and justice (Goal 16) in the different organisational and community contexts in which we operate? Health, as a balance between the bio-psycho-social-spiritual dimensions, can be affirmed as an achievable horizon if it is framed within this broad and thick context of the realisation of ethical values.

4.3. Well-Being, Health, Democracy and Social Justice

A recent study entitled "Climate Anxiety in Children and Young People and Their Beliefs About Government Responses to Climate Change: A Global Survey" (Hickman et al., 2021) shows that young people suffer from anxiety, fear the future and blame governments for this dramatic situation. Children and young people show emotional distress (sadness, fear, helplessness, shame, despair or depression) and their expectations for the future are low and frightening.

The belief that CC is anthropogenic is also not in doubt in the scientific community. As climatologist Filipe Duarte Santos (2017) states: "research published precisely on this subject concludes that 97 per cent of climate scientists share the consensus that the observed global warming is anthropogenic" (para. 10).

So why are we, despite the scientific consensus on the subject, not able to categorically reverse the announced disaster and at the same time restore confidence in the future of the new generations? The answer is complex, because even in democratic societies — societies in which knowledge and the institutions that produce it must be respected, valued and listened to — the rise of populist leaders has made it difficult to clarify and make decisions on the subject. It hasn't been enough, as we mentioned above, to reach the necessary consensus on climate or, more recently, COVID-19, for science to adhere to the new communicational reality. Mediators, or translators of scientific knowledge, can do little when faced with denialist leaders who, in some cases, govern very powerful countries. Take former US President Donald Trump, for example: on 6 November 2012, he said that "the concept of global warming was created by and for the Chinese to make US companies uncompetitive" (Santos, 2017, para. 14).

Summarising this point, we can say that the world today has been facing imminent challenges — for example, CC, the COVID-19 pandemic and now the effects of war. In addition to these challenges, there is also an unfortunately contemporary trend that is jeopardising the existence of a common language between humans and thus undermining the extraordinary democratic experience.

4.4. Holistic (Transdisciplinary) Approach to Health and Well-Being

The 1970s was a time of criticism of the model of teaching and research funded by governments and universities, in which transdisciplinarity emerged associated with ethical concerns related to the direct applications of research to society (Seixas et al., 2020). The problems were too complex to be solved by simply taking laboratory science and applying it to the real world. After 20 years, new and highly complex problems have emerged, including CC and the urgent issues of environmental sustainability, biodiversity loss, pollution and poverty. The relationships between sciences and technologies, social policies, education and the role of the humanities and the arts were being equated in new configurations, and transdisciplinarity seemed to be a new and interesting way of producing theoretical as well as practical knowledge.

A transdisciplinary approach to CC, health and well-being means that teaching, learning or research takes into account different disciplines. Transdisciplinarity is also concerned with the different partners involved in research and action, considering them as "subjects" rather than "objects". In other words, what is sought is the integration of different knowledge and points of view in order to achieve a deeper and more comprehensive understanding of situations, as well as the possibility of developing relevant action.

There are two main trends in the transdisciplinary tradition (Bernstein, 2015). The first is shaped by *The Charter of Transdisciplinarity* (Gibbons et al., 1994), which presents the ideas of Romanian physicist B. Nicolescu: transdisciplinarity recognises the fundamental complexity of the different levels of reality and accepts the "included third party", abandoning the Aristotelian logic that governed Western thought for centuries and advocated the practice, common in science, of separating in order to understand. Nicolescu's approach emphasises the world of human life and lived meanings, in the phenomenological tradition. The second trend is known as "Mode 2" knowledge production: in this conception, transdisciplinarity consists of approaching a concrete situation by integrating the actors concerned, from scientific academia to industry, local governments, non-governmental organisations, museums, architecture, the humanities and the arts. The approaches are complementary to each other, the first addressing real-world issues, the second identifying the theoretical implications of transdisciplinary knowledge.

