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PHOENIX
The Rise of Citizens Voices for a Greener Europe

Participation in Holistic ENvironmental/Ecological Innovations

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Research Report on Society and Nature

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PU = Public
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Preface

PHOENIX is a project that aims to increase the potential effectiveness and efficiency of participatory and deliberative tools to better adapt them to discuss complex topics related to the EGD, supporting the spreading and scaling of these discussions up to a larger range of different administrative institutions and differentiated territories. The project, based on the premise of "not letting any voice and any viewpoint behind", aims to generate a solid chain of trust relations and wider social support and cooperation to the shaping and the implementation of Green Deal policies at a pan-European level. PHOENIX will seek to produce new knowledge on participatory methodological approaches for the EGD beyond the academic space, with the production of policy recommendations, podcasts and even documentaries aimed at the public.

Work Package 2 (WP2) *Participatory and deliberative practices and the environmental challenge* provide the project's theoretical foundations, covering the analysis of the four cornerstone typologies of participatory and deliberative processes (Democratic Innovations or DIs), such as participatory budgeting, public debate, citizen assemblies and system of national conference/forum and councils, mapped in 7 European countries: Portugal, France, Italy, Estonia, Hungary, Spain and Iceland. Also, WP2 will analyse the main expected impacts of the European Green Deal (EGD) transition pathway, the psycho-socio-cultural construction of Nature, and perform the local diagnostic through data collection in each pilot territory at a national (France, Iceland), regional (Central Transdanubia, Emilia Romagna, Cross-border Pilot "Gata-Malcata") and local (Rouen Metropole, Bologna, Tartu, Szeged, Odemira and Tavira) scales.

This deliverable "Research Report on Society and Nature" (D2.3) is the third of five deliverables from WP2. D2.3, and it provides an analytic framework to deliver useful considerations for designing the approach for PHOENIX pilots. Based on the PHOENIX premise of "not letting any voice and any viewpoint behind", the data collected and generated by Task 2.3 will contribute to the understanding of diverse narratives on Nature and Environment along with the different pilots. The outcomes will be included in WP3 to design the participative and deliberative methodological approach that is expected to generate a solid chain of trust relations and wider social support and cooperation in the shaping and implementation of Green Deal policies. Those methodologies and tools will generate the "Tangram Portfolio" to be implemented in each pilot by the Territorial Commissions for Co-Design (TCCD) developed by WP4 and evaluated by WP5.

The methodology combined quantitative and qualitative research on primary and secondary data. The research methods were desk research, systematic literature review, written interviews conducted with specific target groups in each pilot, and a questionnaire

related to the psychological dimension. The data collection was coordinated by Task 2.4 (UNIFI) with the collaboration of the Local Partners: e-Governance Academy (eGA), Associação Oficina de Planeamento e Participação (OFI), Res Publica (RP), University of Szeged (SZTE), University of Iceland (UoI), Università Degli Studi di Firenze (UNIFI), Centre for Functional Ecology - Science for People & the Planet (CFE) and Consejo Superior de Investigaciones Científicas (CSIC).

This Deliverable is structured into seven sections: Task scope and Objectives, Background, Methodology, Results, Limitations, Conclusions and Next Steps. The results of this study are divided into a theoretical part that aims to make a general State of the Art through a systematic literature review, and an empirical part related to the analysis of the primary and secondary data collected in each pilot.

Executive Summary

This executive summary is a concise and condensed overview of this full report that aims to give a quick understanding of the key points, findings, and recommendations of the deliverable.

This executive summary provides an overview of the study conducted by Task 2.3: The psycho-socio-cultural construction of Nature, integrated in the Project PHOENIX H2020 (GA 101037328). The objective was to **understand the psycho-socio-cultural construction of Nature and the Environment** in different 11 pilot contexts spread over 7 European countries: Portugal, Spain, France, Italy, Hungary, Estonia and Iceland.

In this deliverable "Research Report on Society and Nature" (D2.3) we intend to contribute to three major aspects of the Phoenix project, namely, the understanding of society-nature relations and their construction, the sociocultural influence on the implementation of the European Green Deal, and the methodological approaches to foster green transition in each pilot territory. The deliverable firstly aims to contribute to **(1)** a broader understanding of how societies and individuals in each pilot territory make sense and produce meanings about their relation with nature and the environment from different socio-cultural backgrounds, as sociocultural constructions; **(2)** secondly, to understand to what extent different sociocultural constructions of Nature and Environment can condition the implementation of European Green Deal measures and contribute to the ecological transition; and thirdly, **(3)** based on the social construction of nature and the environment in each pilot territory, provide considerations for the identification of the best methodological approach for deliberative and participatory processes)(Figure 1).

Figure 1 - Logics of the epistemology used in the study

This report emphasizes that the successful involvement of people in the ecological transition **requires mechanisms of participation that are grounded in fair, inclusive, and plural processes**. A **transformative policy** for ecological transition must deeply understand **the biophysical, socio-economic, and cultural characteristics of the territories**, requiring transformative processes at both **individual and structural levels**.

The findings of this report may be useful for various stakeholders, including (Figure 2):

Policymakers who are responsible for setting policies that affect the environment, public health, and the economy;
Community organizations who can effectively advocate for policies and practices that protect the environment and promote sustainability;
Practitioners who can design and implement effective, inclusive, and equitable processes that address complex environmental challenges and build community capacity for environmental stewardship;
Citizens who can engage in participatory processes in a meaningful way by providing input based on their experiences and knowledge;
Representatives of nature who can benefit from incorporating the views and interests of non-human species through stakeholder participation in decision-making processes. This can lead to more informed and equitable solutions that benefit all.

Figure 2 - The beneficiaries of the provided knowledge of the deliverable

Methodological note

This methodological note aims to provide a brief overview on the research design, data collection procedures, instruments and data analysis used in this report.

The research was conducted over a period of twelve months and it was necessary to combine different methods that generate primary and secondary data (Figure 3) – this was done through desk research, systematic literature review, written interviews and a survey, with the collaboration of task participants and local partners.

Secondary data was used to analyse how Nature and Environment are represented in the legal framework of each country and to identify the biophysical characteristics of the territory, including the sociodemographic, natural resources, socio-environmental concerns, sociocultural ecological behaviours, experiences in nature, and inclusiveness. The primary data was collected through interviews - to collected different target groups perceptions about the ecological transition barriers and opportunities, as well as their understandings and relations with Nature - and from a survey - to explore the readiness to change and the explicit attitudes toward climate change.

Why using mix methods?

Using a mix of qualitative and quantitative data collected from various levels, we can conduct an integrated analysis, addressing the socio-environmental challenges and barriers linked to the European Green Deal transition pathway in pilot territories.

Interdimensional and integrated analysis

This approach grants us a thorough comprehension of the interrelations between socio-environmental issues, structures, agency, and intersubjective aspects. Integrating these analytical dimensions provides a more detailed insight into the fundamental factors that add to environmental challenges, as well as the motivations and social dynamics that influence environmental behaviours.

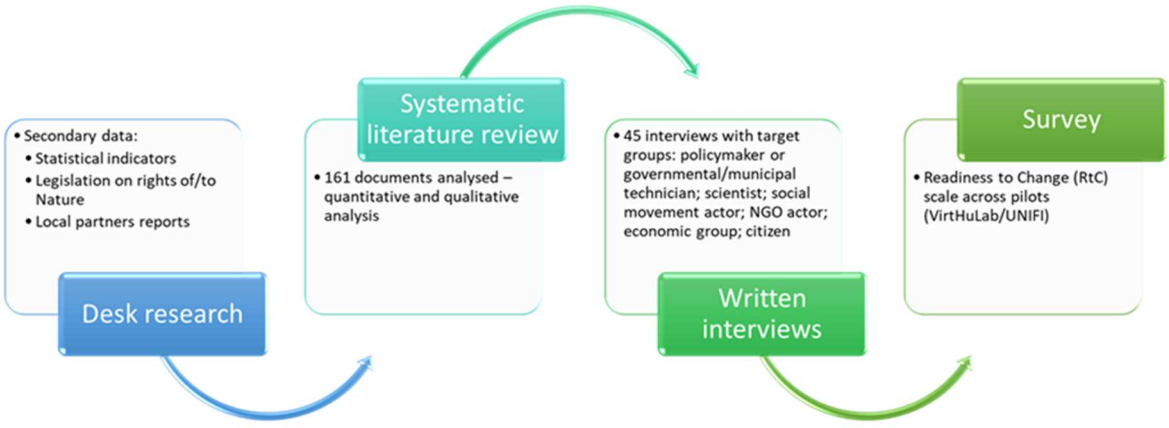

Figure 3 - Methodological approach applied in this study.

Main findings

This section presents the key results obtained and it is structured by the three main objectives that guided this research. As mentioned before, three major aims were defined in connection with the study. This section briefly details the most important findings according to the blend research results.

(1) To understand how societies and individuals in each pilot territory make sense and produce meanings about their relation with nature and the environment from different socio-cultural backgrounds, as sociocultural constructions.

Three society-human conceptions categories

- Through the literature review, it was found that the conceptions of Nature are plural, and the research evidenced 3 major categories about the complexity of Nature-Society relations (Figure 4):
  - "Opposition" - Nature is seen as a threat to society;
  - "Domination" - Nature is seen as a subordinate resource to society;
  - "Interdependence" - the interdependent nature-society agency and interaction is evidenced.

Interdependency is the key

- Assuming that the boundaries between the categories are not watertight or sharp - for example, the objectification of nature occurs in the category of opposition as well as in domination -, but rather communicable, the aim is to highlight the need to foster interdependent relationships between all elements that make up each ecosystem, human and non-human, so that the ecological transition can be successful.

Ecological Transition or transitions?

- How this information may be useful:
  - These categories may be useful when framing the barriers and drivers towards the ecological transition, especially in the multicultural European territories. Despite being a plan for Europe and also for the world, the socio-ecological transition face specificities which, as explained before, vary according to the socio-cultural-environmental-political-economic characteristics.
  - Thus, instead of ecological transition, it may be more appropriate to speak of ecological transitions, in order to emphasize the plurality of configurations (of policies, measures and instruments) required.

The Interdependencies category introduces fresh perspectives, advocating for a shift in our approach to Nature. Instead of the paternalistic notion of protection, it proposes a logic of interdependence, emphasizing that humans cannot be separated from nature. When examining this change in a diverse European region, considering its diverse biophysical features and multiculturalism, which enable various socio-cultural combinations at different levels, achieving a fair, diverse, and transformative Ecological Transition will only be feasible by integrating a range of knowledge, perspectives, and the unique characteristics of each territory.

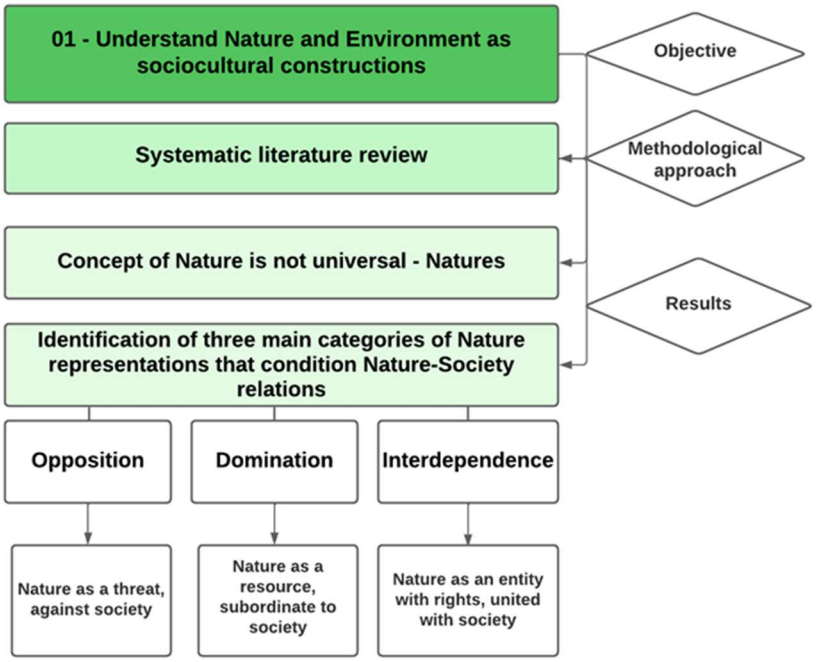

Figure 4 - Synthesis of objective 1 methodological approach and main results.

(2) To understand to what extent different sociocultural constructions of Nature and Environment can condition the implementation of European Green Deal measures and contribute to the ecological transition.

Context related specificities are key to understand possible transitions

- Through desk research and interviews, the study identified the pilots' vulnerabilities, opportunities, and risks regarding the implementation of European Green Deal Measures. Despite the vulnerabilities, opportunities and risks are transversal to the implementation of the EGD Measures in all the pilots, there are biophysical and socio-cultural specificities that should not be neglected (Figure 5). Context related specificities in terms of economic, social, cultural and environmental characteristics are intertwining the understanding of the transition processes;

Recognise and value the ecological transition social perceptions and interpretations

- Plural understandings of what means Ecological Transition have been identified: need to transform the social modes of production and consumption, new economic models that respect the environment, structural paradigm shift, an individual transformation or lack of knowledge about it;

Policies implementation requires collaboration among different stakeholders and actors to facilitate the ecological transition

- Policies and strategies should go beyond individual behaviours change and tackle systemic barriers, such as unsustainable economic models and governance models'

that misfits the contexts. This requires collaboration between governments, businesses, civil society, and communities to create an enabling environment for the ecological transition.

There is also a need to tailoring strategies and interventions to the specific contexts and needs of pilot territories. One-size-fits-all approaches may not be effective, as different regions have unique environmental concerns, social and cultural dynamics, and capacities. Policymakers and practitioners should consider local contexts, build on existing strengths and resources, and empower local communities to drive the transition process.

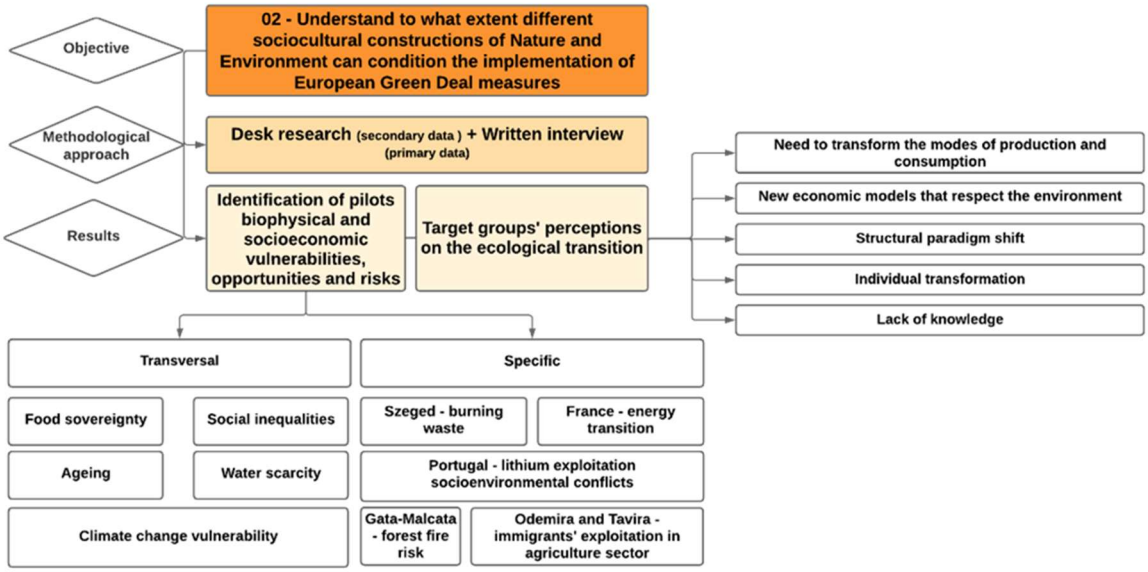

Figure 5 - Synthesis of objective 2 methodological approach and main results

(3) Based on the social construction of nature and the environment in each pilot territory, provide considerations for the identification of the best methodological approach for deliberative and participatory processes.

The unrecognition of nature's rights and limits appears as a possible barrier to the ecological transition

- Through desk research the study also revealed that the rights of Nature are recognized or mentioned in a limited way across all pilots, and prevailing anthropocentric and instrumental viewpoints over Nature and its elements (Figure 6);
  - The nature concept definition is absent in law and politics being substituted by the concept of environment or natural resources;
  - The human right to Nature is widely recognized across the pilots, referring to the right of all to have access to and live in a healthy environment. Despite its

importance as a matter of equity and justice, the unrecognition of nature's rights and limits appears as a possible barrier to the ecological transition;

Readiness to change

Through survey application on the readiness to change about climate change, some key information can be pointed out:

People are ready to change but they point the lack of institutional support

- The study also found that people across pilots are ready to change despite their perceived lack of institutional support, with Estonia pilot being less sensitive to change regarding ecological issues;
    - Participants from Italy reported lower levels of Social Support than France, and Hungary, while still having higher levels than Estonia;
    - Estonia pilot was the one that reported to believe less that climate change is changing due to anthropic actions and that acting against climate change is doable.

Cisgender females had more positive attitudes toward climate change than cisgender males

- Cisgender females appeared to have higher levels of both readiness to change and positive explicit attitudes toward climate change compared to cisgender males;
    - Except for Self-Efficacy and Social Support where the difference is more nuanced.

The framework of the ecological transition could be seen as an opportunity to incorporate the concept of nature into legal and political frameworks by recognizing its intrinsic value. It requires, first of all, a top-down approach to challenge the current anthropocentric and instrumental viewpoint and replace it with an ecological worldview that acknowledges the interconnectedness of all living beings and the importance of preserving ecosystems.

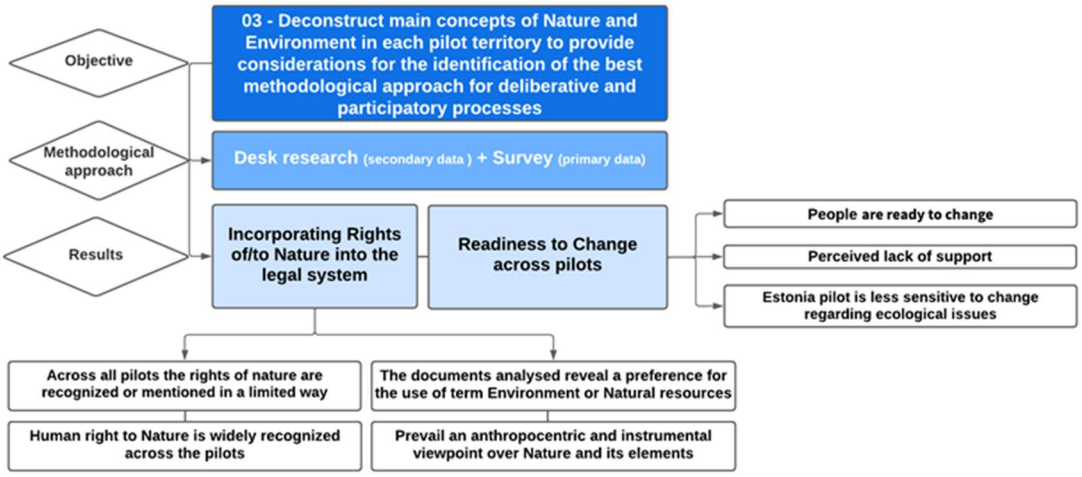

Figure 6 - Synthesis of objective 3 methodological approach and main results.

Key messages for the project and beyond

This section presents the six key highlights that should be considered for the project's next steps and beyond.

1. Identifying both transversal and specific challenges and opportunities for ecological transition across pilots can be useful in the design of the Tangram and the implementation of the Territorial Commission for Co-Design (TCCD).

- Through the TCCD, stakeholders can share their knowledge, experiences, and perspectives, ensuring a comprehensive understanding of the ecological transition within each pilot project. This collaborative approach fosters innovation, builds consensus, and promotes ownership among stakeholders, leading to more effective and sustainable outcomes.

2. The plurality of meanings and understandings regarding nature and ecological transition in the context of multicultural Europe should be framed in the Tangram, TCCD, and evaluation design.

- Multicultural Europe encompasses diverse cultural, social, and historical backgrounds, each with its unique perspectives and relationships with nature. Different communities may have distinct understandings of the environment, sustainability, and the ecological transition. Acknowledging and respecting this plurality is crucial to ensure inclusivity, representation, and effective engagement of all stakeholders. In the design of the Tangram, it is important to create a framework that incorporates and respects diverse cultural perspectives. This entails considering how different communities perceive and value nature, considering their cultural practices, belief systems, and traditional knowledge. By embracing cultural diversity, the Tangram can foster a more comprehensive and contextually relevant approach to the ecological transition. Similarly, the TCCD should prioritize inclusivity and participation of multicultural voices. It should provide a platform for open dialogue, ensuring that all stakeholders have the opportunity to contribute their perspectives and knowledge. This can be achieved through targeted outreach, involving community representatives, cultural organizations, and experts from various cultural backgrounds.

3. The little recognition of the rights of nature across pilots could benefit from a deeper debate in the TCCD and evaluation design.

- In the TCCD, there should be a space for open and inclusive discussions about the rights of nature. This entails creating opportunities for stakeholders to explore and understand the concept, its implications, and its potential benefits for ecological transition initiatives. Through dialogue and deliberation, diverse perspectives can be shared, and common ground can be sought. Furthermore, the evaluation design should incorporate mechanisms to assess the integration of nature's rights in pilot projects. It should consider how the recognition of nature's rights influences decision-making processes, policy development, and project outcomes. This evaluation should go beyond traditional metrics and capture the

extent to which the rights of nature are considered, respected, and implemented, as well as assess the social acceptance and understanding of nature's rights among stakeholders.

4. The lack of institutional support to adopt ecological behaviours mentioned by the interviewees should be considered when designing the Tangram and TCCD to enable close cooperation between all sectors of society.

- When designing the Tangram, it is important to integrate mechanisms that encourage institutional support for ecological behaviours. This can be achieved by actively involving governmental bodies, public agencies, and relevant stakeholders in the design process. Engaging these institutions helps to understand their perspectives, identify barriers, and develop strategies to overcome them.

5. The interviewees' perception of the ineffectiveness of traditional participation models should be seen as an opportunity for openness to envision and test new participation methods through the Tangram and TCCD and to evaluate them

- When designing the Tangram, it is important to embrace innovation and creativity in participation methods. This can involve incorporating new technologies, digital platforms, and inclusive methodologies that enable broader participation and ensure diverse voices are heard. It is essential to prioritize accessibility, cultural sensitivity, and adaptability to different contexts when implementing these new participation methods. The TCCD plays a crucial role in fostering new participation methods by providing a space for experimentation, learning, and evaluation. It can serve as a testing ground for innovative approaches, enabling stakeholders to co-design and co-implement participatory processes that better meet their needs. Moreover, evaluation should be an integral part of the process to assess the effectiveness and impact of new participation methods, by integrating indicators such as inclusivity, transparency, empowerment, and the ability to generate collective solutions. Additionally, sharing experiences and lessons learned with other pilot projects and initiatives can contribute to a collective knowledge base on effective participation methods. This exchange of knowledge and collaboration can drive systemic change and influence the wider adoption of innovative participation approaches.