Transdisciplinarity is an interesting epistemological framework when it comes to exploring or teaching the health problems associated with CC. For example, transdisciplinary projects in medical or psychology teaching curricula have the potential to show the tacit values of the disciplinary sciences more clearly: in biomedicine, these values are the molecular and causal determination of systemic social situations, the analytical materialism of the impacts of CC on diseases, the categorisation and universality of medical and psychological diagnoses. These are values intrinsic to the biomedical discipline that can be rethought in the light of the values of the humanities.

In order to understand hybrid phenomena such as CC and its impact on health, it is not enough to understand the direct effects isolated in the laboratory or to make use of big data; the findings of the humanities and social sciences are equally important because they address the cultural representation of health and climate, they reconstruct the ways in which CC emerged and how history and economics have shaped the current situation, how epistemology, tradition and ethics have guided our relationships with health and climate regimes.

4.5. Environment, Health, Sustainability and Equity

Equity is a central issue in the question of CC's impact on health. When there is no equity, Whitehead (1992) states that there is an unfair and unequal distribution of health care, translating into a strong association between the socioeconomic positions of individuals and the environmental sustainability of societies (Oliveira et al., 2019; Vidal et al., 2018). Anthropogenic and environmental factors are the main causes of CC, impacting human health and ecosystems and resulting in situations of environmental injustice (Schlosberg, 2007), environmental racism (Salas, 2021) and social injustice (Comim, 2008). In fact, history has shown that vulnerable social groups have been continuously exposed to poor air quality, lack of access to green spaces and, consequently, environmental poverty and deprivation (Roberts et al., 2022). Therefore, along with the impacts

of CC that worsen their living conditions, these social groups also have the worst health outcomes, generating a cycle that is difficult to break.

Climate projections show that extreme weather events caused by CC, especially extreme heat or cold waves, are expected to increase in the coming years (Johnson et al., 2018). In this sense, it is expected that these waves will have a negative impact on health conditions. However, vulnerable social groups — those with respiratory or circulatory health problems, children and the elderly, and disadvantaged social groups — are likely to be more affected because they will be more exposed to these impacts. This situation is exacerbated when people live in conditions of energy poverty, related to the inability to keep their homes cool during the summer and warm during the winter. Adaptation and mitigation of CC must ensure that it is adapted to the diversity of socio-cultural contexts which can undermine efforts towards sustainability, if ignored.

The five clusters identified by the *Composing Worlds* network, when combined, can help strengthen the role of the humanities and social sciences in dealing with health risks due to CC. Figure 1 shows the relationship between the five clusters identified by broad interdependent axes of analysis that can be applied to health and CC.