6. The fact that people, in general, are ready to change could be an opportunity to successfully implement the ecological transition, but the less sensitive nature of Estonia should be explored further.

- People's willingness to change and embrace sustainable practices is a valuable asset in driving the ecological transition. When individuals are open to adopting new behaviours and supporting initiatives that prioritize environmental sustainability, it creates a favourable environment for implementing transformative actions. However, it is essential to consider the specific context of Estonia and understand the less sensitive nature observed in the region. Exploring the reasons behind this nature can provide insights into the challenges and opportunities for successful implementation of the ecological transition in Estonia. One

aspect to explore is the cultural, social, and historical factors that shape the attitudes and behaviours of people in Estonia. Another aspect to consider is the level of awareness and education regarding environmental issues in Estonia. Assessing the existing educational programs, public awareness campaigns, and information dissemination efforts can provide insights into the gaps that need to be addressed to enhance environmental sensitivity among the population. It can guide the development of targeted initiatives that effectively engage and educate individuals about the importance of the ecological transition.

Our results in the pilot territories reveals plural understandings and different perspectives of the society-nature relations. This might imply to other parts of Europe besides the pilot territories.

1. Task 2.3 scope and objectives

The objectives of Task 2.3 *The psycho-socio-cultural construction of Nature* can be split into three overarching and tangled goals. The first (1) is to understand Nature and Environment as sociocultural constructions. The second (2) is to analyse to what extent different sociocultural constructions of Nature and Environment can condition the implementation of EGD's measures. The third (3) is to deconstruct the main concepts of Nature and Environment in each pilot territory to provide considerations for the identification of the best methodological approach for deliberative and participatory processes by WP3.

More specifically, Task 2.3 aims to analyse the concepts of Nature and Environment beyond the Cartesian duality between Nature and Society (1.1). It was done by identifying relevant research theoretical concepts on the relation Nature-Environment-Society (operational objective 1.1.1). Simultaneously, this study aims to Identify how societies and individuals make sense and use nature and their environment from different socio-cultural values, experiences, needs, beliefs, attitudes and in relation to specific political institutions. (2.1). It was done by identifying relevant **research topics** and **methodological tools** to perform data collection in each pilot. It includes the selection of secondary data (statistical indicators and a matrix), the identification of target groups categories and the creation of written interview guidelines and a questionnaire to collect primary data in each pilot (operational objective 2.1.1).

The previous two objectives will enable us to reach the third general objective of this study, which is to analyse how individuals and institutions relate with Nature and Environment in each pilot territory (3.1). To address that, the focus of this study is on Nature and Society's representations and practices, and interrelated power relations. It is organised at two analytic levels: at a **structures level** and at an **agency/intersubjective level**.

The **structures level** analyses the official and institutional narratives on Nature and Environment in legislation and public policies (operational objective 3.1.1). The **agency/intersubjective level** analyses two dimensions: the perceptions about Nature and the Environment through the actors' narratives (individual and collective), and the psychological processes related to the individual behaviour attitudes toward environmental issues and climate change.

This study was guided by the **5 main research topics** previously selected: 1. Natural resources, 2. Socio-environmental concerns, 3. Sociocultural ecological behaviours, 4. Experiences in Nature, 5. Inclusiveness. These were the bases to the guidelines of the written interviews (see the detailed description in the Interviews section).

The selection of these 5 research topics aimed to identify how each pilot context deals and constructs a psycho-socio-cultural relationship with Nature and Environment. Specifically, to analyse how institutions and individuals relate with Nature and Environment in each pilot territory (see specific objective 3.1). So, first, we aim to map individual/collective perceptions about ecosystems' services, climate change, social and gender inequalities, health, and well-being (operational objective 3.1.2) through these topics. Second, we aim to analyse the fundamental psychological dimension required to assess the individual behaviour attitudes toward environmental issues and climate change (operational objective 3.1.3).

Finally, this study aims, specifically, to propose an analytical framework around the results of the fieldwork on the understanding of the psycho-social-cultural relationship with Nature in each pilot (3.2). That framework analysis is based on the combination of multiple philosophical, sociological, psychological, and anthropological perspectives that will enable an inclusive methodological approach for each territory (operational objective 3.2.1).

2. Background

2.1 Nature and Society complex relations

In this study, the concepts of Nature and Environment are understood as socio-cultural constructions (Aldeia & Alves, 2019; Descola, 1992), since their meanings are diverse and vary according to **the various ways institutions and individuals relate to Nature and the Environment**. As such, it is relevant to ask to what extent representations and perceptions of Nature and Environment produce hegemonic discourses as well as specific, diverse, contextual meanings and social-cultural practices?

To answer those questions, it is necessary to deconstruct the Cartesian narrative that continues to perceive Nature and Society/Culture as antagonistic poles (Kuper, 1992). This separation shaped by Western modernity is understood by Latour (1991) as the basis of the development of the Nature Western modern concept: **the humans are put on the side of Culture; the non-humans on the Nature side.** Bruno Latour (1991) emphasises that considering the natural world as outside of humans is ethically a problem and is not an empirical reality. The exteriority of Nature from humanity created a hierarchical and disproportional relationship between humans and other beings (Hissa, 2008; Latour, 1991), where the firsts are in command of the seconds.

The dualism between Nature and Humans, sustained in Western capitalist, colonial, and patriarchal dimensions (Aldeia & Alves, 2019; Santos, 2006), is anchored by Judeo-Christian values. Looking back, before Judeo-Christian values were the dominant religious force in the Western world, Paganism, with plenty of Gods and Earth Spirits, prevailed. This system of beliefs considered sacred to be found throughout Nature, and humanity was thoroughly embroiled in it. With Judeo-Christian values, the sole **God was re-positioned outside of Nature** (Elvey, 2006). When adopting a Creationism belief, if God made humans in his own image, than He gave them the right to dominate all non-human species: "Let us make humankind in our image, according to our likeness; and let them have dominion over the fish of the sea, and over the birds of the air, and over the cattle, and over all the wild animals of the earth, and over every creeping thing that creeps upon the earth." (Knierim, 1990). Other interpretations of Genesis 1:26-28 have been presented to contradict the interpretation of a domination and superiority of the humans over the non-humans. Instead of giving rights to human beings over Nature, these bible verses may refer rather to the responsibility of taking care of Nature in a way consistent with God's will (Jakimow, 2013). This cosmovision was also found in a previous study by Schultz et al. (2000), where the authors concluded that more literal beliefs in the Bible scored significantly lower on the New Ecological Paradigm (NEP), lower on ecocentric environmental concerns, and higher on anthropocentric environmental concerns.

Several critics have been pointed out to the NEP developed by Catton and Dunlap (1980), such as: being inadequate for measuring one's affective and experiential relationship with the natural world, as it appears **to measure cognitive beliefs rather than affective experiences** (Mayer & Frantz, 2004); being limited in terms of both the anachronistic wording of the items and its **inability to capture people's increasingly complete understanding of the nature**, severity, and scope of environmental problems (Lalonde & Jackson, 2002); an insufficient predictor of environmental behaviours (Scott & Willits, 1994); or the fact that its conceptualization of the ecological worldviews on which the NEP was built **may not be applicable outside the western world** (Chatterjee, 2008). Despite the validity of some of these critics, it is undeniable that the sedimentation of an idea of an objective Nature external to humans is still visible and present in academia, as well as in official narratives and public discourse. However, not all humans were considered to be on the Culture side by Western modernity

For instance, in the case of gender, ecofeminism criticises the fact that woman is to Nature as man is to Culture (Plumwood, 1993). In fact, previous research shows a consistent structural inequality pattern related to the fact that women, Nature, and the Environment are exploited and dominated by white, middle-class men in Western society (Locke, 1999). At the same time, mastering Nature and controlling women are anchored in the same logic as colonial domination. The European colonialism discourse was founded on

epistemological ethnocentrism (Mudimbe, 1988) that represented **Nature as an object to be exploited, as well as the colonised** societies as "primitive" and "non-civilized" people. Despite their culture and systems of knowledge, those people were put in the natural world side as "savage", "emotional", "intuitive" and "instinctive" persons, in opposition to the "modern", "civilised", "scientific" and "rational" side where the European belonged (Hall, 2001; Said, 2004). Along that process, the cultural difference was made intelligible in a Cartesian perspective, which was a colonial strategy of cultural representation **to legitimize the violent practices of occupation and exploitation** of territories and local ecosystems, and over colonised people and their knowledge, cosmovision, and ways of life (Hall, 2001; Said, 2004; L. T. Smith, 1999; Valentim, 2012). The modern boundary between Culture and Nature is made within a "social classification logic" that naturalises the social hierarchies based on unequal power relations (Santos, 2002, p. 248), which served to build identities, places, and worlds that were strategically intended to be opposites and rivals (Valentim, 2012). The primary justification for colonisation was the "rescue" of the non-European world from a state of association of primitive Nature and its transformation into a state of Civilization and Culture (O'Brien, 2002).

Within that modern discourse, the Western Environmental Law (post-French Revolution) was **based on an anthropocentric representation of Nature as a commodity**, that is, non-human beings (plants, forests, oceans, rivers, mountains, minerals, water, soil, animals, among many others) were seen as a thing to be used, and even destroyed, to fill the individual needs and desires of its owners (Benjamim, 2011; Birnie & Boyle, 1994). More recently, the Environmental Philosophy or Ethics highlighted the effort of protecting Nature and the Environment, which is at the base of the actual mainstream Western and Euro-American environmental legal paradigm (Gonçalves & Tárrega, 2018). Under national and international Human Rights Law, humans have the right to have access to natural resources, green spaces, and a clean and healthy environment (Varvastian, 2019). However, the **Human Right to Nature is translated into environmental laws that, although aimed at the legal protection and conservation of biodiversity and ecosystems services**, continue to perpetuate the modern anthropocentric logic and separation of non-humans/humans in guiding its protection according to the interests and the well-being of humans (Benjamim, 2011): to protect Nature for humans' sake. In other words, Nature continues to be seen as something that has resources (precisely, "natural resources") that are meant to benefit human beings, revealing the *homo economicus* perspective (Eckersley, 1992). In this hegemonic legal system, Nature has an instrumental value and is represented as a commodity. Nature is not seen as a subject with intrinsic value – protecting Nature for Nature's sake- , and agency that acts to and in relation to human beings (Sessions, 1995) and, thus, a subject that has its own rights (Gonçalves & Tárrega, 2018; R. F. (Nash, 1989).[1]

[1] The relation of Nature, Environment, and law will be referred to with more detail in section 2.2 of this deliverable.

The key issue here remains: it is not possible to survive without Nature and humans need the resources provided for that purpose. But this does not justify the abuse and extractive logic that has guided humanity's relationship with Nature. Hence, this **coexistence and interdependence**, which is intended to be harmonious, can find some possibility in the references, principles and virtues associated with the relationship **between People and Nature** - both interpersonal and articulated by policies and social norms (K. Chan et al., 2016).

Thus, Nature/Environment and Society/Culture are not separate entities but instead intertwined in complex relations. Nature and the Environment consist of social and cultural practices that are created and signified by individual and collective actions in specific contexts (Greider & Garkovich, 1994). Furthermore, Nature and the Environment are non-human entities that act and intersect with the social, cultural, political, and economic dimensions of human life (Descola, 2005). Therefore, the notions of Nature and Environment are quite diverse and reasoned differently across specific sociocultural contexts. **The concepts of Nature and Environment are socially constructed**, since in a context where a separation between humans and non-humans is irrelevant, they lost their Western meanings (Bragança et al., 2021). **Acknowledging the deep interdependency between Nature and Society emphasises the importance of understanding the plurality of Nature and Environment perceptions and representations** against the hegemonic socio-ecological narrative (Aldeia & Alves, 2019; Kuper, 1992; Moore, 2016). The need for this understanding is in line with the current debate on the contemporary environmental, climate, and ecological crisis. Ecocide is one of the main concerns that results from a capitalist, neo-colonial, and neo-liberal attitude toward the natural world (Al-Delaimy et al., 2020; Aldeia & Alves, 2019; Alves et al., 2020; Moore, 2016). For instance, the climate change exacerbated by human activity (e.g. industrialization, deforestation, pollution, Greenhouse Gas (GHG) emissions, industrial livestock agriculture, intensive farming) has had growing impacts on ecosystems, public health, biodiversity, climate, and global social inequalities (IPBES, 2019, 2021; R. A. Silva et al., 2017). That is compromising the implementation of the 2030 Agenda goals for Sustainable Development proposed by the United Nations (2015). This situation is leading to deep transformations in humankind and planet relationships (Cortegano et al., 2021; Piteira et al., 2022; Salata et al., 2023; Simpson & Christensen Jr., 2013), which **emphasises the urgency for human behaviour to change, including the awareness of greater individual and collective responsibility** to respect, preserve and conserve Nature and the Environment. For instance, it could be done by reducing the ecological footprint and **creating social and environmental public policies that would challenge societies** in their organisation and structures to deal with the effects of the Anthropocene (Alves et al., 2020; Taylor et al., 2020).

Given this evidence and triggered by the Western modern appropriation of Nature as a commodity, socio-environmental discrepancies between the global North and the global South are gaining visibility. Social inequalities, defined as a disparity in access to goods, resources, and opportunities regardless of individual capacities and performance (Machado, 2015), are deeply tangled with the contemporary environmental and ecological crises. In this context, **the less developed, poor, and industrialised societies are the more vulnerable.** They are experiencing stronger discrimination and exclusion (social, cultural, ethnic-racial, gender, political, environmental and economic) due both to deficit access to natural resources (water, land, air, soil, trees, wood, minerals, fossil fuels, among others) and to the dramatic effects of climate change (forced migrations, drought, storms, warmer temperatures, loss of biodiversity, rising sea levels, displacement, unemployment, among others), compared with the richer and more developed countries, responsible for the greatest emission of polluting gases and global warming on the planet (Adenle et al., 2015; Leal Filho et al., 2016; H. Ribeiro, 2004; Vidal, Oliveira, et al., 2022). Those marginalised and subaltern groups are disproportionately exposed to harmful chemicals from pollution, pesticide use, and waste imported from more developed countries, which unveils that environmental inequalities are part of a historical logic of structural inequalities (Roberts et al., 2022). Simultaneously, they have been left out of social participation, especially regarding environmental policies and decision-making. In turn, climate change impacts increase those social and global inequalities, conditioning the ways different social groups live and cope with the environmental and ecological crises. In fact, this is leading to the growth of socio-environmental conflicts, social inequalities, and vulnerabilities, **revealing situations of environmental injustice and environmental racism** (Harper et al., 2009; Holifield et al., 2009; Nagy, 2021; Velicu & Barca, 2020; Walker, 2012), and a lack of global health and well-being (Leal Filho et al., 2016; Vidal, Oliveira, et al., 2022), which is destroying ways of life and entire communities. In this context, recent interdisciplinary studies have been analysing important social issues, such as sustainability, environmental justice – in terms of distribution, process and recognition-perception -, just transition, the relations between rights and Nature, environmental citizenship, climate change, local communities, ecosystem services, social and gender inequalities, health, well-being and processes of social participation (Al-Delaimy et al., 2020; Alves et al., 2012; Bello, 2012; Cabannes, 2020; Cordeiro, 2021; N. M. O. C. Dias et al., 2020; Díaz-Reviriego et al., 2019; Díaz et al., 2015; Hanspach et al., 2020; Hoffman et al., 2022; Johnston et al., 2011; Leal Filho et al., 2016; Lele et al., 2013; Mendonça et al., 2015; G. M. Oliveira, Vidal, Maia, et al., 2020; G. M. Oliveira, Vidal, Viterbo, et al., 2020; Schmidt, 2015; Velicu & Barca, 2020; Veras et al., 2022; Vidal, 2019; Wahl, 2016). It is worth noting that environmental injustices in Europe are framed by spatial differences in different countries' perception of different of it. In sum, these studies suggest that social transformation needs a collective awareness of the social construction of Nature and the Environment to allow behavioural change towards a more ecological future and Planet.

It should be noted that when we speak of communities, we are referring to a heterogeneous set of social relations between individuals and institutions, between humans and non-humans, things, and persons, whose connections are capable of reflecting and re-configuring societies (Kuper, 1992; Latour, 2007). It means that communities include, at the same time, processes that imply the sharing of common cultural values and symbols that reinforce specific identities and ways of being in the world. In this sense, it is important to understand that different relations between communities, institutions, and the State, produce different societies and, in effect, distinct positions towards Nature and the Environment and, finally, diverse socio-environmental and multidimensional challenges. Therefore, four challenges stand out: (1) One of those challenges is to **consider the agency and the interdependency of humans and non-humans** for a better understanding of social practices (Latour, 2007); (2) The other one is the **recognition of different forms of social participation** through the engagement of communities with the social-cultural world and Nature, implying bottom-up policies to face the effects of climate change (Alves et al., 2012); (3) In this sense, the next challenge is the **conception and implementation of policies that consider effectively the local socio-cultural specificities and needs**, and local effects imposed by climate change, to deal, in a sustainable and inclusive way, with the ecological and environmental crisis (Alves et al., 2020); (4) At the same time, the last challenge that we must highlight is to consider in the **deliberative and participatory settings different forms of knowledge**, language and actors (traditional, erudite, ecological, local, scientific, artistic, popular, lay, among many others.). Also including the kind of knowledge born out of the struggles of the social movements for human dignity, that challenge would imply the recognition and valorisation of other ways of existence and, thus, the epistemological diversity of the world against the dominant ways of knowing (Santos, 2014; Santos & Martins, 2021; Santos & Meneses, 2019).

One way of perceiving this mutual relationship between Nature and Society has been proposed by Ecology studies through the **"ecosystem services" concept** (Lele et al., 2013). Initially proposed by the Millennium Ecosystem Assessment (2005), this concept is part of the CICES (Common International Classification of Ecosystem Services) and is structured into three typologies: **provisioning, regulation/maintenance, and cultural services** (Haines-Young & Potschin, 2018). According to CICES, "provisioning services" are those that guarantee food, nutrients, and energy to all living beings. "Regulation/maintenance services" derive from natural and ecological processes guaranteed by the ecosystems themselves and which serve to support life on the planet (e.g., pollination, absorption of carbon and waste, among others). Finally, the "cultural services" refer to the socio-cultural uses and non-material, psychological, intellectual, aesthetic, recreational, symbolic, and cultural benefits, which result from human and non-human relations with the ecosystems (European Commission, 2015; Haines-Young & Potschin, 2018). Ecology studies have been

valuing the "cultural services of ecosystems" to contemplate the multidimensional character of ecosystems, that is, the connections of the Environment and Nature with spiritual, sociocultural, ethical, epistemological, political, ontological, and emotional dimensions crucial to the human well-being (Bieling et al., 2020; Bieling & Plieninger, 2013; K. M. A. Chan et al., 2012; Cordeiro, 2021; Díaz et al., 2015; Fish, Church, & Winter, 2016; Fish, Church, Willis, et al., 2016; Hanspach et al., 2020; Madeira, 2016; Vidal et al., 2021; Vidal, Dias, et al., 2022; Vidal et al., 2020).

However, the concept of "ecosystem services" can be problematic in the sense of implying the Western modern **anthropocentric rationality behind it, precisely in considering that Nature and the Environment have important "services" for human benefit** (Díaz et al., 2015). In that regard, the conceptual model proposed in 2013 by the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) of the United Nations introduced an alternative language to identify and classify the ecosystem services (IPBES, 2013). In short, it suggests that Nature does not have the function of serving people and proposes a holistic and plural vision for the understanding of ecosystem services in a balanced way. That logic is based on a less compartmentalised, anthropocentric, and capitalist conceptual model (which the concept of "ecosystem services" could imply) and is more inclusive and focused on the Nature agency and intrinsic values. Considering that language is political, that conceptual framework proposes the adoption of specific words to replace certain Western scientific jargon. The "human well-being" concept is understood as "living in harmony with nature, living well in balance and harmony with Mother Earth"; "Biodiversity and ecosystems" concepts correspond to the "Mother Earth systems of life"; and the "Ecosystem goods and services" are defined as "Nature's gifts" (Díaz et al., 2015, p. 15).

The need to reconfigure who is at the Centre – Nature or Humans – is decisive to a deep socio-ecological transformation. Hence the importance of knowing and turning visible different systems of knowledge and languages, making audible the role of other worldviews on Nature in the co-design of local and global strategies, regional and national, to Nature and Environment well-being (Díaz-Reviriego et al., 2019; Díaz et al., 2015; IPBES, 2019). Abandoning the exclusively anthropocentric epistemic principles, the analysis of socio-ecological phenomena about humans and non-humans provides insights for a new perspective on Nature and Environment. Considering the premise that **Nature, Environment, Culture, and Society are mutually constructed, this deliverable is framed beyond the Western dichotomy thinking that deprives Nature of an active agency** (Aldeia & Alves, 2019). Human well-being (physical, mental and spiritual) is intertwined with Nature's well-being (the preservation of ecosystems, biodiversity, and the resilience of a territory) (Caillon et al., 2017). As such, a shift of paradigm is necessary, both in the way we look at Nature (which is not at the "service" of Humans) and in terms of individual and collective values and behaviours (which are not apart from Nature and the Environment).

In that sense, to understand how those representations and perceptions are constructed, the collection of individual and collective narratives about Nature and the Environment is crucial and must be framed by the actors' sociocultural backgrounds, needs, and experiences. Monitoring and understanding these socio-ecological relationships will contribute to social transformation by mitigating the harmful effects of climate change on Nature and Society and combating the loss of biodiversity in the world (Bain & Bongiorno, 2020; Monbiot, 2017). Indeed, transdisciplinary studies that use socio-ecological approaches are important to understand how the various dimensions and sustainability indicators of territory are interconnected and act at different scales (Bridgewater & Rotherham, 2019; Hanspach et al., 2020; Merçon et al., 2019; G. M. Oliveira, Vidal, Viterbo, et al., 2020; Sterling et al., 2017; Vidal et al., 2019).

2.2 The Rights of Nature and the Human Right to Nature[2]

The "Rights of Nature" is a legal and judicial theory according to which the natural elements, and more in general the environment, have inherent rights, comparably to Human Right Theory. In that vision, the nature is considered as the non-human in its entirety: both the inorganic and the organic, both animals and plants, both bacteria and rocks. In general, the **Rights of Nature is the idea that the whole biosphere, meant as the place in which life can happen, is endowed with natural rights**.