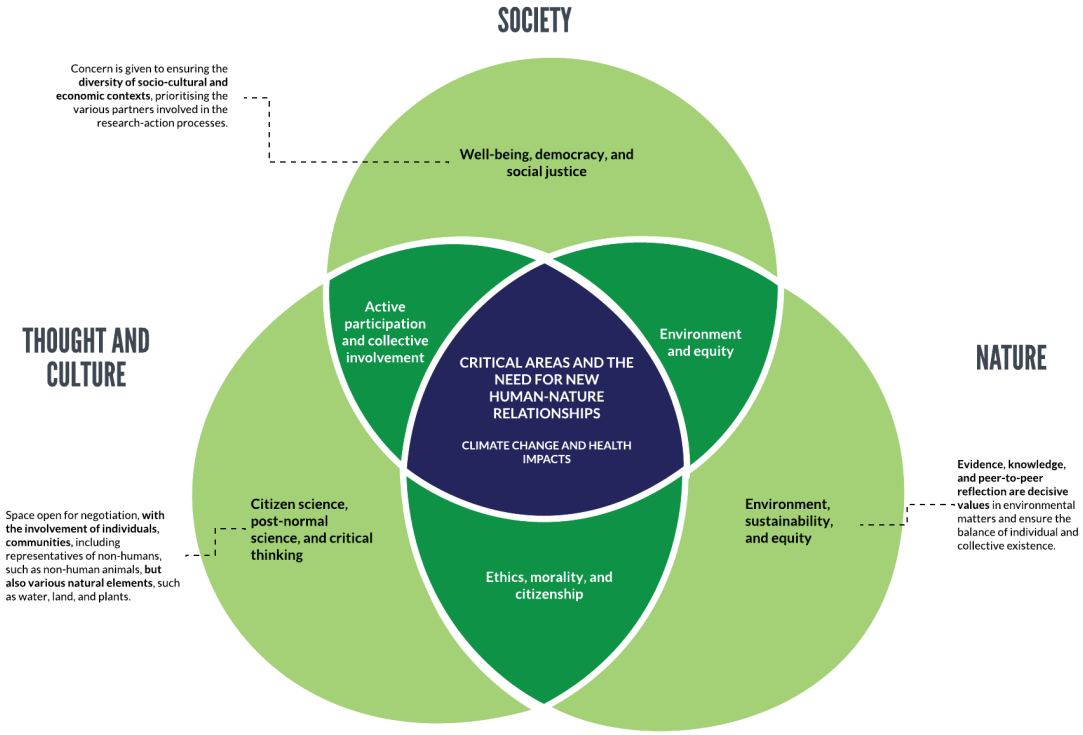

Figure 1. *Clusters emerging from the* Composing Worlds *network that can help address the health risks of climate change from a humanities and social sciences perspective*

The complexity and multidimensionality of CC implies a broad and inclusive community of peers that goes beyond the mere human dimension, taking into account the assumptions that Descola and Pignocchi (2022) refer to in their recent book *Ethnographies*

des Mondes à Venir (Ethnographies of Future Worlds). The authors point to a hybrid society that would see state structures and autonomous territories articulated in a heterogeneous profusion of modes of social organisation, ways of life and cohabitation.

The impacts of CC are transversal to all living beings, so their rights must be respected and taken into account when designing mitigation and adaptation actions. As stated by Beck (2016), human and non-human communities around the world are facing the unpredictable impacts of climate phenomena. The strangeness of the world that Beck describes implies critical thinking about the concepts of "society", "environment" and also health, as well as a revision of the paradigm in which individuals are at the centre.

In this context, the role of the aforementioned "critical zones" stands out, a concept developed in the social sciences by Bruno Latour (2014) and expanded upon by various authors. The idea of the "critical zone" and the practice of "critical zone science" focus attention on geographical analyses centred on interdisciplinarity, large data sets and participatory techno-scientific processes. For Latour (2014), the critical zone documents the properties of all the terrestrials that live there and are necessary for its maintenance. How can all these interests be reconciled? In recent years, we have witnessed the emergence of a profound technological increase in the management of these critical zones, along with new methods for dealing with "living capital" and non-human labour. These practices are described in the book *Critical Zones*: *The Science and Politics of Landing on Earth*, written by Latour and Weibel (2020), which explores the work carried out by humans and non-humans in an environment where technological approaches coexist with traditional approaches necessary for human and non-human evolution.

5. Final Considerations

Technoscience has proved not to be enough to deal with the complexity of the global changes resulting from CC. This article sets out to rethink some aspects of the health effects of CC through the lens of the social sciences and humanities. Framed by a transdisciplinary network of academics, the *Composing Worlds* network explores in depth the powerful connection between social values, democracy, health, well-being and sustainability, considering the need to move towards the integration of multiple voices and knowledge, from humans and non-humans, in order to deal with CC. Anchored in the concept of the "metamorphosis of the world" developed by Beck (2016), we argue that the social sciences and humanities can help deal with the health risks that result from CC, not only theoretically, but also in practice, by deconstructing the common narratives about climate and health, and reconceptualising the complex socio-ecological phenomena that humanity and other living beings face today and in the near future.