According to Nash (1989) and following the main addresses of ethical analytical philosophy, two groups of argumentations can lead to the recognition of the Right of Nature: by the one hand, a deontologist approach, according to which as human rights originated from the sole human existence, the same should work for the nature rights, that originated by the sole existence of the natural world; by the other hand instead, a consequentialist one, which is more instead oriented toward the environmental outcomes of the Anthropocene. According to a consequentialist point of view in fact, acknowledged the socio-environmental crisis *in fieri,* the only way to address it and to guarantee the sustainability of the life on the planet is to reduce the ecological impact of human life, therefore by recognizing the rights of the non-human.

However, as more critical authors have found (Bookchin, 1987, Thomas 1999), both deontologists and consequentialists approaches are rooted into an anthropocentric understanding of the relationship between the human and the non-human. In fact, both the approaches rely conceptually on the Cartesian dichotomy between the human sphere and environmental one. This dichotomy, or separation, is both embodied in the idea of

[2] This section was developed by Luca Novelli (FGF) and Puttini Spartaco (FGF).

instrumental (consequentialists) and intrinsic (deontologists) value in relating with the nature. Accordingly, humans consider themselves as something ontologically different from the environment in which they live (Aldeia & Alves, 2019). Chan et al. (2016) discussed this idea, by proposing "relational values", considering therefore the human as just a part of a more complex ecologic system, defined by the relationship between its parts.

However, rather than the conceptual side, the goal of this background is to seek to explore the ways in which European countries embodied the Rights of nature in their legal system, both at the constitutional and at the various legislative level. Following this line, a premise has to be done, to clarify the conceptual space into which we are moving. In fact, the Western legal system is rooted in an anthropocentric perspective[3], in which the nature is basically considered as a good. In other word, the idea is that natural elements are disposable and commodifiable. Moreover, as it is for goods, nature is subjected to property rights and is exploitable for profit. Those considerations, that will be further elaborated in the discussion of the empirical data[4], guide our expectations on the results that will be found. In fact, even if some positive steps had been made in Europe, it is known how the only two legal systems that guarantee a protection of the Rights of nature are the Ecuadorian and the Bolivian ones (Baldin, 2014).

2.3 Readiness to Change (RtC) theory: Continuous Commitment, Trust, Self-efficacy and Perception of social support[5]

Regarding behavioural and attitude change is fundamental to consider the "**Readiness to Change**" (RtC) theory that is nowadays modelled as composed of seven interconnected but independent dimensions: the motivations toward change (van Valkengoed & Steg, 2019), the personal self-efficacy (Loy et al., 2020), the perceived social support from society and community (Goldberg et al., 2020), the knowledge and perception of problem complexity (Leiserowitz, 2006), the perception of the proximity/reachability of the goal given the proposed actions (Schwarzer, 2008), the personal engagement (Cunningham et al., 2002), and the perceived readiness to change (Holt & Vardaman, 2013).

The knowledge and perception of the problem complexity dimension states that a minimum level of perceived threat or preoccupation is required, so that people would begin to contemplate the benefits of a possible change in their behaviours. **Motivations toward change** points out that higher levels of motivation are positively correlated to higher determination to change and higher readiness to change as well, making people feel committed to pursuing challenging goals and objectives. **Personal self-efficacy** is the

[3] This discussion was deeply developed in the previous section (2.1. Nature and Society complex relations).
[4] The discussion of the Matrix of Rights of Nature / Human Right to Nature can be found in section 4.2.1.
[5] This section was developed by Andrea Guazzini (VirtHuLab, UNIFI) and Mirko Duradoni (VirtHuLab , UNIFI).

perception of the individual that they have the capability to change successfully, and it is one of the major direct predictors of behavioural intention towards change. **The perception of the proximity/reachability of the goal** relates to the expectations of positive outcomes and has been demonstrated to have an influence on behavioural intent as well as to be one of the major predictive factors of behaviour change. Instrumental, emotional, and informational **perceived social support** has been reported as a fundamental resource for change, and the lack of it has been detected as a major barrier to adopting or maintaining pro-environmental behaviours. **Personal engagement** can be considered the "fuel" of behavioural change and the ingredient that promotes the people's intention to move forward with the behaviour change modifying their problematic behaviours or acquiring new behaviours. **Perceived readiness to change** is intended as the self-perception of the willingness to change, and it is adopted as an index of RtC by various psychological tools. Evolutionary and social psychology clearly demonstrated how **people change in and because of psychological groups**.

The social context is an essential factor to understand, as well as to intervene in people's behaviours. In this sense, participation and engagement are fundamental elements in shaping people's attitudes and readiness to change. Participation and engagement in a community can be considered a measurement of the community's success because it shows member satisfaction, while at the same time advancing important community goals (Hügel & Davies, 2020). Readiness to change levels and attitudes regarding the anthropic origin of climate change within a given community can hinder both participation and communication if not addressed carefully, and for this reason, having a map of these levels in each pilot site appears essential to base our pilot activities.

2.4 The PHOENIX Pilots: Major environmental concerns and challenges related to the EGD's transition pathway

The pilot territories previously selected to test and implement the PHOENIX participatory and deliberative tools and methodologies (Tangram) are in 7 countries: Portugal, France, Italy, Hungary, Spain, Estonia and Iceland. In order to better understand the different experiences and dynamics, and to improve synergies and cooperation between different European contexts, the pilots referred to different scales and administrative levels: national (in France and Iceland), regional (in Italy - Emilia Romagna, Hungary – Transdanubia and Portugal-Spain Cross-border Pilot "Gata-Malcata") and local (in Portugal – Odemira and Tavira, Italy - Bologna, France - Rouen, Hungary -Szeged, and Estonia - Tartu).

To enable the selection of the methodological tools to reach the Task 2.3 research goals, the major environmental concerns and challenges related to the EGD's transition pathway in each pilot territory were previously selected from the Pilots' description in the Annex I, Part

B, in Grant Agreement (GA, 2021, p.17-21). As detailed in Table 1, contextual socioeconomic and cultural practices reveal specific environmental concerns and challenges that refer to the following dimensions: Energy, Transport/Mobility, Agriculture, Forestry, Fisheries, Industry and Trade, Research and Innovation, Education, Governance, Natural Heritage, Tourism, Urban Planning, Housing, Natural Resources Consumption and Management, Pollution, Climate Change.

Table 1 - Major environmental concerns and challenges related to the EGD's transition pathway by Pilot

Pilots' Scale	Environmental Concerns and Challenges
National	
France	• Energy • Radioactive materials and waste • The gold mine project in French Guiana • The Roissy-Charles de Gaulle airport extension project • The Offshore Wind Farms Project in the Mediterranean Sea and their electrical connection • The Offshore Wind Power Project off the Coast of Dunkirk and its electrical connection • Large Solar Photovoltaic Park Project • National Biomass Mobilisation Strategy • Preservation of the Marine environment • The Economic Development of Maritime and Coastal Activities • Preservation and Restoration of Ecological Continuity • Waste prevention and management • Protection of Waters against Nitrate Pollution from Agricultural Sources • Forestry
Iceland	• Protect and preserve Iceland's vast highland and natural resources • Green policies • Common understanding of the value of Iceland's arctic spaces.
REGIONAL	
Transdanubia	• Sustainable tourism • Support the prevention of overuse of natural areas, for example, the lakes • Industrial activity and air pollution • Industrial waste • Preservation of natural resources and biodiversity • Decrease of pollution sources • Improvement of built infrastructure
Emilia Romagna	• Air quality • Agriculture • Energy • Mobility • Waste management • Protected areas • Forests • Education on sustainability • Reduce GHG emissions from agriculture. • Green economy • Energy saving and efficiency • Renewable energy development, transport, research, innovation, and training

Pilots' Scale	Environmental Concerns and Challenges
Cross-border Pilot "Gata-Malcata"	• High vulnerability to forest fires • High vulnerability to water scarcity • Landscape planning and management • Valorisation of biodiversity and ecosystem services
LOCAL	
Rouen Metropole	• Public transportation • Urban planning and sustainable construction • Protection of the biodiversity • Local industrial economy ecological transition • Industrial risks, need for dialogue and transparency
Bologna	• Green spaces • Alternative energies • Sustainable mobility • Climate change • Waste collection • Protection of biodiversity • Energetic transition • Reduction of pollution
Tartu	• Local engagement • Coherent and resilient urban community • Urban planning and budgetary issues • Sustainable Energy • Climate change • Energy • Transportation • Sustainable buildings • Protection of biodiversity
Szeged	• Sustainable city management • Sustainable urban development • Air quality • Heating and air quality to educate the inhabitants • Improvement of air quality during the wintertime • Learn of adequate materials to heat local homes
Odemira	• Removal of invasive species • Fisheries • Safeguarding of biodiversity • Alternative energies (including the production of wind and solar production, alternative mobility • Water efficiency • Waste optimisation and collection • Municipal plan for social integration of farm labourer immigrants • Increase of local participatory citizen actions
Tavira	• Intensive agriculture • Solar panel installations • Loss of biodiversity • Public transport • Foreign • Climate change vulnerability • Waste • Tourism

3. Methodology

The research methods consisted in desk research, systematic literature review, identification of relevant target groups, written interviews, and a questionnaire to assess the psychological dimension (RtC theory). The methodology aimed to favour bottom-up research.

3.1 Desk Research

Desk research was conducted to perform the methodological-theoretical framework of Task 2.3, namely through a guided literature review of relevant socio-environmental, psychological, sociological, and anthropological perspectives. Additionally, this aimed to conceive the methodological and analytic tools to the analysis of how individuals and institutions relate with Nature and Environment in each pilot territory at both structures and agency/intersubjective analytic levels.

At the **structures level,** desk research was done on secondary data available in government reports and legislation (national, regional or local scales) to identify how Nature and Environment are represented and described in law and public politics in each pilot (operational objective 3.1.1). For that purpose, a matrix regarding the Rights of Nature and the Human Right to Nature was conceived, to provide information to the Local Partners on how to collect the required data (Appendix 1). This matrix is based on two different positions regarding Nature:

i) **The Rights of Nature (RoN)** - Formal/Legal recognition that Nature has rights is the recognition that Nature has rights just like human beings. Rights of Nature is about balancing what is good for human beings with what is good for other species, and what is good for the planet as a world. It is the holistic recognition that all land life, all ecosystems on our planet are deeply intertwined. Therefore, the ecosystem - trees, oceans, animals, and mountains, among others - is entitled to legal protection;
ii) **The Human Right to Nature (RtN)** – It is a vision of Nature as property to be used for human benefit. This vision can be translated by the right to live in a healthy environment, access to urban green spaces, and live in a balanced climate, among others. Legislation and policies have been historically elaborated on a basis of Nature as property to be used for human benefit, rather than a rights-bearing partner with which humanity has coevolved.

At the **agency/intersubjective level,** desk research was performed using both secondary and primary data. As a first step of the analysis, on the major socio-environmental concerns and challenges related to the EGD's transition pathway in each pilot according to the pilot's

description in the Grant Agreement (see Table 1). In a second moment, and considering that, desk research enabled the selection of the five main research topics (Table 2) as well as the environmental and socio-demographic statistical indicators (Appendix 2) around those topics (Figure 8). Those indicators were relevant to contextualise each pilot territory relevant for the analysis of the primary data (operational objective 3.1.2). The indicators' selection integrated the inputs from Local Partners on topics that they considered most relevant to be covered by the project. In a third moment, it was requested by UNIFI to prioritise the statistical indicators according to the goals of each task and the overall project. The requested secondary data was asked to UNIFI as presented in Appendix 2. However, the data was received in two different ways: first through the local partners qualitative report, where local partners describe the pilots according to the objectives of Task 2.4 (UNIFI)[6]; and second in an excel file created to Task 2.5 (RUG) where raw data, when available, were inserted and shared with the consortium members.

Simultaneously, the written interview guidelines, the target groups categories and the RtC questionnaire were conceived through desk research to collect primary data in each pilot. Finally, UNIFI asked for secondary and primary data to each Local Partner.

Table 2 – Selection and description of the research topics for data collection

Research topic	Description
A. Natural resources	The knowledge about natural resources' and their ecological, economic and social relevance aim to highlight the regularities and singularities regarding different sociocultural contexts and social groups in each pilot/territory/context. This information will be useful to define participative methodological strategies and to relate the knowledge about the social perceptions on natural resources with the primary and secondary data obtained in each pilot. Moreover, social struggles on natural resources are also important in this regard. They can be characterised as contradictory movements: from one side the demand for more space for humans and their ways of life, their rights to a dignified life; from the other the demand for more space for Nature and its rights. These knowledge-power relations are of complex nature based on different interests in natural resources that show different narratives about Nature and Environment. The little attention given to the social and environmental effects of those demands for natural resources should be further considered to promote the preservation of biodiversity and a more inclusive ecological transition. Therefore, data on the occupation of soil/land, the local natural resources available and their accessibility, as well as on the existing socio-environmental conflicts are useful to understand in each pilot the social perceptions and struggles on natural resources.
B. Socio-environmental concerns	The identification of the main environmental risks and concerns has a great value to environmental policy and governance, referring to risks that simultaneously impact social and environmental dimensions and that can be of human or natural origin, putting the entire ecosystem, human and non-human, at risk. Current evidence shows a discrepancy between environmental risk perception and environmental protection behaviours. This discrepancy may be mediated by different contexts and cultural worldviews, which also influence risk perception. This information will provide useful insights into how individuals may be more likely to understand environmental policies according to their socio-cultural and religious beliefs, highlighting the importance of a collaborative and participative ecological transition. Alongside, due to the complexity of the EGD strategic framework to implement long-term sustainability in Europe, it is fundamental to identify the major

[6] Some information used to characterise the pilots through the secondary data, according to the research topics defined in this research, can be also found at D2.4 "Diagnosis Report for each Pilot" led by UNIFI.

Research topic	Description
	environmental challenges since the EGD is based on an inclusive interaction among different actors. Only through a prior identification of the main challenges that EGD may face regarding its implementation will it be possible to design tailored participative methodological strategies. Hence, these indicators refer to climate change impacts, pollutants emissions, farming types, fisheries, energy efficiency.
C. Sociocultural ecological behaviours	The identification of the drivers and barriers regarding the adoption of ecological behaviours is crucial to understand the sociocultural construction of Nature and to promote an EGD transition. Adopting ecological behaviours is essential to move societies towards a more sustainable and fair future. However, it is widely acknowledged that people may face some barriers that undermine the adoption of these ecological behaviours, such as psychological (i.e., attitudes, fears, intentions) social/cultural/religious (i.e., beliefs, knowledge, ambitions), territory/geographic (neighbourhood, city), financial (i.e. impossibility to buy new technologies, electric cars) and structural (i.e. those that are out of individual control, such as governmental action). Therefore, the identification of the drivers and barriers regarding the adoption of ecological behaviours is crucial to understand the sociocultural construction of Nature and to promote an EGD transition. Additionally, the importance of laying strategies to support and regenerate ecosystems is essential, since different cultural backgrounds may perceive Nature and ecosystems differently. These strategies, being socially and participative constructed, may lead to a higher opportunity to change individual behaviours concerning environmental issues. The indicators of ecological behaviours include waste management practices, sustainable mobility habits and social participation on NGOs and environmental education activities.
D. Experiences in Nature	The experiences in Nature are a research topic that allows to reflect on how people experience and benefit from Nature contact and existent natural elements in the territory. Nature can also provide non-material benefits which are those provided by ecosystems and especially by cultural landscapes, which are shaped by intimate human and non-human interactions, and inter-species relations. It emerges from the interaction between Nature and humans, contributing to develop people's identities through a sense of place, connectedness, and spirituality. Moreover, contact with Nature enables experiences through aesthetic appreciation, inspiration, and opportunities for solitude. Alongside, these non-material benefits comprise the promotion of knowledge about Nature, cognitive function, physical and mental health, and well-being, which may clarify specific notions and narratives of Nature and the Environment. Since this dimension will be mainly assessed through primary data collection, the selection of the secondary data indicators is based on the local information that may translate the possibility of experiencing Nature, concerning the green space available, the existence of natural protected areas and tourism and ecotourism activities, amongst others.
E. Inclusiveness	The last research topic deals with a crucial dimension of the PHOENIX project: Inclusiveness. Historically, marginalised groups, those that experience discrimination and exclusion (social, political, racial, gender and economic) because of unequal power relationships have been left out of social participation, especially regarding environmental policies. This complex phenomenon is associated with situations of environmental justice and/or environmental racism, which can be defined as a disproportionate impact of environmental hazards on racialized groups. These unfair situations are visible in the unequal distribution of environmental benefits, environmental risks, and rights to decide about environmental issues. Without social justice, environmental justice is undermined. The deliberative and participative processes should be done on the basis of several other voices, their knowledge and narratives on Nature, and the Environment. The participation of all voices, independently of gender, age, social status, or ethnic and religious identities, in local environmental decision-making is at the core of democracy. Thus, the primary and secondary data indicators selected to analyse this research topic are expected to highlight the local reality of each pilot on this matter. Beyond the indicator that directly represents this research topic, others were chosen regarding marginalized groups and social inequalities since these are assumed as barriers to participate in the decision-making process.

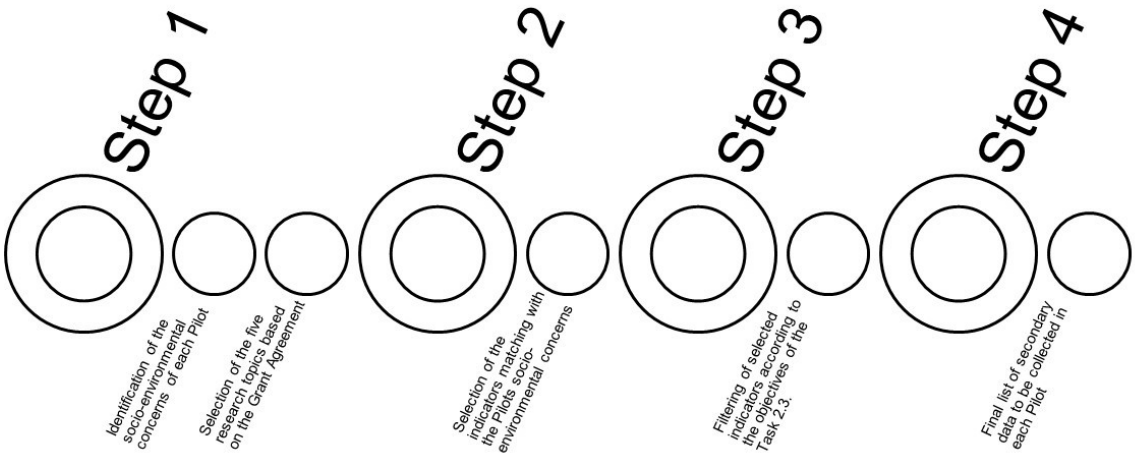

Figure 7 - Steps followed to select the indicators for secondary data collection

3.2 Systematic Literature Review

Systematic literature review enabled us to identify relevant academic publications based on main concepts on the relation Nature-Environment-Society. It was based on the search for interdisciplinary studies, namely from socio-environmental, philosophical, sociological, and anthropological perspectives, considering the plurality of social representations and perceptions. The systematic literature review was conducted according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009).

The research strategy to understand which are the sociocultural representations of Nature and Environment across different sociocultural contexts was run on the Web of Science, Scopus, and Google Scholar since each are scholarly databases that include documents from different publishers. The search was multi-stranded and had different searches, which were combined with the Boolean operator OR/AND and examined the title, abstract, author keywords and keywords plus (Table 3).

Table 3 – Databases and queries used in the systematic literature review

Databases	Queries
Web of Science	((TS=(Nature)) AND TS=(Environment)) AND TS=(Representation) ((TS=(Nature)) AND TS=(Environment)) AND TS=(Definition) ((TS=(Nature)) AND TS=(Environment)) AND TS=(Understanding) ((TS=(Nature)) AND TS=(Environment)) AND TS=(Perception)
Scopus	(TITLE-ABS-KEY ("social representations of nature") OR TITLE-ABS-KEY ("social representations of environment")) (TITLE-ABS-KEY ("social perceptions of nature") OR TITLE-ABS-KEY ("social perceptions of environment"))
Google Scholar	allintitle: "social representations of nature" allintitle: "social representations of environment"

Since the aim was to consider the diversity of perceptions and representations, there were no restrictions in terms of publication date, document type or language. The titles and abstracts of bibliographic records were downloaded and imported into the bibliographic management software Mendeley before all duplicate records were deleted. The search was conducted on May 18, 2022, and the flowchart of procedures taken to select relevant studies to be included in this review is shown in Figure 9. The search returned 27169 documents, and, in addition, 29 documents were added to the database by searching in Google Scholar, Scopus and screening the cited references of the originally retrieved results. The next step consisted in screening both titles and abstracts of documents to select those presenting social representations of Nature and Environment, as well as those describing Nature-Society relations. To screen the documents, the following inclusion criteria were defined: studies specifically dealing with Nature and Environment concepts as social constructions; studies exploring Society-Nature relations. Documents simply mentioning Nature or

Environment concepts without exploring their meanings were excluded, such as documents that were unavailable to consult.

Full texts of the remaining 318 documents were carefully read to retrieve the information related to social representations of Nature and Environment. During this process, 157 more documents were excluded as they did not include details related to the social representations of Nature and Environment or were not available.

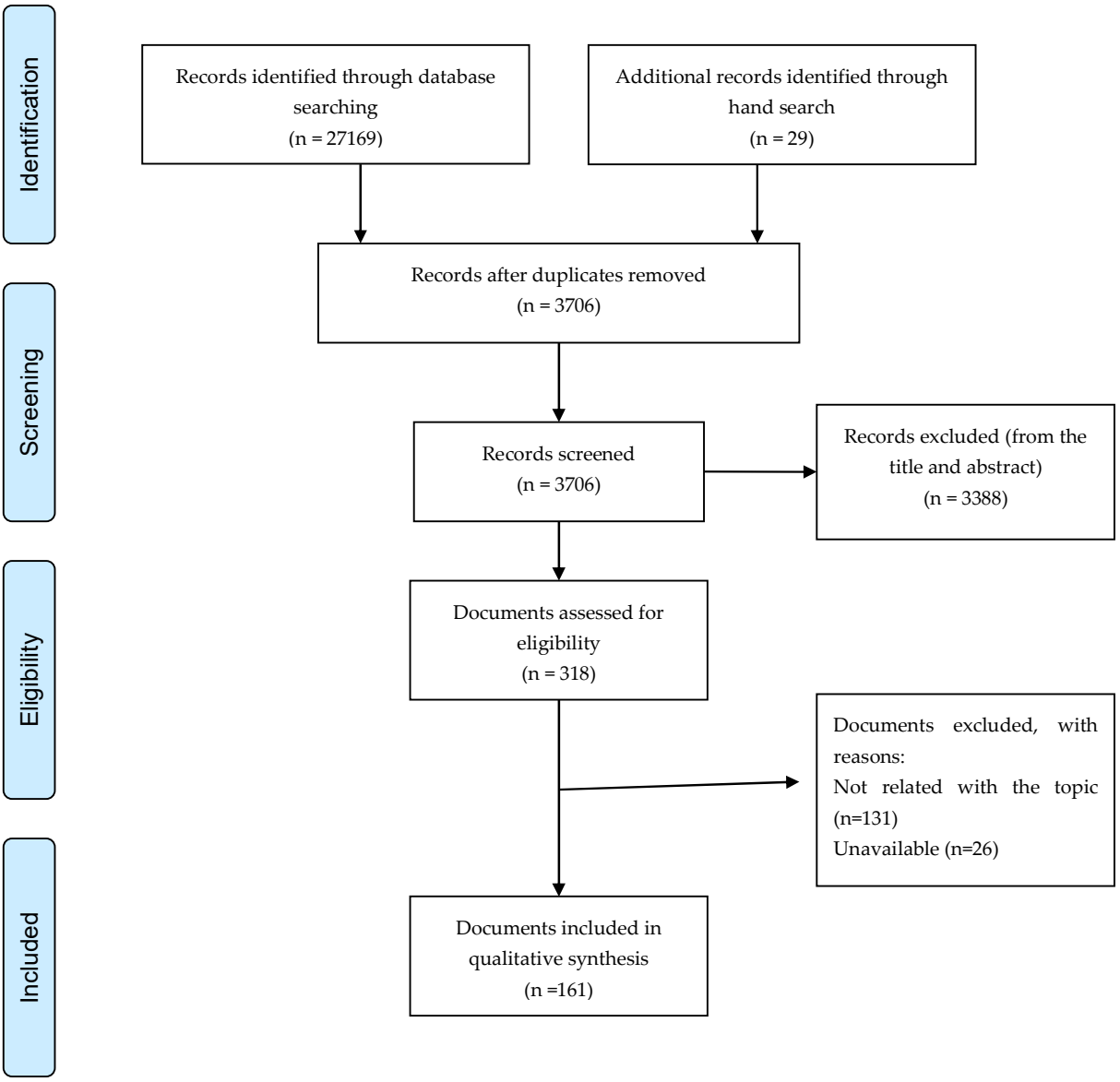

Figure 8 - Procedures for literature search and selection - adapted from Moher et al. (2009)

Despite being aware that some other related documents may exist that have not been identified through our approach, to our knowledge, no studies have systematised the evidence regarding this diversity of perceptions, considering social representations of nature and environment but also the society-nature relations. Also, the number of

documents reviewed is considerable for the goal of identifying the plurality of representations and perceptions, which means adding more papers may not necessarily lead to new or different results.

The information retrieved from the analysed studies were organised in a Microsoft Excel sheet such as the database, title, author(s) name(s), year, author(s) affiliation country(ies), study area(s), study scientific area, objectives, methodology and target group (Appendix 3). Precise and reflexive information was also collected, when available, namely if Nature and Environment concepts are conceptualised in the same way, the social representations of Nature, the social representations of Environment and how Society-Nature relations are described.

To perform a synthesis of the information collected, a manually inductive content-analysis method was adopted (Mayring, 2014). Despite being a time-consuming task, when conducting a systematic review where existing knowledge is somewhat fragmented and/or disperse and, as is the case of this review, no previous systematic reviews exist, inductive content analysis is considered as a desirable method, since no previous assumptions are considered and bias is reduced (Moldavska & Welo, 2017). However, this qualitative analysis involves a certain subjectivity level expressed, naturally, in the categories defined by the researchers.

3.3 Written interviews (n=45)

After the selection of the research topics and statistical indicators, the guidelines for the written interviews were conceived to collect primary data in each pilot (operational objective 3.1.2). Interviews are a qualitative method that has been widely used to explore stakeholder/target groups perceptions of, for instance, environmental and landscape changes (Albright & Crow, 2015; Lamarque et al., 2011; Vila Subirós et al., 2016). In this case, the semi-structured interviews were chosen because it is possible to include questions that are central to the study, while allowing greater flexibility to discuss new topics raised by the interviewees themselves (Creswell & Poth, 2018). This method also allows for a holistic view into which local studies can be integrated. In this way, a solid basis is created for the development of future socio-ecological studies. To facilitate the application of the interviews, and due to the fact that this is a time-consuming task, it was decided to opt for written interviews, in which the only difference is that the interviewee writes their answers instead of providing them verbally. The limitations and constraints of the method are elaborated in another chapter.

3.3.1. Study protocol and ethics approval

The written interview guidelines were conceived in English and made available to be discussed with all the partners in WP2, WP3 and WP5. After that, both were translated to each Pilot's local language by the Local Partner. The interview guidelines consisted of a topic guide with 29 questions along six sections (A-F) that correspond to the five research topics previously selected – Natural resources, Socio-environmental concerns, Sociocultural ecological behaviours, Experiences in Nature, Inclusiveness – and a set of sociodemographic data, plus instructions that intend to help the interviewer (Appendix 4). These written interviews aimed at the collection of diverse perceptions, understandings, and plurality of answers. The written interviews were all done online through the platform google-forms and, after collecting the information, they were translated to English by the Local Partners.

Regarding sociodemographic information, only personal relevant data needed for the research study were collected, namely birth year, gender, marital status, educational level, education/academic background, occupation, place of residence, and nationality. Also, sensitive personal data were collected, namely related to ethnic-racial and religion/spirituality identities. Due to Task 2.3 objectives, it is necessary to collect those personal and sensitive data to accomplish the set objectives and the overall PHOENIX project's scope.

Previous literature on the topic emphasises that both concepts are socially constructed and, therefore, their representations and perceptions vary according to culture, gender, age, religion/spirituality, and ethnic-racial identities. This process occurs through symbols and meanings that are socialised, negotiated, renegotiated, and imposed. Based on these assumptions, the narratives about Nature and Environment collected in each pilot must be framed by the interviewers' sociocultural backgrounds. It will allow us to understand how those representations and perceptions are constructed, combined with a sociodemographic and socio-environmental characterization of their contexts.

Altogether, the analysis of these primary data will be useful to design the Tangram for each pilot according to the pilot's sociocultural specificities in WP3, and to implement the Territorial Commission of Codesign by WP4.

Personal and sensitive data was limited to what is necessary for the purposes for which they were processed. The processing of data included anonymization whenever needed. Since these data was used for academic purposes only and to contextualise interviewees' answers, we are not aware of any critical ethical implications of the research results such as adverse impacts on dignity, autonomy, integrity, and privacy of persons. Regarding the policymakers or governmental actors' social category, when it pertains to sensitive data we are interested in technicians and not in well-known public persons. Due to the specific nature of this study, the socio-economic information is cross-sectional data collected at one

point in time. There is no need to follow up, track, or re-connect with study participants for additional collection of personal data later in the project. Ethics approval was obtained from the Ethical Committee of the Centre for Social Studies. A copy of the ethics approval letter is included in Appendix 5.

3.3.2. Target groups and participants recruitment

The target groups were selected to allow written interviews to be conducted by the Local Partners in each pilot territory. The identification of the target groups categories and the decision on the number of interviews in each of them had into consideration the previous main socio-environmental concerns of each pilot territory, as well as the definition of the five research topics and secondary data. The selection of the target groups aims to cover the maximum diversity that can be found in the territories, considering people's occupations, cultures, and social and economic diversity which may translate into different viewpoints on Nature and Environment.
The target groups were defined into 6 categories:

- Policymaker or Governmental technician;
- Scientific community (area related to environmental issues);
- Social movements;
- NGOs (Civil society organisations, Environmental NGOs, immigrant, and vulnerable populations NGOs, etc.);
- Economic groups (representative of the most relevant local economic activity);
- Citizens (including youth, women, elderly, and vulnerable groups, such as ethnic-racial communities and immigrants).

The selection of the target groups categories and their quantification, and the corresponding number of interviews requested was made by pilots and scales, resulting in **69 planned interviews** in total (Table 4). A pre-test interview was conducted to assess the clarity and adequacy of the script master version and to address possible limitations or misleading before conducting the formal phase of qualitative research. After this procedure, the interview script was shared among the participants to check cultural consistency and contextual conditions. Each Local Partner was invited to translate and apply the written interviews into their pilots.

Once the master version of the script was finalised, it was sent to UNIFI, which was in charge of disseminating it to the local partners in order to proceed with its translation. The translations were delivered by the local partners. After being translated into local languages, UNIFI sent it to us so that we could insert it into Google forms, the platform through which all written interviews were collected. The identification of the target groups

in each pilot was done by the Local Partners, under the UNIFI coordination of UNIFI. This process was controlled by the WP2 coordinators. A total of 45 interviews have been completed during the period 07 November and 16 December 2022[7].

[7] Since the translation process into the 7 project languages and other organisational aspects in each territory took longer than expected - difficulty to identify target groups and the late ethical approval - it was necessary to set a date by which all the interviews answered would be included in our analysis because content analysis is a time-consuming task. Therefore, the 16th of December was set as the deadline, with exception to the Tavira pilot that was integrated later. All remaining interviews that may be at a later stage will be subject to further analysis.

Table 4 - Target Groups and Interviews by Scales and Pilots

Scale	**National**			**Regional**			**Local**					
Pilot	**France**	**Portugal**	**Iceland**	**Transdanubia**	**Emilia Romagna**	**Cross-border Pilot "Gata-Malcata"**	**Rouen Metropole**	**Bologna**	**Tartu**	**Szeged**	**Odemira**	**Tavira**
Target groups	1 Policy maker or Governmental/Municipal technician 1 Scientist			1 Policy maker or Governmental/Municipal technician 1 Scientist 1 Social movement actor 1 NGO actor 1 Economic group			1 Policy maker or Governmental/Municipal technician 1 NGO actor 1 Economic group 5 Citizens (see profile below*)					
Interviews by Pilot	2	2	2	5	5	5	8	8	8	8	8	8
Interviews by Scale	**6**			**15**			**48**					
Total of Interviews	**69**											
***Citizens Profiles**	• 1 woman (age 30-50) • 1 elder woman/man (age >70) • 1 young woman/man (age >18) • 1 immigrant woman/man active worker (age >18) • 1 ethnic-racial minority representative, woman/man (age >18)											

3.3.3. Sample composition, data handling and analysis

Regarding target groups by pilot the following was obtained (Table 5): 22 citizens, 7 policy makers or governmental/municipal technicians, 6 scientists, 6 NGO actors and 4 representatives of economic groups.

Of the 45 written interviews gathered, there is a balance regarding participants' gender[8] between females (n=24) and males (n=20). Concerning marital status, 33.3% are married and 28.9% are single. Table 6[9] illustrates that our sample is a hypereducated one with 90.9% holding a university degree, specifically 17.8% with a bachelor's degree, 53.3% with a master's degree and 15.6% with a PhD[10]. Their academic backgrounds are mainly from the field of Social Sciences (30.8%) and Technical/Technological Sciences (28.9%). Regarding age, the median is 45.9 years old, ranging from 18 to 82 years old which captures a high diversity of viewpoints. As expected, all respondents lived and worked in Europe. However, it is visible a certain diversity concerning nationality, which is in according with the target groups selection: French (n=9), Italian (n=6), Hungarian (n=8), Estonian (n=6), Portuguese (n=8), Belarussian (n=1), German (n=1), Moroccan (n=1), Nigerian (n=1), Brazilian (n=1), Indian (n=1), Spanish (n=1) and Ukrainian (n=1). When asked about whether they had an ethnic identity, the majority identified themselves as European or through their nationality. Nevertheless, one participant (Nigerian) identified himself as Yoruba[11] and another one (Indian) as Punjabi[12].

Previous literature on the topic presented in the background section emphasises that the way societies relate to Nature and Environment is socio-culturally influenced. Therefore, data on spirituality and religion were gathered to frame the participants' answers. A general overview reveals that 31.1% (n=14) considered themselves not as religious or spiritual, followed by those that considered themselves as spiritual (n=12; 26.7%). South Europeans consider themselves more spiritual or religious, and for example the Estonians do not. Regarding current religion, it was found percentages about 10% in Catholicism (n=10; 22.2%), Believing, but without religion (n=7; 15.6%), Atheism (n=7; 15.6%), and Agnostic (n=5; 11.1%).

[8] 1 respondent chose the option "prefer not to say".
[9] In Table 5 it is presented data regarding participants gender and educational level disaggregated by pilot.
[10] This hypereducated sample is associated with the target groups definitions. We have also considered the "short courses" in higher education, representing 2.2% of the sample.
[11] Yoruba are one of the three largest ethnic groups of Nigeria, concentrated in the southwestern part of that country.
[12]The Punjabis are an ethnic group of Indo-Aryan peoples mainly found in Pakistan and northern India.

Since the interviewees were contacted by the local partners, and the interviews were written directly in a google forms link, the anonymization is guaranteed (there are no audio records). Data were firstly analysed through SPSS V.29. The manual deductive content analysis was used after since the interviews were semi-structured and categories[13] were already present in the interview script.

With the interviews, we intend to capture and illustrate the diversity of visions, perceptions, senses and meanings attached to the five research topics: natural resources, socio-environmental concerns, sociocultural ecological behaviours, experiences in nature and inclusiveness. In the results section, the written interviews will complement the pilots' characterization, firstly done with secondary data (statistical indicators and desk research reports) and secondly with primary data (written interviews). This data will be useful in the identification of the main opportunities, risks and vulnerabilities of each territory.

[13] The categories were the same as the five research topics: (A) Natural Resources, (B) Socio-environmental concerns, (C) Socioecological cultural behaviours), (D) Experiences in Nature and (E) Inclusiveness.

Table 5 – Target groups by Pilot obtained with collected written interviews (n).

Pilots*	Target Group				
	Policy maker or Governmental/Municipal technician	Scientist	NGO actor	Citizen	Representative of economic group
Estonia (n=12)	1	3	2	5	1
Portugal (n=1)	0	1	0	0	0
Odemira (n=2)	1	0	0	0	1
France (n=2)	1	1	0	0	0
Rouen (n=7)	1	0	1	4	1
Emilia Romagna Region (n=2)	1	1	0	0	0
Bologna (n=3)	0	0	0	3	0
Transdanubia Central Region (n=2)	0	0	1	0	1
Szeged (n=6)	0	0	1	5	0
Gata-Malcata (n=2)	2	0	0	0	0
Tavira (n=6)	0	0	1	5	0
Total (n=45)	**7**	**6**	**6**	**22**	**4**

*Iceland is not presented here since no written interviews were collected.

Table 6 - Participants' gender and educational level disaggregated by pilot (n; %).

Pilots*	Gender (n; %)			Education Level					
	Female	Male	Other	Primary	Secondary	Bachelor degree	Master	Doctoral	Short-course
Estonia (n=12)	6 (50.0)	6 (50.0)	0 (0.0)	1 (8.3)	0 (0.0)	2 (16.7)	5 (41.7)	4 (33.3)	0 (0.0)
Portugal (n=1)	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100)	0 (0.0)
Odemira (n=2)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)	0 (0.0)
France (n=2)	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)
Rouen (n=7)	4 (57.1)	2 (28.6)	1 (14.3)	0 (0.0)	0 (0.0)	1 (14.3)	4 (57.1)	1 (14.3)	1 (14.3)
Emilia Romagna Region (n=2)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)
Bologna (n=3)	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100)	0 (0.0)	0 (0.0)
Central Transdanubia Region (n=2)	2 (100)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Szeged (n=6)	3 (50.0)	3 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (100)	0 (0.0)	0 (0.0)
Gata-Malcata (n=2)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)
Tavira (n=6)	4 (66.7)	2 (33.3)	0 (0.0)	0 (0.0)	1 (20.0)	2 (40.0)	1 (20.0)	1 (20.0)	0 (0.0)
Total (n=39)	**24 (53.3)**	**20 (44.4)**	**1 (2.2)**	**1 (2.3)**	**3 (6.8)**	**8 (18.2)**	**24 (54.5)**	**7 (15.9)**	**1 (2.3)**

*Iceland is not presented here since no written interviews were collected

3.4 Readiness to Change & Explicit Attitudes toward Climate Change Survey[14]

The questionnaire *Readiness to Change & Explicit Attitudes Toward Climate Change Survey* was developed by VirtHuLab, UNIFI to analyse the psychological dimension (operational objective 3.1). All pilot areas were to participate in the survey, but Iceland and Spain were excluded from the analysis because of the small number of respondents to avoid data bias.

The questionnaire *Readiness to Change & Explicit Attitudes Toward Climate Change Survey* was structured into two sections: section A regarding the ADOPTION OF SUSTAINABLE BEHAVIOURS, and section B regarding the CLIMATE CHANGE ATTITUDE (Appendix 6).

The Readiness to change for Climate change scale consists of 29 items measured by a 5 - point Likert-type scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The scale captures 7 dimensions: (1) Perceived importance of problem/change; (2) Motivation for change; (3) Self-efficacy; (4) Effectiveness of proposed solution; (5) Social support; (6) Action; (7) Perceived readiness. It aims to understand the adoption of sustainable behaviour from 1 - Strongly Disagree to 5 - Strongly Agree from several statements about adopting sustainable behaviour that is posed to the interlocutor.

For investigating explicit attitudes was selected the climate change attitude survey (Christensen & Knezek, 2015). The scale consists of 15 items measured by a 5-point Likert-type scale (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree and 5 = strongly agree).

3.4.1 Sampling and procedure

For each country involved in the pilots, a dedicated in-language online form was prepared containing a brief socio-demographic form, and the two questionnaires investigating Readiness to Change and Explicit Attitudes towards Climate Change. Participation in the Phoenix's survey data-collection was promoted by integrating both online and offline channels to minimise possible sampling biases. Participants recruitment was carried on through posts and messages on social media platforms, like Facebook and Instagram, via the website of local pilot sites (e.g., shorturl.at/lMT56), as well as by directly asking people to participate by scanning a QR-code on local newspapers which led to the dedicated online data collection form. Data were collected following the EU regulations (2016/679) and national law's privacy requirements. A disclaimer was included at the beginning of the survey to inform the participants of the aim of the study and the full anonymity regarding

[14] This section was developed by Andrea Guazzini (VirtHuLab, UNIFI) and Mirko Duradoni (VirtHuLab , UNIFI).

their answers. To continue with the survey, each participant had to accept the terms of the study. Completing the survey was fully voluntary.

3.4.2. Sample composition

In Table 7 are reported the descriptive statistics regarding the socio-demographic characteristics of the samples disaggregated by country.

Table 7 - Descriptive statistics of the surveyed people. The table reports the sample size achieved in each country, the average age and sex distribution across countries.

Country	**N**	**Age**	**Sex**					
		M (s.d.)	Cis. Male	Cis Female	Trans. Male	Trans. Female	Not Binary	No answer
Estonia	327	39.0 (12.9)	33.6%	59.3%	0%	0.3%	0.9%	5.8%
France	104	35.1 (14.5)	36.5%	52.9%	1.9%	0%	1.9%	6.7%
Hungary	105	40.7 (13.6)	52.4%	47.6%	o.n.g	o.n.g	o.n.g	0%
Italy	242	48.7 (10.0)	31.4%	62.0%	0%	0.8%	0.8%	5.0%
Portugal	147	44.4 (10.7)	28.6%	68.0%	0%	0%	0.7%	2.7%
Total	**925**	**42.2 (13.0)**	**34.7%**	**59.4%**	**0.2%**	**0.3%**	**0.9%**	**4.5%**

Note: M = Mean; s.d. = standard deviation; o.n.g = option not given; Cis. = Cisgender; Trans. = Transgender.

4. Results

This section presents the results achieved in this research and it is organised into three main subsections: a first one that presents the results of the systematic literature review; a second one that focuses on the biophysical characteristics of each pilot through the analyses of primary and secondary data – from the matrix Rights of Nature / Human Right to Nature, qualitative desk research and written interviews; and a third one dedicated to discuss the results of the application of the RtC scale across the pilots.

4.1 Systematic Literature Review

4.1.1. Global overview

The understandings of Nature and Environment concepts were explored through a systematic review of 161 documents. An overview of those included in this review revealed that the majority have been published by authors affiliated with North American (36%) or

European institutions (33.5%). Considering this first overview, it can be said that it is widely acknowledged that a small number of European nations were the home of modern science during 16th and 17th centuries, framed by the scientific revolution (Basalla, 1967; Raj, 2017). The spread of Western science had several consequences, namely legitimating what is knowledge and neglecting what remained. This process had implications on ways of knowing, organising society and, importantly, on how to respond to the socioecological crisis (Akena, 2012). Regarding Figure 10, **Nature and Environment representations are mostly described from a Western viewpoint. If it is considered that views of Nature are traditionally rooted in systems of beliefs that vary across different sociocultural contexts, it can be stated that this situation may contribute to little diversity of social perceptions on Nature** (Iaccarino, 2003; Mazzocchi, 2006). It is possible to observe, from Figure 10, that Africa and Central America only represent 5% of the studies included in this review, which does not mean that their production of knowledge does not exist. It exists, but their knowledge and epistemologies have been put aside, to the periphery, outside of the circuits of western scientific production and publication, which dominate (Adas, 2008).

The dominant Western perspective of science has profound disadvantages for researchers from emerging countries, which limits their possibilities to publish, especially in international and high quality journals (Bou Zeineddine et al., 2022), but also to research local problems. Researchers from the "developed world" are interested in countries considered as developing, where Nature is understood as pristine, savage, and non-humanized. However, this does not translate into an effective investment in those territories, creating a dependency on external expertise (Adas, 2008). This is visible in the studies analysed when moving to the geographical contexts of the studies, where the percentage of those conducted in South America and Africa almost doubles, from 5% to 9.3%. Additionally, this first overview on the literature produced unveils **a pattern of inequality but also power relations inscribed in systems of scientific knowledge** (Hanafi & Arvanitis, 2014), **reproducing structural inequalities and favouring historically dominant groups** (Alatas, 2003; Keim, 2008), namely from Anglophone and Western nations. Therefore, the literature included in this review may be considered representative of those that circulate in the international scientific publications channel, however, it should be emphasised that scientific production on this topic is not limited to these studies.

In the studies analysed, 72 (44.7%) **conceptualised Nature in the same way as Environment** and only 33 (20.5%) conceptualised these concepts differently (Table 8). Of the 161 studies, it was not possible to identify a clear position on these concepts in 56 (34.8%). These results are directly related with the dominant Western view of Nature, that prevails in the studies analysed. This vision, anchored **in an anthropocentric vision where Nature is exterior to humanity** (Aldeia & Alves, 2019; Latour, 1993), understood the environment as something that does not belong, which is in line with Serre's statement

"...the word environment, commonly used in this context (…) [,] assumes that we humans are at the center of a system of nature" (1998, p. 33). The environment in the Western world is humanity's reservoir of potential resources, to satisfy their needs and desires, associated with capitalism.