The clusters identified by the network can now be explored empirically by the experts who are currently part of the *Composing Worlds* network, or by other interested researchers outside the network, in order to reveal their full potential for driving concrete projects, *composing worlds*. It is important to note the growth of the network, which in 2024 already informally involves 25 experts from five universities, and that the themes

identified primarily by research are being developed, either in interdisciplinary research projects or through training and dissemination via podcasts and webinars[2]. One of the initial objectives of this project was to act at various levels, from academic to non-academic, involving public and social agents from different fields, since solutions to CC and health issues can be found at very different levels and in very different places. Especially at a time when democratic values, anchored in social justice and the well-being of all, and the actions needed to minimise the effects of CC are being challenged, a new narrative for humanity is needed that promotes imagination about cultures/natures. One of the original features of the *Composing Worlds* network project is that it proposes an integrated set of concepts that allow us to better think about the complexities and strangeness of today's world. On this basis, interdisciplinary areas have been defined that have given rise to published research and podcasts, such as the group on Biophilia and Health, or the group on Socio-ecological Challenges, Health and Citizen Science, among others (https://compormundos.fundacaofernandopessoa.pt/). The humanities and social sciences can pave the way for reinterpreting the meanings of the central concepts of our cultures and help us think about our place on the planet and, more importantly, about the relationships that we, as humans, forge with other living beings.

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Translation: Linguaemundi

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Appendix 1

Dimension	Question
Personal context	1. What is your subject area of initial training and how does it relate to your current professional activity and what are your main research interests? Please detail your answer. 2. Is your activity as a researcher and as a teacher related to the area of well-being and/or health? If so, how do you approach these areas? If not, what influences have marked your interests in your scientific and academic career? How can they contribute to your understanding of well-being and/or health?
Definition of the concepts and usefulness of the humanities and social sciences	3. This is a project about well-being and health. How do you define these concepts and which areas of the humanities do you think can contribute most to your study? Please state the reason(s). 4. In your experience, and starting from your area of research, what are the big questions that make you think today in the area of well-being and/or health? How can your research contribute to understanding them? 5. Which topics in the area of well-being and/or health do you find most embarrassing or, on the contrary, most promising for the future? Please tell us why.
Technological and ethical issues	6. Technologies for human well-being and/or health are changing rapidly and affecting contemporary societies in different ways. How do you redefine the human's place in this world increasingly marked by technologies? 7. What is your opinion on the role of critical and ethical thinking at a time of great technological advances, environmental transformations, changes in social discourse and dialogues with other non-Western partners? How do you think about the relationship you establish with the search for truth in knowledge?
Research into health and well-being	8. How can your area of expertise participate in interdisciplinary projects related to health and/or well-being? If possible, can you give one or more examples, proposing general research designs? 9. Do you have any other questions or important life events that shape your ideas about well-being and/or human health that you would like to develop?

Table 1. *Dimensions and questions of the interview survey script*

Biographical Notes

Diogo Guedes Vidal is a sociologist with a PhD in Ecology and Environmental Health. He was awarded a research grant for various projects funded by the Energy, Environment and Health Research Unit of the Fernando Pessoa University. Between 2017 and 2022 he was a doctoral fellow with a project funded by the Fundação para a Ciência e a Tecnologia, I.P. (Foundation for Science and Technology), focusing on the socio-ecological understanding of urban public green spaces where he combined innovative and transdisciplinary techniques. He is currently a guest assistant researcher on the European project *PHOENIX*: *The Rise of Citizens Voices for a Greener Europe* at the Centre for Functional Ecology of the University of Coimbra and visiting assistant professor at the Department of Social Sciences and Management of Universidade Aberta. His research interests are diverse and characterised by a transdisciplinary profile, namely in the field of sociology, climate change and society, possible natures, socio-ecological futures and epistemic alternatives. He is a member of the COST CA21166 — Ciências Sociais e Humanas para a Transformação e Resiliência Climática (Social and Human Sciences for Climate Transformation and Resilience) and of the transdisciplinary network *Composing Worlds: Humanities, Well-Being and Health in the 21st Century*. He is editor of the Ciências Sociais e Antropologia (Social Sciences and Anthropology) section of the journal *PLOS Climate*.