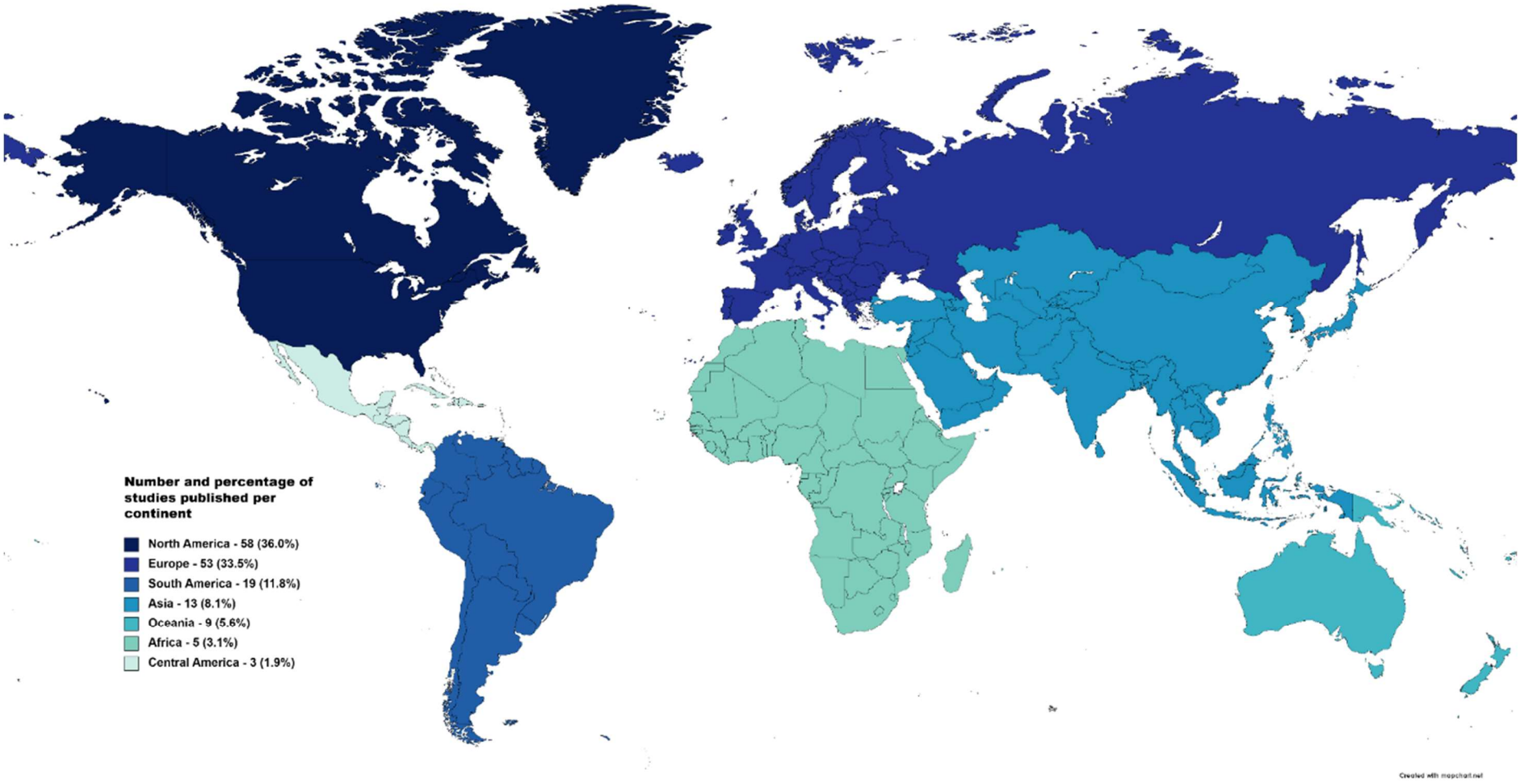

Figure 9 – Number (n) and percentage (%) of studies published per continent include in the review

Table 8 – Percentage of studies (%) by continent and how they conceptualized Nature and Environment concepts.

	Are Nature and Environment conceptualized as synonymous?			
Continent	**Yes**	**No**	**Not Clear**	**Total**
Africa	3 (60.0)	0 (0.0)	2 (40.0)	5
Asia	6 (46.2)	4 (30.8)	3 (23.1)	13
Central America	3 (100)	0 (0.0)	0 (0.0)	3
Europe	22 (40.7)	13 (24.1)	19 (35.2)	54
North America	27 (46.6)	11 (19.0)	20 (34.5)	58
Oceania	4 (44.4)	1 (11.1)	4 (44.4)	9
South America	7 (36.8)	4 (21.1)	8 (42.1)	19
Total	72	33	56	161

Regarding the type of document (Figure 11), a balance can be observed between empirical research studies (51%) and essays (49%). It should be noticed that despite a considerable number of essays having been considered, their relevance as a source is recognized, namely as a source of a deep analysis that aims to make connections between empirical studies, in order to define or advance a theoretical position. The number of publications in this area, spanned from 1969-2022 (about 5 decades), has increased consistently since 2012, reaching the maximum in 2019 (Figure 12). This trend matches with the date of the publication of the conceptual framework for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2013) which aimed to enhance "a positive transformation in the elements and interlinkages that are the causes of detrimental changes in biodiversity and ecosystems and subsequent loss of their benefits to present and future generations" (IPBES, 2022, p. s.n.).

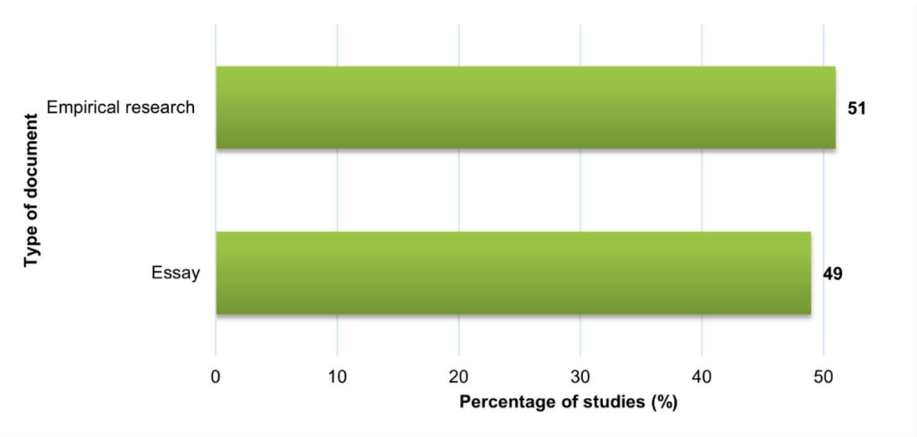

Figure 10 – Percentage of studies (%) by type of document.

The studies integrate three major scientific areas from the field of social sciences: Geography (21.1%), Psychology (11.2%) and Sociology (10.6%). Literature (7.5%) and History (7.5%) also play a relevant role, but a considerable diversity of areas (Figure 13) shows that social representations of Nature are a wide topic of interest.

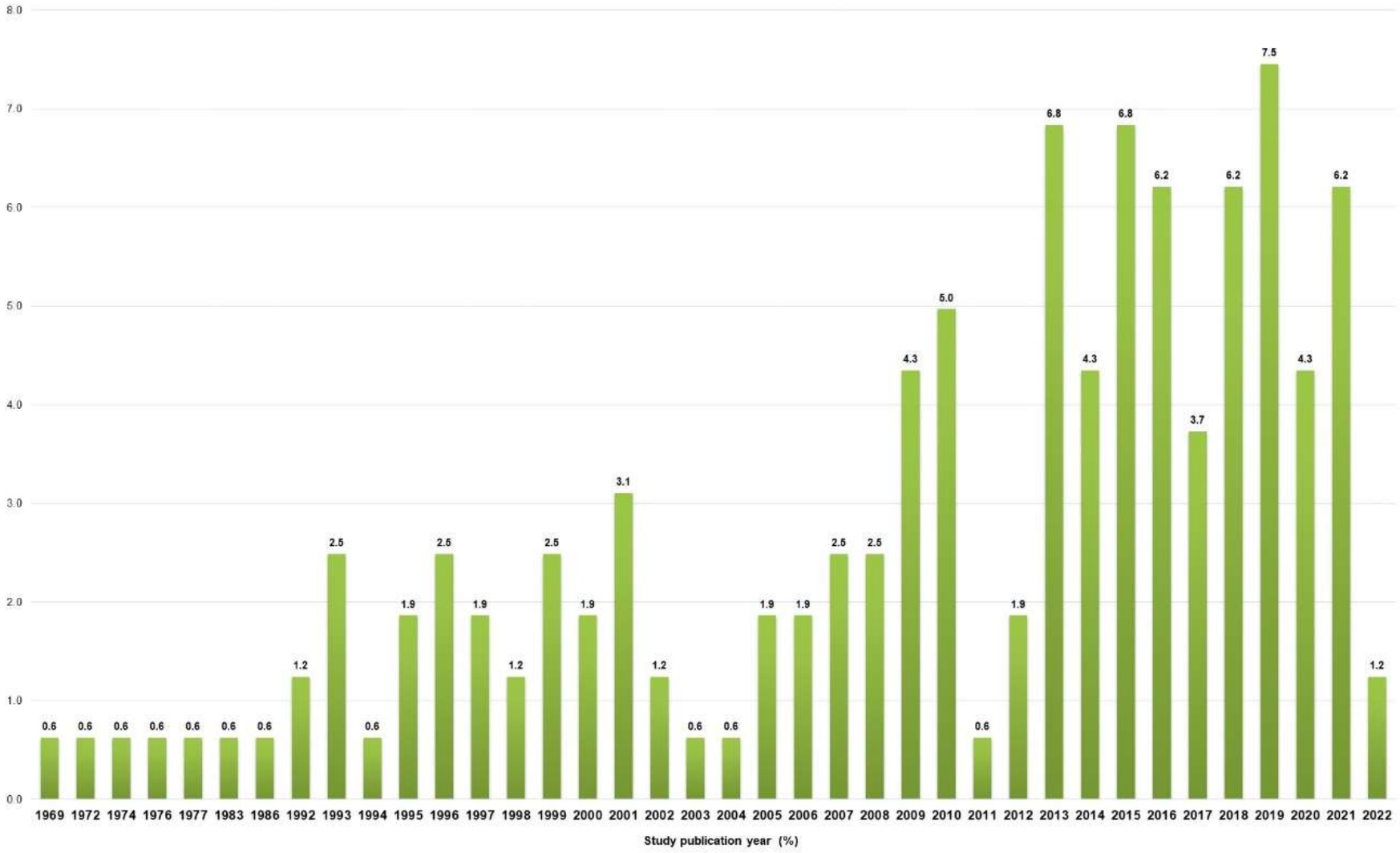

Figure 11 – Percentage of studies (%) by year of publication.

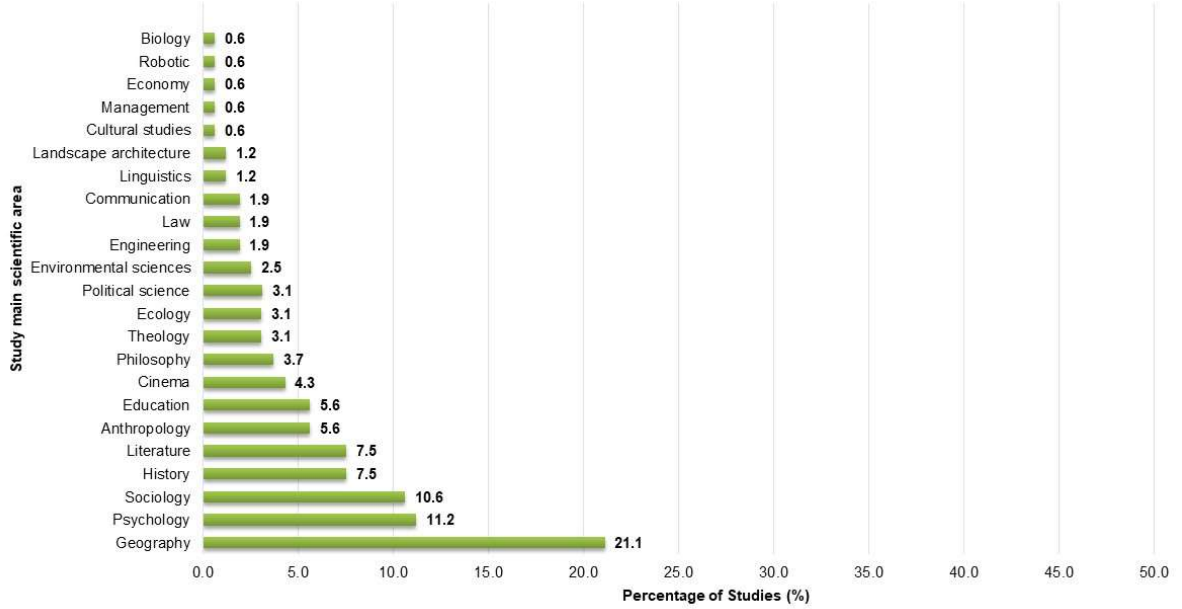

Figure 12 - Percentage of studies (%) by main scientific area.

Concerning the empirical research, it can be observed from Figure 14 that most of the studies adopted a document analysis approach (45.2%). This qualitative approach aims to interpret the sources to give voice and meaning to an assessment topic (Bowen, 2009). Also, 21.6% adopt a mixed-method approach to deal with Nature representations, meaning that one approach may not be enough to embrace the complexity of this topic. However, these data also show the need to involve communities in the research, to understand how they deal with nature, and what are their imaginaries and images.

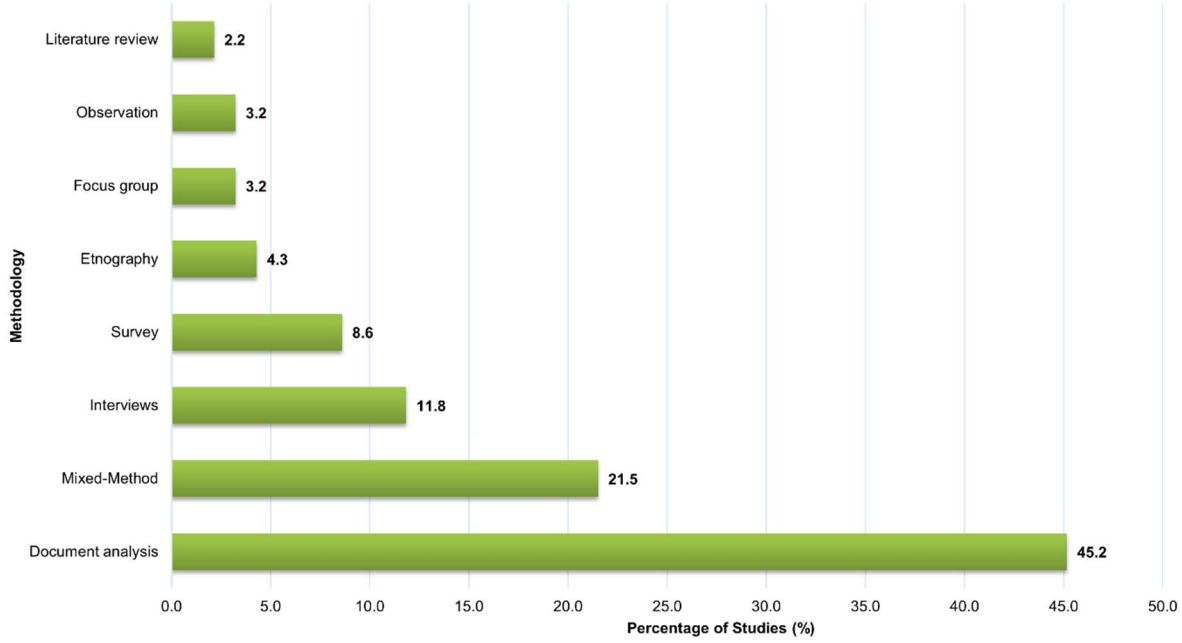

Figure 13 – Percentage of empirical research studies (%) by methodological approach.

To analyse the co-occurrence of keyword, the VOSviewer software (van Eck & Waltman, 2010) was used where the minimum number of occurrences of a keyword was set at 5 to reflect the importance and its relatedness to other keywords. Of the 1018 keywords presented in the documents analysed in this review, 25 meet the threshold. Each circle represents a keyword, and the size of the circle varies according to the frequency of the keyword (i.e., the larger the circle, the higher the frequency). The distance between circles and the established networking represented by lines characterises the relation between keywords (i.e., keywords that are closer and have stronger links are more closely related). Colours are determined by the cluster to which the keyword belongs, which was automatically originated by the VOSviewer software based on the previous input information. The analysis was divided into two phases, and 7 distinct colour groups can be observed with different sizes, reflecting the link and strength of keywords.

The first one relates to the co-occurrence network of keyword map (Figure 15). The red cluster joined keywords like ecocriticism, ecology, environmentalism, history, place, and sustainability. The red cluster comprises of keywords such as Anthropocene, climate change, culture, environmental ethics, and perception. The blue cluster englobes children, animals, environmental education, health, and nature keywords. The conservation, landscape, nature conservation and social representations together materialise the yellow cluster. The last cluster, the purple one, is made of keywords like discourse, environment, representation, and sustainable development. This first attempt regarding the connection between the clusters allows some reflections: looking at the red clusters, the interlinks between the keywords made the discussion around **the anthropogenic impact on climate**, i.e., climate change clear, which is directly connected with human culture and ethics towards environment. Moving to the blue cluster, it is visible that the focus of the discussion remains on **children's contact with nature**, mainly represented by animals (non-humans), which once again are put in the nature side, as well as **the role of environmental education** (formal education). The yellow cluster represents the emphasis on **nature conservation and the social representation**s linked to it, which may reflect an anthropocentric viewpoint where nature is conserved to humans' purposes. Finally, the last cluster is centred on **environmental discourse** and sustainable development, where the environment is central to humanity's survival and to sustain their life patterns. From this overview, an absence of the rights of nature issues is noticeable, which may reflect those social representations of Nature and Environment, both society-nature relations, have been framed by an anthropocentric outlook where an instrumental view prevails. However, and as stated before, this can be related by the predominant presence of dominant western publications.

The second analysis aimed to look to the network of keywords spanned through time (Figure 16), revealing that the environment keyword has been use before the keyword

nature, highlighting the same anthropocentric pattern of conceiving environment and nature as synonymous, since this presupposes that humans are the centre that nature gravitates around (Serres, 1998), understood as exterior.

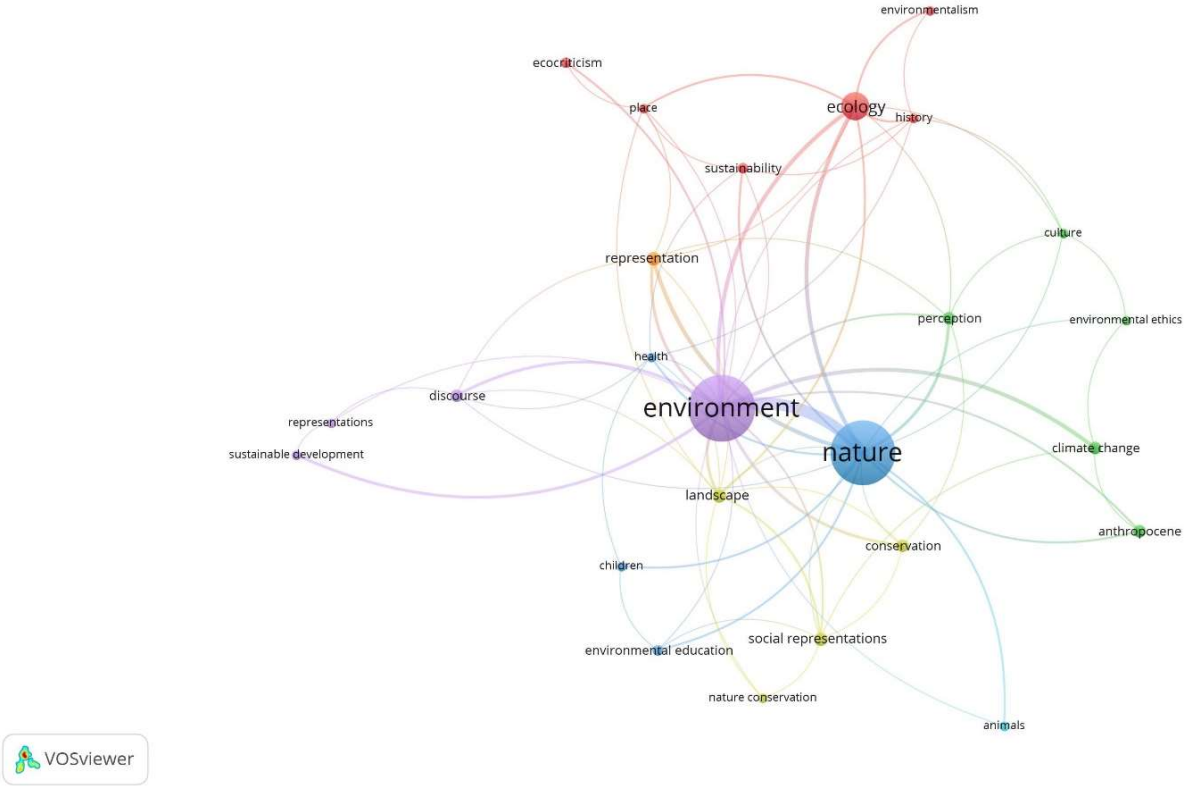

Figure 14 - Co-occurrence network of keyword map, generated using the software VOSviewer 1.6.11.

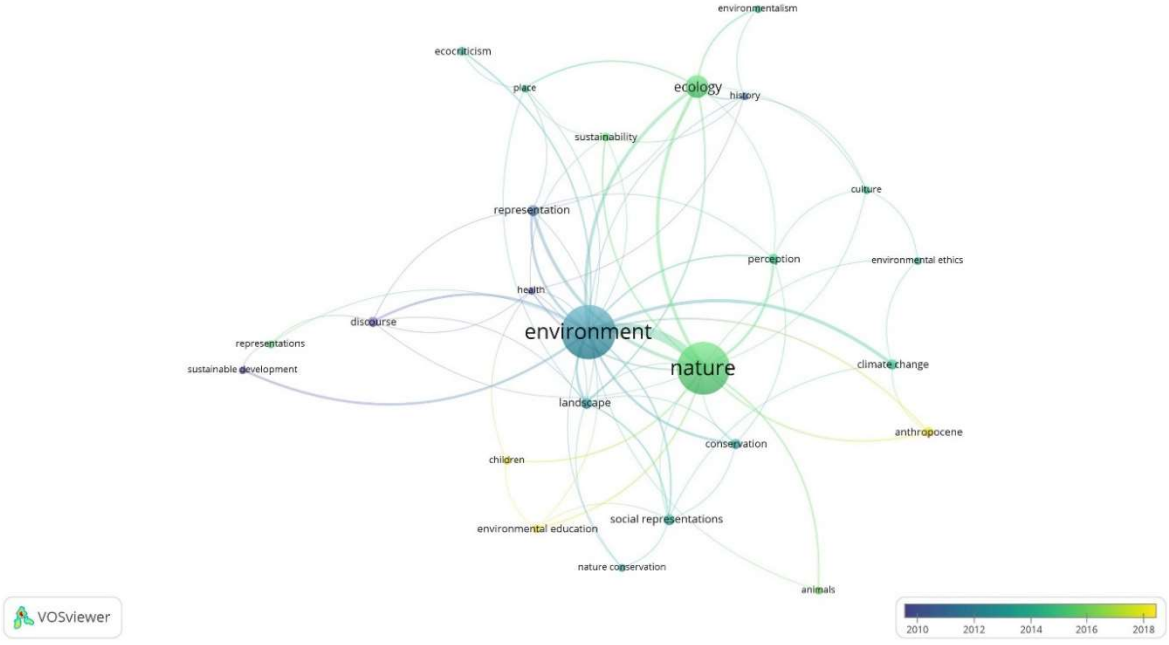

Figure 15 - Co-occurrence network of keyword map spanned through the time, generated using the software VOSviewer 1.6.11.