ORCID: https://orcid.org/0000-0002-2777-2372

Email: diogo.vidal@uc.pt

Morada: Rede Compor mundos. Humanidades, bem-estar e saúde. – Fundação Fernando Pessoa, Praça 9 de Abril 249, 4249-004 Porto, Portugal

Marina Prieto Afonso Lencastre is a former full professor at the University of Porto and a full professor at the Fernando Pessoa University. She is a specialist in psychotherapy and a supervisor for the Portuguese Society of Clinical Psychology, and holds a specialisation in Clinical and Health Psychology, as well as an advanced specialisation in Psychotherapy from the Portuguese Psychologists' Association. She is an accredited trainer in Environmental Education. She is also co-ordinator of the transdisciplinary network *Composing Worlds: Humanities, Well-Being and Health in the 21st Century*.

ORCID: https://orcid.org/0000-0003-1879-1077

Email: mlencast@ufp.edu.pt

Morada: Rede Compor mundos. Humanidades, bem-estar e saúde. – Fundação Fernando Pessoa, Praça 9 de Abril 249, 4249-004 Porto, Portugal

Hélder Silva Lopes has a degree in Geography and Planning from the University of Minho, a master's degree in Geography — specialising in Spatial Planning and Management and a PhD in Geography and Regional Planning from the University of Minho and in Geography, Territorial Planning and Environmental Change — specialising

in Global Change and Natural Systems from the University of Barcelona. He is an assistant professor in the Department of Geography at the University of Minho. He is also a contributor to *Meteored – tempo.pt*, where he writes weekly opinion pieces on climate, the environment and climate change. He is a researcher at the Landscapes, Heritage and Territory Laboratory / Associated Laboratory for Research and Innovation in Heritage, Arts, Sustainability and Territory — Landscapes and Society Group and is a collaborating member of the Climatology Group at the Instituto de l'Aigua. His main research interests are environmental perception; heritage and territory; landscape evaluation; urban tourism; environmental management; citizen science; climate change; and regional and local development. He is a member of the transdisciplinary network *Composing Worlds: Humanities, Well-Being and Health in the 21st Century*.

ORCID: https://orcid.org/0000-0002-2931-5175

Email: helderlopes@geografia.uminho.pt

Morada: Rede Compor mundos. Humanidades, bem-estar e saúde. – Fundação Fernando Pessoa, Praça 9 de Abril 249, 4249-004 Porto, Portugal

Susana Magalhães has a PhD in Bioethics from the Catholic University of Portugal, is a lecturer at the Fernando Pessoa University and head of the Responsible Behaviour in Research Unit at the University of Porto's Institute for Research and Innovation in Health. Her research interests are narrative medicine and research ethics/integrity. She is a certified Virt2UE trainer and a member of the management group of the Portuguese Reproducibility Network. She is the coordinator of a Study and Reflection Group on Narrative Medicine and a member of the European Society for Narrative Medicine. He is a member of the transdisciplinary network *Composing Worlds: Humanities, Well-Being and Health in the 21st Century*.

ORCID: https://orcid.org/0000-0002-3440-4244

Email: susana.magalhaes@i3s.up.pt

Morada: Rede Compor mundos. Humanidades, bem-estar e saúde. – Fundação Fernando Pessoa, Praça 9 de Abril 249, 4249-004 Porto, Portugal

Rui Estrada has a PhD in Literary Theory from the Faculty of Humanities of the University of Lisbon. He is a full professor at the Fernando Pessoa University and a researcher at the Center for Transdisciplinary Research Culture, Space and Memory (Faculty of Humanities, University of Porto). He won the Pen Club Essay Prize in 2002 and has published four books, edited six and is the author of several articles and book chapters (national and international). He is a still co-ordinator of the transdisciplinary network *Composing Worlds: Humanities, Well-Being and Health in the 21st Century.*

ORCID: https://orcid.org/0000-0002-8076-6692

Email: restrada@ufp.edu.pt

Morada: Rede Compor mundos. Humanidades, bem-estar e saúde. – Fundação Fernando Pessoa, Praça 9 de Abril 249, 4249-004 Porto, Portugal

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