4.1.2. Qualitative analyse of the studies

After this overview of the documents included in this review, a manually inductive content-analysis method was adopted to identify the main categories that emerged. From the qualitative analysis of the 161 studies, three major categories were identified and a deep analysis of them will be provided (Figure 17): (i) Nature against society, in a logic of opposition; (ii) Nature subordinated to Society, in a logic of domination; (iii) Nature united with Society, in a logic of interdependence.

Nature against society – Opposition

The "Opposition" category represents 19.9% of the studies analysed in this review and the majority (84.4%) were carried out in Europe and North America, being the set of studies that mostly conceptualised Nature and Environment in the same way (46.9%). In this category, **Nature is conceptualized as something that has no human intervention** (Froude et al., 2010; Hovardas & Stamou, 2006b; Valcuende et al., 2013; Wohlwill, 1983b), being wild (Evanoff, 2005; Fraijo-Sing et al., 2020), untouched, pristine (Ghaffari & Hall, 2004; Lemoni et al., 2013; Schroeder, 2005; Youngs, 2012), **undisturbed** (Castrechini et al., 2014; Edgington, 2008; Guyot, 2011; Kheraj, 2007; Rutherford & Shafer, 1969; Stamou et al., 2009; Talbot & Kaplan, 1986; Ullrich & Ullrich, 1976), the place of the non-humans (Simmons, 1998), a static environment that **supports the Nature-Society dichotomy**. This dichotomy finds strength in a colonialist perspective, in which Europeans, associated with "society", saw themselves as separated from an externalized "nature" (Perez-Marin, 2016). Within this framework, a primary justification for colonization was the "rescue" of the non-European world from a state of association of primitive nature and its transformation into a state of civilization and culture (Guyot, 2011; Liu & Lin, 2014).

In these studies, **Nature is represented as a natural world where uncivilised creatures live** (Robinson & Jorgensen, 2013), physically and intellectually. In fact, some studies reproduced an idea of dangerous nature, mostly framed by people surrounding environment (Adams & Savahl, 2015), harbouring ruthless exploiters and criminals who must be banished from the land (Worster, 1977), a destructive entity (Lawrence, 2016), supporting the defeat of Nature as a societal progress (Hajdu, 2009). This portrays indigenous people as "uncivilised" humanity, commonly represented as **free, wild, mystical, and even as sexually promiscuous and violent** (as in tribal warfare, cannibalism and headhunting), "all explicitly associate such "natives" with nature, as humans in their supposedly untamed, uncontrolled free state" (O'Brien, 2002, p. 493). Therefore, a place of the "ignoble savage", irresponsible beings, that from a paternalistic viewpoint, need to be domesticated and controlled, since they are primitive (Mathisen, 2010). Here, non-human nature is present only as a form of absence and nullity and does not present an ethical

challenge or claim (Shields, 2018). The relationship between humans and nature, in this set of studies, is understood as one where it is impossible to ever achieve the kind of reciprocity available in human society. Whatever form our respect for nature takes, it will always be different from the relationships we have with those we consider human (Dienstag, 2021).

Nature subordinated to Society - Domination

Despite linked with the "Opposition" category, namely through the logic of superiority of humans over non-humans, the "Domination" category has some nuances and is the most representative of the studies analysed (47.2%). In this set of studies, 57.9% were developed in Europe and North America and 15.8% were developed in Central and South America. It is also significant that, like in the previous category, 44.7% conceptualize the Environment and Nature in the same way. When it comes to Nature representation, it appears represented in two interconnected dominant ways. First, in a **logic of exploitation and at the disposal of human will and desires** (De Vreese et al., 2019; Gugssa et al., 2021; Hull et al., 2001; Husband, 2006; Jewitt, 2000; Jørgensen et al., 2013; Luke, 1997; Prendergast et al., 2021; Prévot-Julliard et al., 2015; L. C. Smith, 2022; Sousa et al., 2017; R. Williams, 1972), considering **Nature as a source of human survival that must be dominated to meet humanity's needs** (Abarghouei Fard & Saboonchi, 2020; Bravi, 2016; Clayton, 2007; Dake, 1992; de Giacomini Martínez & Beling Loose, 2015; Figgins & Holland, 2012; King, 2015; Miranda & Robaina, 2017; Neto & Lima, 2016; Rey-Goyeneche & Alexander, 2021; Shangpliang, 2008; Šorytė & Pakalniškienė, 2019; Thomsen, 2018; Till, 2001; Veselkova et al., 2016). Nature is a source to maintain the human way of life, associated with the ecosystem services concept (Horton, 2009; Liechti et al., 2010; Meyer, 2010; van Holstein & Head, 2018; Yarde, 2013): a capitalist dogma that deprives nature of its agency while propagating endless growth and human supremacy (Lahl, 2019).

Nature is understood as **a resource intended for human exploitation, as a resource for the generation of wealth in the name of societal progress**, where environmental degradation is treated as an economic externality to be managed (Burke et al., 2015; Natarajan & Khoday, 2014), enhancing these mechanisms of exploitation, the poverty and relate to environmental, economic and sociocultural issues of regions that present favourable conditions for the extraction of ores and other nature's riches (Guida & de Melo, 2020). Nature, as an object distant from humans, is only valued and protected because it can enhance humans' quality of life or provide material resources for humankind, translating the instrumental value (do Couto Chipoletti Esteves & Goncalves, 2015; Ferguson, 2008; Laschefski et al., 2012). But within this category, the socioenvironmental conflicts gained special relevance (Broderick, 2007; Elliot, 2017; Linnros & Hallin, 2001), **as an "arena of citizen activism**" (Bhan & Trisal, 2017), of dispute over the management of the use of natural resources, putting local understandings of nature and scientific

knowledge that foster social conflicts face to face, namely in what configures "domination" and what does not. Several studies documented experiences and complexities, mostly with farmers, which find a justification to the dominion for use and development of nature through farming methods and technologies. Often, dominion is used alongside or within an understanding of stewardship (Laschefski et al., 2012; Ruiz-Ballesteros et al., 2009; Vandergeest, 1996; Woods, 2003), which exhorts responsibility towards nature, seeing farmers as co-creators with God, able to make creation more than it was (Armstrong, 2016; Gervais, 2016). Therefore, and considering this, it is understood that they are not damaging the environment (McHenry, 1998).

On the other hand, Nature also brings an association with structural traditional systems of domination to the discussion. **Controlling nature and controlling women is anchored in the same logic of domination**. Women and the environment are exploited and dominated by white, middle-class men in western society (Aitken & Zonn, 1993). In fact, when looking to history and some communities worldwide, women are more dependent on nature by virtue of the sexual division of labour: women are primarily responsible for the gathering of fuel, fodder and wild foods and the growing of subsistence crops for survival (Locke, 1999). The elements of nature, non-humans, are themselves used as tools in the hands of those who dominate and abuse to punish, and control others (Harris, 2016). From another dimension, the idealisation of beauty is anchored in gendered ideals that disallow the agency of both Nature and Women. They are the Others, positioned outside (Bennett, 2014). Similarly, postcolonial states were consistently willing to sacrifice both the environment and the poor to further a longer-term vision of commercial growth and industrial modernity (G. Williams & Mawdsley, 2006). These logics appropriate **Nature as a space of conflict and exploitation of the poor, as subordinate actors, fragile and strictly vulnerable to environmental changes** (Dutra E Silva et al., 2017). Nature and/or the environment are understood to create the conditions for social justice (Schlosberg, 2013).

In a second logic, **Nature is as a sign of God**, from whom He holds power under His submission: created by God and controlled by God (Richardson, 1995; Riviere, 1992). Human beings seek to merge harmoniously with nature as they transform it into an environment (Ciccantell, 1999; Schnell, 1997), being their power over non-humans guided and constrained by God's supreme authority (Peterson, 2000; Velassery & Patra, 2016). While God creates and governs all creation, God is not equally close to all creation. The lower creatures can approach divine goodness only through their relationship with the higher ones, in this case humans (Kaltner, 2015; Sekerák, 2019). As rational creatures, they are superior to other animals and to all inanimate creatures (Li & Qiu, 2013). **Their greater proximity to the divine makes' humans not only more perfect, but also dominant over other creatures**. It is here that the concept of "domesticated Nature" can be integrated, translated into gardens, a Biblical representation of Garden of Eden (Kleese, 2002), that

symbolizes the successful control over Nature (Clayton, 2007; P. Vieira, 2017). The combination of these two dimensions makes it clear that the concept of Nature is often used as a way to moralise and exclude (Eden, 2001). In this sense, environment is understood in these studies as the human background, a planned and improved Nature (Husband, 2006; Yilmaz & Kahraman, 2015), as a domain of ideas and entities accessible only with the aid of science and technology, the scientific aspect of nature (Jasanoff, 2010; Munõz-Rodríguez et al., 2019).

Nature united with Society - Interdependence

The third category "Interdependence" represents 32.9% of the analysed studies. It is in this category that a most significant presence of studies conducting in Central and South America is visible (18.9%), despite those developed in Europe and North America continuing to be the majority (64.2%). It is also the set of studies that less conceptualize the Environment and Nature concepts in the same logic (37.7%). Endowed with works that seek to promote a **theoretical and interdisciplinary debate, they represent Nature as a real, living entity: an entity with agency and with transformative power over human beings** (Aslanimehr et al., 2018; Beery & Wolf-Watz, 2014; Blatt, 2019; Čapek, 2010; Duarte, 2018; Hartig, 1993; Millington, 2013; Mthatiwa, 2014; Pollini, 2013; Retnowati et al., 2014; Solar, 2021; Starik, 1995; Tillmann et al., 2019; N. Vieira et al., 2020), since Nature, or "Mother Nature", is a unity of which humanity is an integral part (Kodir et al., 2018; Magallanes-Blanco, 2015; Onwudinjo, 2015; Pohl & Helbrecht, 2022; Tavilla, 2018; Watanabe, 1974). These studies reject a dichotomous view between Nature-Society and Nature-Culture, as they argue that we live in a symbiotic community that is a large, unique and underappreciated sphere of life, where nature and humanity are essentially integrated at the spiritual and moral level (Aldeia & Alves, 2019; Bravo Silva, 2019; Costanza et al., 2007; Di Bianco, 2020; Frank, 1997; Gilebbi, 2020; Jia et al., 2016; Mausner, 1996; McIsaac & Brün, 1999; O'Rourke, 1999; Salmón, 2000; Saunders, 2013; Tickell, 1993; Whatmore & Boucher, 1993; Yarova, 2020), a "conjoint constitution" stated by Freudenburg et al. (1995).

It is also in this group of studies that a fruitful debate on the rights of Nature can be identified, perhaps due to the fact that it includes researchers from Latin America where the first amendment to the constitution is identified, consecrating the Rights of Nature (Ecuador) with rights and limits to be respected: **nature is unity, so any violation of the right to exist of any entity is, in itself, a violation of the nature of creation and a degradation** (Dwivedi, 2021; Huanca, 2019; Lauderdale, 2008; Mentz, 2010; Note, 2009; Previato, 2018; Probst, 2021). In this topic, interdependent communities of humans and non-humans are defended, because if people come from Nature, they are part of it, so ancestors are now in Nature again, expressed in rivers, rocks, mountains and trees, representing a spiritual and affective connection (Horowitz, 2001; Mocellim, 2021; D. S. Silva

& Santos, 2019; Thevenin et al., 2021). No less important is the reference to the value of Nature, which is valid by itself, regardless of its usefulness for or recognition of humans, approaching the concept of relational values, to the detriment of an instrumental view and services of Nature (Breitenbach, 2009).

The understanding of nature and of human relationships with the environment are cultural expressions used to define who we were, who we are, and who we hope to be at this place and in this common home (Greider & Garkovich, 1994). This category claims that society-nature relations is synonymous to the conduct of social relations and social relations are synonymous with Nature (Rikoon, 1996), being more expressive in societies in which clans are identified with various animals, in which humans' and animals' shapes shift into one another, in which animals contain the spirits of humans, gods, and creators, and in which other cultural systems link nature and culture. Being socially constructed, the plurality of meanings regarding the concept of "Nature" should be valued, rejecting a common definition which limits our possibilities to understand societies: the concept of "Natures" appears as a possibility since the biggest problem lies in trying to define the nature concept first, neglecting to understand how societies and communities reason about it (Kloek et al., 2018; Lamb, 1996; Llosa, 2019; Newman & Dale, 2013). Here, the **Environment concept represents an opportunity for policy and for capital to employ new technologies in the search for profit** (Redclift, 2009). Considering this, Nature is seen as a factor of cohesion, it conveys interaction, creates links and takes down symbolic barriers (Houdayer, 2015). It is concluded, from this range of studies, that nature is not subordinated to humans, but works with them and by their side, influencing them in a way that highlights the limits of anthropocentric narratives.

In the next sections, the focus will be on the analyses of secondary and primary data to characterise the biophysical profile of each pilot and to identify the main vulnerabilities, risks and opportunities towards the ecological transition through dynamic communication with the systematic literature review results.

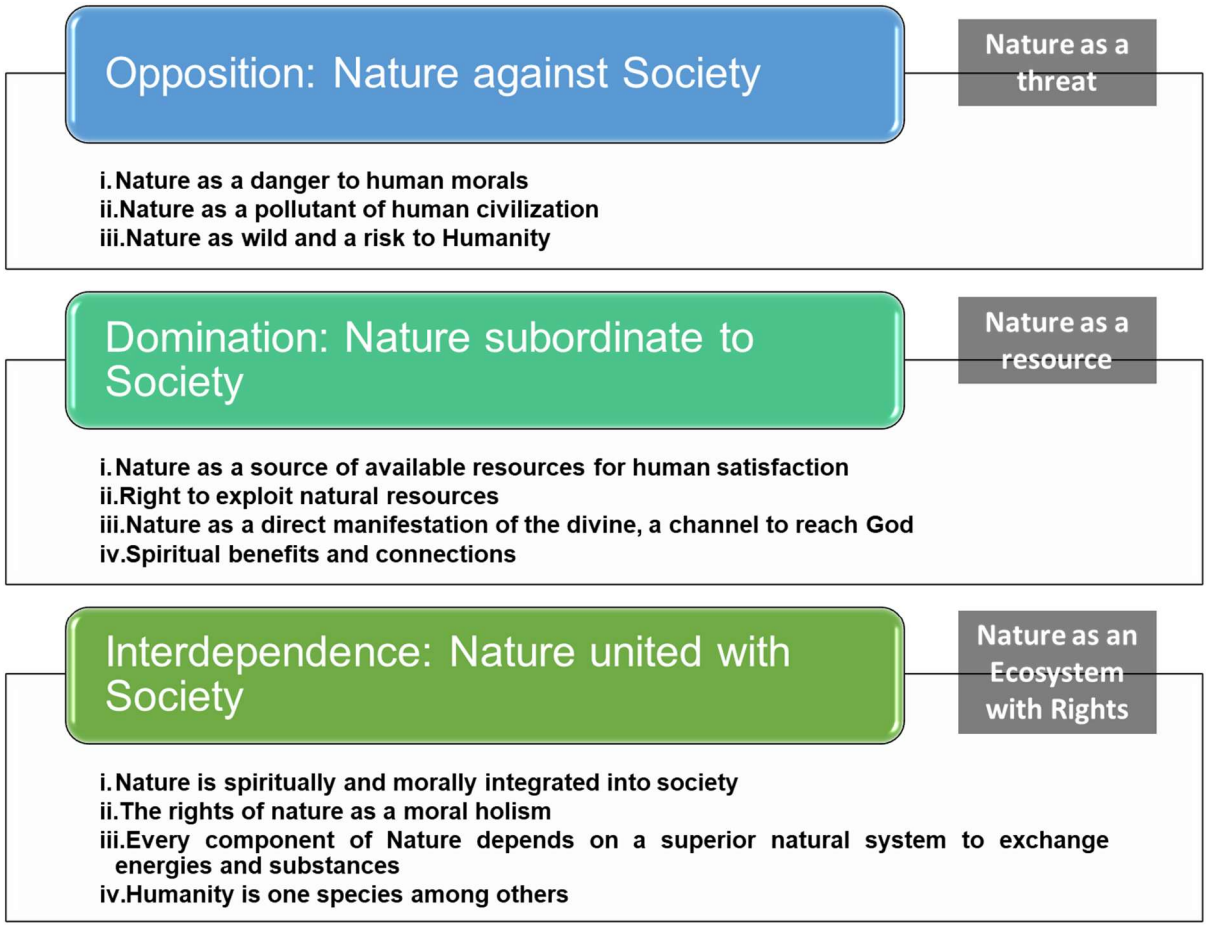

Figure 16 – Categories emerged from the inductive content-analysis of the documents included in the review

4.2 The Pilots

This section will provide, firstly, an overview of the official and institutional narratives on Nature and Environment in legislation and public policies, secondly a contextualisation of each pilot territory, both biophysical and socio-psycho-economic-cultural, which is crucial to identify structural drivers and barriers towards the EGDs measures implementation.

4.2.1. Official and institutional narratives on Nature and Environment in legislation and public policies: The Rights of Nature and the Human Right to Nature[15,16]

The Rights of Nature / Human Right to Nature matrix integrates the structures level and aims to analyse the representations of Nature and the Environment in official narratives, namely in legislation and public policies available in governmental reports. The sample is there

[15] The Matrix Right of Nature / Human Right to Nature filled by the Local Partners is available in the Appendix 7.

[16] This section was developed by Paulo Costa (UC-CFE), Luca Novelli (FGF) and Puttini Spartaco (FGF).

composed of Portugal, France, Italy, Hungary, Estonia and Iceland. For those countries, the data at the disposal[17] regard legal provisions of different legislative levels, from the constitutional ones to the administrative (question 1, question 2, question 3, question 4). Moreover, the analysis will also delve into the conceptual understanding of "nature" and "environment" in the different legal systems, to signify the variety of meanings that the two words have in the different systems (question 5, question 6). Lastly, more than just exploring the different visions, the idea is also to explore the dimension of participation in the elaboration and implementation of environmental policies (question 7.1, question 7.2, question 7.3, question 8).

Legal protection of Nature

The idea that humans have a right to use natural resources to satisfy their needs, interests and personal tastes does not seem to be defendable without corresponding duties of care for the preservation of these same natural resources. This principle finds expression, for example, in the Convention on Biological Diversity (1992), whose preamble recognizes the "intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components", and in which it is stated that the "conservation of biological diversity is a common concern of humankind". Thus, the concern for the protection of nature is not limited only to the natural resources necessary or useful to people, because the conservation of biological diversity is, in itself, a necessity that stems from its recognized value. Accepting this principle, we may question whether it is possible to argue that nature, having its own, intrinsic value, has rights.

From a strictly normative point of view, we cannot say that nature is an entity endowed with rights, since it is not a subject with legal personality, given that, in particular, it cannot manifest a will of its own, which would render the attribution of rights (it cannot exercise them) **and the imposition of obligations** (it cannot fulfil them) **void**. On the other hand, the problem of ownership would also arise, since nature is a concept that encompasses a great diversity of elements, such as water, fauna or flora, these would have to be considered in their individuality; just as it is not humanity that has rights, but each person individually, the same would have to be considered in the relationship between nature and its various constituent components. But does this mean that natural elements are not, in themselves, protected by law? The answer has to be negative because if it is not defensible that the natural elements are holders of rights, this does not mean that they

[17] The data collected by the Local Partners is somewhat limited to respond to some Matrix topics. We are aware that a further analysis of this topic is needed with more robust data on the legal documentation. Nevertheless, this preliminary analysis aims to provide an overview of this topic at a European level.

should not be protected from harmful acts performed by people, namely those that exceed what is necessary for the satisfaction of their basic needs. This is recognized, for example, by the Portuguese Constitution (2021), when it establishes as a fundamental task of the State "to protect and enhance the cultural heritage of the Portuguese people, to defend nature and the environment, to preserve natural resources and to ensure proper land use planning" (article 9, e*)*).

For this, for example, geographical protection areas are created that introduce limits on the use of the natural resources that are integrated into them. See, for example, the Estonian Nature Conservation Act (RT I 2004, 38, 258) (Nature Conservation Act, 2004), in which "nature conservation is carried out by means of restricting the use of areas important from the aspect of preservation of the natural environment, by regulating steps involving specimens of species of wild fauna, flora and fungi and specimens of fossils, and by promoting nature education and scientific research" (§2.1). This is also the case with the Portuguese legal regime for the conservation of nature and biodiversity (Decree-Law 142/2008, of July 24), which aims at the "maintenance or recovery of natural values" and the "enhancement and sustainable use of natural resources" (article 3, c)); however, and for the purposes of the protection conferred by this normative act, natural resources are understood to be "the natural environmental components that are useful to humans and generate goods and services, including fauna, flora, air, water, minerals and soil". Nevertheless, the Portuguese Constitution determines that the State must create and develop these areas in order to guarantee "[...] nature conservation and the preservation of cultural values of historical or artistic interest" (article 66, no. 2, c*)*) and "promote the rational use of natural resources, safeguarding their capacity for renewal and ecological stability, with respect for the principle of solidarity between generations" (article 66, no. 2, d*)*).

In addition to conservation regimes, it is possible to identify several norms that protect natural resources from uses that are so serious that they qualify as a crime. For example, article 278 of the Portuguese Penal Code (1995) provides for the crime of damage against nature, which is committed by anyone who:

- "eliminate, destroy or capture specimens of protected species of wild fauna or flora or eliminate specimens of fauna or flora in considerable numbers" (no. 1, a*)*);
- "destroy or significantly deteriorate protected natural habitat or unprotected natural habitat causing it to lose protected species of wild fauna or flora or to eliminate specimens of wild fauna or flora in considerable numbers" (no. 1, b*)*);
- "seriously affect subsoil resources" (no. 1, c*)*).

Even if it is arguable that in the case of protected species and habitats such protected status would reflect their value and interest to humans so that this would be what is being

protected and not the value of these species and habitats themselves, the punishment conferred on those who eliminate unprotected specimens, even if conditioned to a "considerable number", makes it possible to maintain that such value is recognized at least for species of fauna and flora.

Also, the Estonian Penal Code (2001) provides for the punishment of various offences directed against natural components, such as, "activities dangerous to flora" (article 353), "damaging or destruction of trees and shrubs" (article 354), "damaging of landscape" (article 359), "damaging of wild fauna" (article 361). In turn, the French Environmental Code (2000) also establishes a set of forbidden actions concerning fauna and flora, "when a particular scientific interest or the requirements for the preservation of the biological heritage justify the conservation of non-domestic animal or non-cultivated plant species" (article L411-1.I).

Common to the various countries, and except for Hungary, is the absence of a definition of nature in the legislation consulted, which may be associated with the difficulties of operationalizing such a concept in the context of legal protection, for the reasons mentioned above. Nevertheless, an attempt is made to characterise the natural elements, even if this is done in an almost descriptive way. Thus, for example, in Portugal, the Basic Law of Environmental Policy indicates that environmental policy focuses on natural and human environmental components, the former being defined as "air, water and sea, biodiversity, soil and subsoil, and landscape," and environmental policy aims to recognize and value "the importance of natural resources and ecosystem goods and services" (article 10). In turn, in Estonia, the Nature Conservation Act indicates that its purpose is "to protect the natural environment by promoting the preservation of biodiversity through ensuring the natural habitats and the populations of species of wild fauna, flora and fungi at a favourable conservation status" (§1, 1).

In Spain, the Law of Natural Heritage and Biodiversity (Law 42/2007, December 13) presents a notion of natural resources, which are "any component of nature, susceptible to being taken advantage of by the human being for the satisfaction of its needs and having a current or potential value, such as the natural landscape, the waters, surface and underground; soil, subsoil and land for their greatest use: agricultural, livestock, forestry, climate and protection; biodiversity; geodiversity; genetic resources; and ecosystems that support life; hydrocarbons; hydro-energy, wind, solar, geothermal and similar; the atmosphere and radio spectrum, minerals, rocks and other renewable and non-renewable geological resources" (article 3, no. 30).

In the case of Hungary, the Law on the Protection of Nature (Act 1996/LIII) defines a "natural (ecological) system", which is presented as "the dynamic and natural unity of living

organisms, their communities, and their inanimate environment" (§4, k*)*). Furthermore, it presents a relatively complex (or unclear) concept of natural value, which is understood as "the natural resource [Kt. §4 point c*)*], the living world and its inanimate environment necessary for its survival, as well as other - defined in this law - environmental elements that do not qualify as natural resources [Kt. Section 4 point a*)*], including the protected natural value" (4§, a*)*). The latter is defined as "an individual, developmental form, stage, derivative of a living organism declared protected or highly protected by this law or other legislation - benefiting from priority nature protection - as well as the living communities of living organisms, as well as a cave, mineral, mineral association, fossil" (§4, e*)*).

Regarding the concept of environment, the Portuguese Basic Law of Environmental Policy (Law No. 19/2014, April 14), without presenting a concept, indicates that in environmental policy "natural and human environmental components are inseparable" (article 9). As previously stated, natural environmental components are "air, water and sea, biodiversity, soil and subsoil, landscape" (article 10), while components associated with human behaviours are exemplified by "climate change, waste, noise and chemicals" (article 11). In Hungary, the Law on the General Rules of Environmental Protection (Act 1995/LIII) presents the concept of the environment as "environmental elements, their systems, processes, structure" (§4, 2), indicating that environmental elements are "land, air, water, wildlife, as well as the built (artificial) environment created by man, as well as their components" (§4, 1).

The human right to Nature and Environment

As a rule, national legislation recognizes the existence **of a human right to a healthy environment** - five of six countries have legal provisions in this sense, the exception is Iceland. This is the case, for example, of the Portuguese Constitution, which states that "everyone has the right to a human living environment, health and ecologically balanced and the duty to defend it" (article 66, no. 1). The Basic Law of Environmental Policy specified that this "right to the environment consists of the right of defence against any aggression to the constitutionally and internationally protected sphere of each citizen, as well as the power to demand from public and private entities the fulfilment of duties and obligations in environmental matters [...]" (article 5, no. 2). This is concretized, for example, in the right of popular action to "promote the prevention, termination or judicial prosecution of offenses against [...] the preservation of the environment [...]" (Portuguese Constitution - article 52, no. 3, a*)*).

In the Spanish Constitution, article 45 recognizes that "everyone has the right to enjoy an adequate environment for the development of the person, as well as the duty to preserve it". In France, the Environmental Charter, which was given constitutional status by

Constitutional Law No 2005-205, March 1st, states in its first article that “everyone has the right to live in a balanced and healthy environment”. The Environmental Code provides that "laws and regulations organise everyone's right to a healthy environment and contribute to ensuring a harmonious balance between urban and rural areas" (article L110-2).

The importance of nature for people's quality of life is expressly stated in Hungary, in the preamble to the General Rules for the Protection of the Environment, when it states that “natural heritage and environmental values are part of the national wealth, the preservation and protection of which, and the improvement of their quality, are a basic condition in terms of the living world, human health and quality of life; without this, the harmony between human activity and nature cannot be maintained, failure to do so endanger the health of present generations, the existence of future generations and the survival of many species”. In this piece of legislation, the utilitarian perspective of nature for humans is clearly exemplified by the concept of natural resource, which is understood as “environmental elements or their individual components that can be used to satisfy social needs” (article §4, 3). Nevertheless, the Law on the Protection of Nature states that “natural values and areas can only be used and utilised to the extent that the functionality of natural systems and their processes, which are fundamental to their operation, is maintained, and biological diversity is sustainable” (article §5, 2).

This same concern is expressed in Estonia in the General Part of the Environmental Code Act (RT I, 28.02.2011, 1), recognizing the “right to environment that meets health and well-being needs” (article §23), namely “everyone is entitled to expect that the environment concerning them directly meets the health and well-being needs” (1), and each person “can demand that the administrative authority spare the environment and take reasonable measures to ensure the compliance of the environment with the health and well-being needs” (5).

Duties towards the environment

The relationship between the existence of a right and the simultaneous imposition of a duty to contribute to the protection of the environment is very present in Portuguese legislation, with the Portuguese Constitution, as mentioned above, establishing that "everyone shall possess the right to a healthy and ecologically balanced human living environment and the duty to defend it" (article 66, no. 1). And with the Basic Law of Environmental Policymaking this link even more explicit by providing that "the right to the environment is inseparable from the duty to protect it, preserve it and respect it so that long-term sustainable development is ensured, namely for future generations" (article 8, no. 1). As indicated above, the Spanish Constitution also establishes this link between the right to the environment and the duty to protect it (article 45).

In France, the Environmental Charter stipulates that "everyone has the duty to take part in the preservation and improvement of the environment" (article 2), which should be reflected in the prevention of "the attacks that it is likely to cause harm to the environment or, failing that, to limit the consequences" (article 3) and in "reparation the damage it causes to the environment" (article 4). Similarly, the Environmental Code states that "it is everyone's duty to safeguard and contribute to the protection of the environment", which applies to all public and private persons (article L110-2).

In Hungary, the duty to protect the environment is laid down in the Law on the Protection of Nature, Article 5(1): "all natural and legal persons, as well as other organisations, have the duty to protect natural values and areas", to "prevent dangerous situations and damage, mitigating damage, eliminating its consequences, and restoring the state before the damage".

The Estonian General Part of the Environmental Code Act includes several provisions in Chapter 3, with the indication of different duties, which are preceded by two main duties, the wording of which seems interesting: a "duty of care", according to which "everyone must, to a reasonable extent, take measures to reduce the environmental nuisance caused by their act or omission" (§14), which seems to suggest a different understanding of the relationship with the environment, assuming that any human action can cause damage, which should be avoided or diminished; and a "duty to acquire knowledge for prevention of environmental threat", which supposes that "before commencing an activity that causes an environmental threat, everyone must, to a reasonable extent, acquire knowledge that, given the type and scope of the activity, is necessary for preventing the environmental threat" (§15).

These duties imposed on individuals extend to public authorities and, first and foremost, to the State. This is what follows from the Portuguese Constitution when it states that the State has the fundamental task of "defending nature and the environment, [and] preserving natural resources" (article 9, e*)*). This task is carried out "through the direct actions of its bodies and agents at diverse scales of local, regional, national, European and international decision, as well as through mobilisation and coordination of all citizens and social forces, in a participatory process and settled in the full exercise of environmental citizenship" (Article 2, no. 2, of the Basic Law of Environmental Policy). To this end, the State must monitor "activities susceptible of a negative impact in the environment following its execution through monitoring, inspection aiming, namely, secure the implementation established in the instruments and environmental normative and prevent environmental illicit" (Article 21 of the Basic Law of Environmental Policy).

In Hungary, "state bodies, local governments, natural persons and their organisations, management organisations and their interest protection organisations, as well as other institutions are obliged to cooperate in the protection of the environment. The right and obligation to cooperate covers all stages of solving environmental protection tasks" (article §10 (1) - Law on the General Rules of Environmental Protection). In Chapter III, this law determines how the state and local government must implement environmental protection policy (articles §37 to §48). In turn, the Law on the Protection of Nature establishes the system for planning and organising this protection, with the assignment of duties and tasks to the State (articles §56 to §59), the public prosecutor (article §60) and local governments (article §61 to §63).

In Spain, the Law of Natural Heritage and Biodiversity indicates the duties of public authorities, stating that "all public authorities, in their respective fields of competence, shall ensure the conservation and rational use of natural heritage throughout the national territory and in maritime waters under Spanish sovereignty or jurisdiction, including the exclusive economic zone and the continental shelf, irrespective of their ownership or legal status, taking into account, in particular, the threatened habitats and the wild species under special protection" (article 5, no. 1).

Participation of people and organisations in the legislative process

About this point, some information is available for the Portuguese, French and Hungarian cases. For Estonia and Iceland, it is known that there are provisions for participation in the environmental law-making process but no further information is available; for Italy those provisions are absent.

The Basic Law of Environmental Policy adopted the principle of participation in Portugal (article 4.º, e*)*), but in a broader context, that of environmental policy. In this sense, it determines the obligation of the "involvement of citizens in environmental policies", ensuring that "citizens have the full right to intervene in the elaboration and monitoring of the application of environmental policies" (article 4.º, e*)*). However, the Law that regulates the statute of non-governmental environmental organisations establishes that they have "the right to participate in the definition of policy and the main legislative guidelines in matters of the environment" (article 6). In Hungary, environmental associations also have the right to "comment on drafts of state and local government legislation related to the environment" (§98, 2, c*)* - Law on the General Rules of Environmental Protection). Finally, in Estonia, the General Part of the Environmental Code Act recognizes the right to participate in the elaboration of instruments that have a "significant impact on the environment", so that "the Government Office and the ministries publish on their websites relevant information on which draft regulations and acts that have a significant impact on the

environment they intend to draft, publishing the intent of drafting, timetable, research to be carried out in the course of drafting, persons responsible, possibilities of participating in drafting, the issues on which public opinions are expected and the results of consultations" (§29, 1).

Participation of people and organisations in the implementation of laws

In Portugal, individuals and environmental organisations have the constitutionally recognized right of popular action and may use it to "promote the prevention, termination or judicial prosecution of offenses against [...] the preservation of the environment [...]" (article 52, no. 3, a*)*). This right is regulated by Law 83/95, August 31, which also provides for the right of popular participation, which determines the hearing of interested persons and entities defending interests that may be affected by the "adoption of development plans of the Public Administration's activities, of urbanism plans, of master plans and land use plans, and the decision on the location and the realisation of public works or other public investments with relevant impact on the environment" (article 4, no. 1). The right to participate in administrative procedures is also recognized in the Basic Law of Environmental Policy, covering the "adoption of decisions on authorization procedures or concerning activities that may have significant environmental impacts, as well as in the preparation of environmental plans and programs" (article 6, no. 2, a*)*).

The French Environmental Code recognizes the right to participate when there are projects that may have a significant impact on the environment so that the "public debate can be organised on the objectives and the main characteristics of the projects, during the phase of their elaboration" (article L121-1). Environmentalist associations are recognized with the right to "action against any administrative decision having a direct relationship with its object and its statutory activities and producing harmful effects for the environment on all or part of the territory for which it benefits from approval" (article L142- 1).

In Estonia, the General Part of the Environmental Code Act determines that "everyone has the right to participate in the proceedings of granting authorization for an activity of a significant environmental impact and in planning an activity of a significant environmental impact" (article §28). In addition, environmental associations can challenge administrative decisions in court, assuming "that its interest is reasoned or that its rights have been violated where the contested administrative decision or step is related to the environmental protection goals or the current environmental protection activities of the organization" (article §30, 2).

In Hungary, people and organisations "are entitled to participate in the non-official procedure related to the environment" (article §97, 1 - Law on the General Rules of

Environmental Protection), as well as, "has the right to draw the attention of the environmental user and the authorities to environmental hazards, environmental damage or environmental pollution" (article §97, 2). In addition, various participation rights are recognized for environmental associations, either through participation in administrative processes or through the use of judicial means (article §98 to §100 - Law on the General Rules of Environmental Protection; article §65 - Law on the Protection of Nature).

Law 27/2006, July 18, regulates the right of public participation in environmental matters in Spain, seeking to ensure the right "to participate effectively and genuinely in the preparation, modification and revision of those plans, programs and provisions of a general nature related to the environment" (article 3, no. 2, a*)*). In this context, "allegations and observations when all the options are still open and before the decision is adopted" (article 3, no. 2, c*)*), as well as "participate in an effective and real way [.. .] in the administrative procedures processed for the granting of the authorizations regulated in the legislation on integrated pollution prevention and control, for the granting of administrative titles regulated in the legislation on genetically modified regulations, and for the issuance of environmental impact statements regulated in the legislation on environmental impact assessment, as well as in the planning processes provided for in the water legislation and the legislation on evaluating the effects of plans and programs on the environment" (article 3, no. 2, e*)*).

Wrap-up

The analysis of the legal provisions about the environment and nature of six European countries has shown some relevant information. First, all **the countries have ratified the Convention on Biological Diversity, which has significant content in terms of Rights to nature.** However, schematically, this International Treaty, in the juridical site, is systematically weaker concerning the economic rights (freedom of economic initiatives, property rights regarding natural elements) which are protected by constitutional level norms and by European Treaties. Accordingly, the provisions contained in the Convention on Biological Diversity, aware of **the Rights of nature, remained typically intent** declarations which then are overwhelmed, in the balancing of the relevant rights, by higher ranked rights, such as the economic ones. For the second point, regarding the Right to nature, this kind of legal provisions reflect both the deontologist and the consequentialist approaches, as **nature is framed as something "necessary to guarantee the human life"**, as for the Italian law, or as something to which everybody should have right, as it is for the Portuguese case.
About the following points instead, **the definition of nature is only present in the Hungarian law**, while a definition of "environment" is provided for the French case. In both cases, the definitions are referred to the biosphere.

Lastly, regarding participatory practices in environmental decision-making and policymaking, few legal provisions are at their disposal. In general, the idea embodied in the analysed legal systems is that citizen participation should be a significant part of the legislative process related to environmental matters, which is, for the Portuguese and Hungarian case, in some cases, mandatory. The case is instead different concerning the implementation of environmental norms, due to a lack of legislative specification related to the implementation processes, with the partial exception of Hungary and Estonia.

4.2.2. Portugal[18]

4.2.2.1. Sociodemographic

Population structure by sex, age group, education level and ageing

The structure of Portuguese society is mostly female 52.4% and follows the south European trend regarding the ageing phenomenon, where 63.7% of the population are 15-64 years old and 23.4% more than 65 years old (totalizing 87.1%) (Pordata, 2020). This evidence is more significant when applying the ageing index, finding that per 100 young people, 182 elderly exist (Pordata, 2021a).

The life expectancy in Portugal is 81.1 years (Eurostat, 2022c). Living longer is a positive outcome of the socio-cultural-economic progress during the 20th century, when better life, health and income conditions were achieved. However, population ageing is also a direct symptom of the decrease of fertility rate, currently 1.4 children per female (Eurostat, 2022f), but not only. It can be a consequence of poor and unstable labour and living conditions of current generations that undermines the possibility of having children.

Regarding the education level, Portugal holds, in 2021, 28.3% persons with higher education and 40.3% persons with only elementary education (Eurostat, 2021b).

Unemployment and income

As stated before, the ageing of a population can be a symptom that living conditions, trust in the future and expectations are low in a certain society. In Portugal, the unemployment rate was 6.6% in 2021 (Pordata, 2021d) and younger people are experiencing difficulties to obtain reasonable labour conditions and to access housing. When looking at the GINI index, where 0 means perfect equality and 100 perfect inequality, Portugal's index was 33% in 2020 (INE, 2021). Nevertheless, considering the study conducted by the Bank of Portugal (Costa

[18] In Portugal, only 1 interview was collected.

et al., 2020), it was found that the 10% of wealthiest families held 53,9% of their wealth, while the 50% of poorest families held 8,1%.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Portugal is presented in Table 9. This situation reveals profound inequalities regarding wealth distribution, which may **translate into a material barrier to the ecological transition that, together with the ageing phenomenon and the socio-economic instability** of younger generations, should not be ignored. The resistance to change is higher in older groups, namely the adoption of more pro-ecological behaviours and the change of life patterns aligned with the ecological transition philosophy.

Despite the challenges previously identified in the country concerning its socio-demographic structure, some potentialities may be pointed out. Firstly, a rapidly growing population is unsustainable since it implies the demand of more natural resources and, thus, more consumption. Therefore, a balanced growth is favourable to the ecological transition. Secondly, current evidence shows that in Portugal, the younger people and the elderly are those with more sustainable concerns, the first due to the formal education, the latter due to the contact with land and agriculture (Schmidt et al., 2016). Thirdly, maybe this demographic reality can be an opportunity to value accumulated expertise, knowledge, and experience. This can be particularly relevant in the integration into environmental decision-making.

Table 9 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Portugal

Vulnerabilities	Risks	Opportunities
Ageing	Resistance to change behaviours	Balance population growth; Accumulated expertise, knowledge, and experience
Income inequalities	Economic barriers to adopt pro-ecological behaviours	To discuss the economic and structural barriers of ecological transition

4.2.2.2. Natural resources

4.2.2.2.1. Secondary data on natural resources

Land use

In terms of land consumption, INE (2019a) reported that in 2018, 65% of Mainland Portugal was occupied by forest and cropland areas. The surface areas with water bodies, artificial

land and cropland were the fastest growing from 2015-2018, while forest, grassland and shrubland areas scored negatively, and all cropland presented a positive balance.

Water resources

Water resources in Portugal are quite significant. The country holds a significant coastal line around 850 km in length with alternate cliffs and capes and sections with dunes. Beyond its advantage for fishing, the extensive **Portuguese coastal line is highly attractive to tourism**, especially due to the Mediterranean climate and the beaches. Regarding bathing water, 89,2% of the beach's present excellent status, 5,6% a good status, 0,8% sufficient or poor, and 4,4% were not classified (EEA, 2021).

The morphological elements of the Portuguese Coast considered most important are the estuaries of rivers Tejo and Sado, the Lagoon of Aveiro (Ria de Aveiro), Ria Formosa in Faro and Olhão, and the Capes Carvoeiro, Espichel and São Vicente. The continental platform presents an area of 28000 km^2, with four submarine cannons in Nazaré, Lisbon, Setúbal and São Vicente (A. M. P. J. Ferreira, 2000). The main rivers of the hydrographic network are all transnational: Minho, Lima, Douro, Tejo and Guadiana, whose basins occupy 63% of the national territory (A. M. P. J. Ferreira, 2000). **However, the potential of water sources in the country is challenged by the contamination of its bodie**s, being considered one of the most urgent problems in the country. Illegal discharges from industry, agriculture and even domestic sources are threatening the quality of the water and its ecological health. Some examples can be pointed out, such as the Tejo river, which was affected by thick foam in 2018 after a drought due to industrial cellulose discharge (de Pablo et al., 2022). Or the case of Lis river, polluted by waste from swine farming (J. G. Ferreira, 2016).

The water productivity in the country, as a measure of the efficiency of water use, reveals that Portugal, in 2017, was 37.9 euros per cubic metre, which means that poor efficiency regarding water use exists. However, it is worth to remark that, in 2019, almost 93% of the resident population is connected to wastewater collecting systems and to wastewater treatment plants, which is not an universal reality across European countries (OECD.Stat, 2019).

Minerals and deposits

Natural resources in Portugal, especially those related to minerals and deposits, are mainly gold, barium, tin, tungsten, titanium, uranium, lead, zinc, chalcopyrite, and ferromanganese and are widespread throughout the country (A. M. P. J. Ferreira, 2000). The main mining projects currently being undertaken in the country are Neves-Corvo (copper and zinc), Panasqueira (tungsten) and Aljustrel (copper and zinc).

Socio-environmental conflicts

Portugal is now placed amongst the ten biggest lithium producers in the world, which has created several socio-environmental conflicts, especially in Covas do Barroso (Frontiline, 2021), between local communities and the entities responsible for the exploitation. The main issues lie on the landscape and ecological balance that will be destroyed, namely changing the course of the river, destruction of the forest and the promotion of low paid, seasonal, and low skill jobs. This has been the main argument of the local agricultural cooperative that seems to be one of the most affected groups.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Portugal is presented in Table 10. Natural resources in Portugal, due to their potential and diversity, have been dealt several challenges that must be considered.

In the case of water resources and the favourable Mediterranean climate, there is a need to regulate the illegal discharges in water bodies, especially in the case of rivers. Together with the lithium exploitation, these situations are both considered as an "ecocide", in the first case due to a massive destruction of the riverine ecosystem; in the second due to the overexploitation of non-renewable resources, as is the lithium case. This implies the need to bring citizens and organisations to the centre of environmental decision-making and to discuss the issues of their territories.

Table 10 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Portugal

Vulnerabilities	Risks	Opportunities
Water sources pollution	Ecocide; destruction of riverine ecosystem	To regulate the illegal discharges; to develop an integrate strategy regarding the collective management of water resources
Overexploitation of non-renewable resources	Socio-environmental conflicts	Integrate citizens and organisations in the environmental decision-making

4.2.2.2.2. Primary data: Social perceptions on natural resources

Despite having only one interview in this territory (a 50 years old male scientist), we opted to summarily characterise the underlying perceptions regarding natural resources in Portugal – availability, scarcity, and existing socio-environmental conflicts. **Water and food are** considered by our interviewee **the most important natural resources in Portugal**. This perception is in line with our secondary data that revealed the existence of problems in the management of water sources and the pollution that affects its quality.

The respondent highlights that the importance of these two natural resources is framed by the scarcity that both are experiencing in the national territory and that will aggravate shortly: firstly, **the scarcity of water in the Algarve region** (south of Portugal) that derives from climate change impacts; secondly, **the lack of food sovereignty that Portugal** faces and its dependence on imported products. Both make Portugal a particularly vulnerable territory to climate change impacts.

Concerning socio-environmental conflicts, the respondent focuses on water as the main concern, stating:

"The main consumers of water in the Algarve region are agriculture and the tertiary sector (hotels and restaurants). The intensification of cultivation of agricultural and ornamental species that require large quantities of water will jeopardise the direct supply to the region's population, especially in summer periods." (Portuguese male scientist, 50 years old, Portugal)

His statement reveals several issues that deserve to be mentioned: the identification of the sectors of activity that consume the most water in the country, i.e. agriculture and tertiary sectors (hotels and restaurants); the type of use of this resource, which is inefficient, since it is applied to intensive cultivation and ornamental species; the impacts on these types of use that will directly impact local population with a significant increase in the temperature.

It is also implicit in the interviewee's answers the need to shift agriculture practices towards less intensive ones and the recognition of the low instrumental value of ornamental species, suggesting that the value of specie is understood in terms of their benefits to humans.

4.2.2.3. Socio-environmental concerns

4.2.2.3.1. Secondary data on socio-environmental concerns

Air Pollution

Air quality in Portugal is a complex issue, since there are contradictory visions. Despite being ranked 104º out of 177 of the most polluted countries (IQ Air, 2021), some studies suggest the opposite, highlighting that Portugal has more than 5000 premature deaths per year caused by exposure to nitrogen dioxide (NO_2) and fine particles (Brito et al., 2022). In fact, the distribution of air pollutants emissions is unequally distributed around the country, and the exceeding limits situations are identified in Porto, Lisbon and Guimarães, all urban centres, suggesting that atmospheric pollutants are mostly concentrated in urban territories than rural ones (Maia et al., 2018), where 18.6% of population is exposed (Eurostat, 2021g). This is due to the urbanisation and the concentration of air pollutants in

areas of intense road traffic, mainly those fuelled by diesel that emit Nitrogen Dioxide (NO_2) and fine particles (PM_{10} and $PM_{2,5}$), which is a big problem in European cities (Climate Feedback, 2020), as well as Nitrogen Oxides (NO_x) (Anenberg et al., 2017). Another emerging pollutant is Ozone (O_3) that recorded high levels in Viana do Castelo, a probable consequence of maritime transportation. Poor air quality and long-exposure to air pollutants may result in long-term consequences to human health, which is a key challenge to public health policies, especially in urban areas.

GHG emissions

According to the National Inventory of Emissions, in 2016, Portugal totalised 67,8 megatons (Mt) of CO_2 equivalent, representing a 20% reduction from the levels recorded in 2005 (Agência Portuguesa do Ambiente, 2022). This trend of reduction has been consistent due to the implementation of the National Programme for Climate Change 2020/2030, that aims to reduce 18-23% in 2020 and 30-40% in 2030 (based on the emissions of 2005). In fact, the Portuguese Minister of the Environment stated that in 2021, the country grew its gross domestic product by 4,9% and reduced carbon emissions by 4,8%, concluding that pollution is not required to grow the economy. Several strategies in Portugal can be pointed out with the mission to achieve carbon neutrality, namely the Recovery and Resilience Plan (PRR, in Portuguese) that is devoted to goals of climate transition; the National Strategy for Adaptation to Climate Change 2020 (ENAAC, in Portuguese) (Agência Portuguesa do Ambiente, 2015), now extended until 2025, that was conceived to improve the level of knowledge of climate change and promote climate adaptation across public administration sectors in the country while supporting Portugal's goal of becoming Carbon Neutral by 2050; and the Roadmap for Carbon Neutrality 2050 (RNC2050), concluding that every sector will contribute to emissions reduction and that achieving neutrality is technologically and economically viable (Governo de Portugal, 2019).

Climate-related economic losses

The climate in Portugal is predominantly of Mediterranean nature, where the North of the country is characterised by Temperate with Dry and Mild Summers, with monthly temperatures ranging from 10-20ºC and annual rainfall of about 1000mm/year; and the South of Temperate with Dry and Hot Summers, with temperatures ranging from 12-24ºC. However, the country is experiencing a changing climate. **Currently, the country accounts for 13461 million euros of economic loss caused by climate change in 2020** (EEA, 2022). The droughts are more frequent, associated with the precipitation reduction and the rise of temperatures, while extreme events increase in occurrence and intensity and susceptibility to desertification also increases (Cortegano et al., 2021; Vizinho et al., 2015). This leads to the alteration of conditions that privilege pathogens, and plant crops and animals are unable to adapt fast enough to the changes, apart from less water availability, a decay in

soil fertility and erosion. It is worth to remark that water consumption is exceptionally high in the agro-food industry, since it is required for manufacturing and sanitation of infrastructures, being considered inefficient regarding water. **In the long term, water availability in the region is projected to decrease substantially** and, together with increasing water demands, may seriously affect the wellbeing of humans and ecosystems that depend on groundwater for their subsistence. But the impacts of climate change are not limited to this one.

Despite droughts, an increase in the magnitude and frequency of floods is expected, particularly in the northern region, posing a risk to populations in the area. Coastal populations will be highly affected by sea level rise, and this is very significant, since two-thirds of the population is still living on the coastline (Schleussner et al., 2020). Water quality may also be affected, particularly in the southern region, due to the rise in temperature and to the reduction in river flows in the summer season. Groundwater tables will sink, especially in near-subsurface aquifers due to the expected reduction in the replenishing rate and the increase of evaporation. There will also be an increase in saline contamination of coastal aquifers due to saline intrusion as a result of sea level rise (Stigter et al., 2014).

Farming types and scales of production

The scale of farming production in Portugal is primarily industrial. In terms of organic farming, Portugal occupied the 10th position in the European Union in 2020, with 8,1% of its land area destined for it, compared to 1,2% of the area used for this finality in 2000. Agricultural, silviculture and fishing products are around 4,3% of Portugal's imports (Pordata, 2022a). The structure of agriculture in the country is mainly based on small to medium-sized family-owned dispersed units, despite the sector including some larger-scale intensive farming with an export-oriented nature.

However, and despite being a sector that represents a significant amount of land use in the country, it faces some challenges regarding its attractiveness and sovereignty. In 2018, the primary sector was responsible for 2,7% of the Gross Value Added (GVA) and only for 5,8% of the national employment. These are quite different from those found in the secondary sector, which had 21,9% of the GVA and 24,1% of employment; and the services sector that grabbed 75,3% of the GVA and 70,1% of employment. Regarding its attractiveness, the tertiarization of the society, the urbanisation experienced in recent decades and, also importantly, the social representations of farming, suggesting depreciation of the sector are the main drivers. On the other hand, the food sovereignty of the country is also a challenge. In 2020, Portugal was about 85% self-sufficient in food production, with a particular highlight on olive oil (160%), tomatoes (175%), vegetables (155%), butter (152%) and wine (113%) (Figure 18).

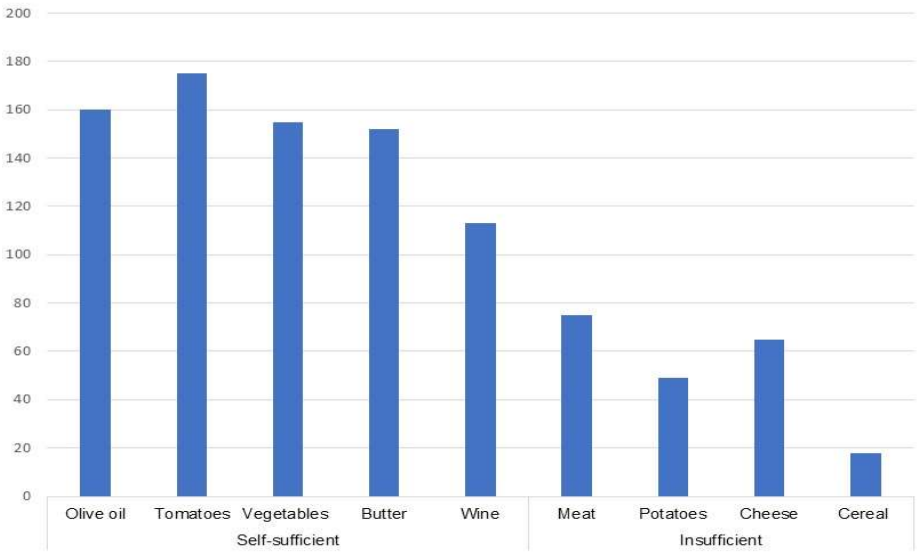

Figure 17 - Portugal self-sufficient and insufficient in food production by type (%).

In contrast, the country produces only 75% of the meat it consumes, 49% of potatoes, 65% of cheese, and in the last position, 18% of its cereal. In 2022, only rice could fulfil the country's needs, while wheat was at 6,3% of its need (80683 tons, importing 2391581 tons from France), and corn 23,7%. This raises questions regarding food sovereignty, especially in a time when Ukraine is at war, which constrains the European circulation of cereal. Together, lack of attractiveness and food sovereignty appear as the biggest challenges of the agriculture sector in the country.

Fisheries

The fish sector is also facing challenges. In 2017, only one-fourth of the fish consumed by the Portuguese was fished in the country, and stocks were overexploited. It is worth mentioning that the Portuguese consume 62 kg of fish per year, three times more than the average European citizen. This leads Portugal to import 181 128 433 € of fish in 2022, as well as 153 687 934 € of cereals, 118 196 942 € of grains, and 399 751 127€ of meat (Pordata, 2022a). This evidence brings the need to consume endogenous products aligned with the farm to fork strategy to the discussion, enhancing food sovereignty, and reducing food chains.

Energy

Portugal presented, in 2020, an oil and gas dependency from the exterior at about 65% (Eurostat, 2021c), which is quite significant. Also, the energy efficiency indicator for 2020 shows that the country has an efficiency of 19.5%, a value that does not allow to reduce GHG and, consequently, the dependence from the exterior (Eurostat, 2019). By improving energy saving, citizens may also benefit from a reduction on their bills. Apart from these indicators,

energy poverty ones may also be considered, since they have direct links with social inequalities but, also importantly, with climate change impacts. Despite these indicators being old (2012), 35.7% reported not being able to keep their dwelling cool during summertime (Eurostat, 2021f), which can be a vulnerability to heat waves; on the other hand, in 2016, 22.5% reported not being able to keep their dwelling warm during the winter (Eurostat, 2020), which may lead to a higher vulnerability to respiratory diseases, with more relevance in an ageing population.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Portugal is presented in Table 11. Socio-environmental concerns in Portugal are diverse but interconnected. They have the impacts of climate change in common. The rise of temperatures affects both the agriculture sector and the water quality, demand, and efficiency. Regarding these undeniable current and future impacts, Portugal can adopt measures that simultaneously help to tackle climate change and impact positively in other sectors. The need for sustainable farming systems, such as the organic ones, may help to bring younger people to the sector, since they are aware of potentialities to a balanced ecological system. On the other hand, the potential higher interest of younger people in organic farming could regenerate the sector towards more harmonious patterns of production that respect the limits of Nature. Also, the gradual adoption of sustainable farming implies a sustainable use of natural resources, such as water, adapted to its scarcity, i.e., a more efficient use. It is an opportunity to develop robust and resilient sectors that are more adapted to climate change by deepening knowledge on their impacts on the viability of these potential strategies. The need to ensure a farm to fork strategy is also visible, which is at heart of the EGD, that considers the sustainable use of agriculture, ensure food security and food sovereignty. This will directly positively affect the Portuguese economy and local producers. Additionally, it can generate new jobs and opportunities, performed by high skills workers, contributing to deconstruct the negative representation of the agriculture sector.

But, being climate change the major risk that Portugal faces, the society should not be put aside of this debate. The impacts are enormous in coastal areas, but there should exist a shared discussion on how to address this issue. It is necessary to find solutions for these populations, to make them part of this ecological transition.

The air quality and the GHG emission, with direct impact on global warming, are also a subject of concern. Despite the several measures adopted by Portugal, which are opportunities to reduce the pollutant emissions and GHG, a transition in daily habits is necessary, especially regarding transports and energy, mainly when those are related with fossil fuels. However, the adoption of pro-ecological behaviours in Portugal could be

influenced by the ageing of population and by the poor living conditions of a significant part of the society. Since some pro-ecological behaviours are more difficult to achieve, such as electric cars or domestic renewable energies, it is necessary to consider the structural inequalities within the Portuguese society in this transition, and democratise the access to ecological alternative solutions.

Table 11 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Portugal

Vulnerabilities	Risks	Opportunities
Dependence of exterior food production	Food insecurity	Higher interest of youth in organic farming; Regenerative cultures
Lack of attractiveness of agriculture sector	Unsustainability of the sector	Deconstruct the negative representation of agriculture sector; High skill workers
Low precipitation and intensive agriculture production	Droughts - Reduction on the agriculture production	Implementation of sustainable farming systems
	Droughts - Impacts on water quality; Water scarcity	Implementation of efficient systems of use of water sources
Two-thirds of the population lives in coastal areas	Sea level rise - Impacts on the coastal population	To enhance a strong commitment to coastal management by Portuguese authorities shared with local communities;
Urban planning and road traffic	Global warming; poor air quality; public health impacts	Reduce road traffic; Implementation and monitoring of national strategies
Energy poverty	Heat waves; public health impacts	Rehabilitation of housing; decentralised renewable energy; Adequate and affordable finance

4.2.2.3.2. Primary data: Social perceptions on socio-environmental concerns

The socio-environmental concerns stated at the interview corroborate the secondary data: the respondent reveals a growing concern with climate change, with direct impacts on the decrease of the amount of drinking water and the sea level rise – as seen through the secondary data, two-thirds of the Portuguese population lives in coastal areas.

According to the interviewee, to tackle the climate change impacts**, the ecological transition implies a new way of living**, organising society and governance, where environmental/ecological issues are put above economic interests:

"…a paradigm shift, where ecological/environmental issues will take precedence over purely economic ones when implementing new governance strategies from the global to local level" (Portuguese male scientist, 50 years old, Portugal)

To the success in this transition, it is necessary **a global commitment from all sectors** of society:

"All sectors of society must empower themselves with the knowledge and practices that will bring this transition to fruition. The ecological transition will not be feasible if only one sector of society takes this issue seriously." (Portuguese male scientist, 50 years old, Portugal)

This statement highlights the need of making a transition grounded in knowledge and practices, by considering local realities and sociocultural specificities: a transition from all to all. If this does not happen, the risk of failure increases. Therefore, the local specificities contribute also to knowing the barriers and challenges that ecological transition implementation is going to face. In the case of Portugal, the respondent reveals that the economic interest at the local and national level is the main barrier since this transition implies a shift, namely in the whole society's practices and behaviours. But the biggest challenge relies on the recovery of Portuguese food sovereignty, a critical issue to avoid situations of food insecurity, especially due to climate change impacts on agriculture and food production.

4.2.2.4. Sociocultural ecological behaviours

4.2.2.4.1. Secondary data on sociocultural ecological behaviours

Waste production and treatment

In 2020, Portugal produced 5,070,835 tonnes of waste, where the majority was destined to landfills (2,710,614; 53.5%). Despite this still being a challenge, a significant increase of waste destined to be recycled is observed (46.5%), distributed by energy recycling (19.0%), organic recycling (14.3%) and common recycling (13.3%) (Pordata, 2022j). However, and due to the consumer society, people tend to consume more, being produced 510.8 Kg/inhab. in 2020, representing an increase of almost 20% since 1991 (425.7 kg/inhab.) (Pordata, 2022k).

Mobility

As stated before, one of the socio-environmental concerns in Portugal are the pollutant emissions, especially by road traffic. In 2021, 685 motorised road vehicles per 1000 inhabitants were observed (Pordata, 2022f), an increase of 17.2% since 2010 (584.7‰). This situation worsens when including the motor vehicles in circulation by type of fuel used: of the 7,090,889 in circulation in 2021, 65.2% are fuelled by diesel and 31.5% by gasoline. Only 2.5% are fuelled by other type of energy, including electricity (Pordata, 2022e). In fact, Silva (2014) studied consumer habits in Portugal on a small scale and found that cars used as personal transportation by diesel are the preferred option for mobility in the country, with an average of 30 km per citizen travelling daily.

Recent data shows that, in general, 13.6% of the population reported difficulty in accessing public transport in urban areas (Eurostat, 2021a). However, when it comes to checking the percentage in rural areas, it increases to 23.3% (Eurostat, 2021a). Despite the social pass for the use of public transport having been universalized in Portugal, especially in the metropolitan areas, population living far away from urban centres needs to use car due to the lack of options, for example, regarding railroad, which have been target of a continuous divestment in past years.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Portugal is presented in Table 12**. The adoption of sociocultural ecological behaviours cannot be seen exclusively from an individual viewpoint** or as a personal choice. Economic and structural barriers should also be considered in this equation, since they may be a driver or constrain their adoption. The lack of public transport outside urban centres may be a barrier to the reduction of road traffic. The consumption of organic products or the acquisition of an electric car may be discouraged due to the high price when compared with non-organic food or diesel/gasoline vehicles.

Due to the vulnerability of Portugal to climate change, there is an urgent need to promote circular economy to reduce consumption and to extend the life cycle of products, with direct impact on tackling global challenges such as climate change impacts, biodiversity loss, waste, and pollution.

Table 12 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Portugal

Vulnerabilities	Risks	Opportunities
Increase in the consumption	Production of more waste	Circular economy
High utilisation of motor vehicles; lack of alternative mobility solutions outside urban areas	Poor air quality	Co-design of solutions that restrict the circulation of motor vehicles in high density areas; Discuss the need of sustainable mobility solutions
	Increase of GHG emissions	

4.2.2.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

The adoption of pro-ecological behaviours is a direct result of individual and collective ecological awareness. In this case, according to our interviewee, the most effective strategy relies on the increase of scientific and environmental literacy of the population, so that they can make decisions based on scientific knowledge, and not be misled by the misinformation that exists in social networks and the media. Contradictory information in the media, often without scientific validity, compromises the ecological transition and creates divergence among the population. But **the adoption of pro-ecological behaviours, especially the individual ones and those that directly affect the comfort and daily lives of populations is a big challenge**:

"Human beings do not like change. The population can be defined by the following sentence: " change is necessary, as long as I don't have to change my lifestyle. Combating this way of being is going to be the biggest challenge of any significant change." (Portuguese male scientist, 50 years old, Portugal)

This statement links with the English acronym "NIMBY – Not in My Back Yard" (Hubbard, 2009), which applies to situations where measures that are taken and considered positive for local populations encounter great resistance since they affect the way that they have been living.

4.2.2.5. Experiences in Nature

4.2.2.5.1. Secondary data on experiences in Nature

Protective functions of forests

Forests have an important role regarding the protection of natural resources and, simultaneously, benefiting humans and protecting them from natural risks. According to the last data available, in 2015, Portugal accounts 380.29 thousand hectares of available forest with protective functions (Eurostat, 2021e). Also, in the same year, 1070.11 thousand hectares of forest area within legally established protected areas in thousand hectares were identified (Eurostat, 2021d).

Vulnerabilities, risks, and opportunities

Through the available data, it is not possible to identify significant vulnerabilities or risks associated regarding the experiences in Nature in Portugal is presented.

4.2.2.5.2. Primary data: Social perceptions on experiences in Nature

Our interviewee provides a definition of nature that highlights the interdependency between the elements (human and non-human ones), as follows:

"Nature is the whole of everything living and non-living, and all the relationships between them. Nature is where we live (from our home to the whole planet) and we too are part of nature." (Portuguese male scientist, 50 years old, Portugal)

This personal definition is aligned with the category found in the literature: interdependency. The recognition of the whole, the "web of life", that Nature and Society are integrated into its complex relations. When we ask to choose five words that come to his mind when thinking about Nature, the words chosen continue to reveal the "whole" through the Earth's system: Biosphere, lithosphere, hydrosphere, atmosphere, and environment. The biosphere is the living beings, humans and non-humans, the lithosphere is the land, the hydrosphere is the water and the atmosphere is the air. The word environment here represents the surroundings or conditions in which a person, animal or plant lives or operates. And this meaning of Nature is visible in the answer regarding how he describes his contact with Nature:

"I am Nature…" (Portuguese male scientist, 50 years old, Portugal)

This description is related, once again, to the category of interdependency, where several studies reveal that Nature influences social and individual identity construction, in a way that society and nature cannot be separated from each other.

4.2.2.6. Inclusiveness

4.2.2.6.1. Secondary data on inclusiveness

Vulnerable groups

In Portugal, the most vulnerable groups are migrants, refugees, gipsies, and youth. These groups are generally less qualified, professionally precarious, earning lower wages, and often exposed to work accidents. Furthermore, most migrants are employed for jobs below their professional qualifications. Refugees are subject to language difficulties, long waiting times to receive legal documents, forcing them to look for work while in an illegal situation, and facing resistance from the job market to employ them. Gipsies are also marginalised, facing discrimination when looking for work since most employers refuse to employ them or even fire them when they discover their ethnicity. About 77000 youth were reported to have emigrated due to the economic crisis between 2011 and 2015, aged 15-24 years old, since they were affected by less access to jobs, housing, and intention to start a family.

People at risk of poverty

A recent report coordinated by Fernando Diogo (2021) reveals that 17,2% of Portuguese population (1,7 million people) were at risk of poverty in Portugal in 2018. Statistically, it represents an income 60% below the average observed in the country during a specific year; in 2018, it corresponded to 501,2€ per month. The highest poverty rate in country is observed in the group up to 17 years old, being higher than the global rate. The second highest poverty rate concerns to the inactive population (people over 18 years old and not retired) students, interns, housekeepers, caregivers, and citizens unable to work. Nevertheless, a high poverty rate was observed in families with one or two adults and three or more children during 2015-2018.

Gender pay gap

Even though 84% of women have an education level higher than their previous generation, they generally have the same or more professional qualifications than their partners. A recent report found that two-thirds of women earn a net salary inferior to 900€ and would work fewer hours a week if offered the possibility (Sagnier & Morell, 2019). Furthermore, women do three times more unpaid work than men - 74% of domestic tasks are carried out, and 73% of parenting is also their responsibility (Sagnier & Morell, 2019). In 2020, the average monthly income of women in the country was 1130,9 € against 1349,4 € for men (Pordata, 2022b). Therefore, it was concluded that it might take five to six generations to achieve gender equity in families where both parents have paid work.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Portugal is presented in Table 13. The absence of data regarding citizen participation in environmental decision-making in Portugal is a considerable gap which makes it difficult to this study to provide a picture of the current situation. Anyway, the existing data enables us to identify the main vulnerable groups in Portugal: immigrants, ethnic minorities, youngers, and women. The exclusion of these groups from the participatory and environmental decision-making processes brings risks to the ecological transition. As seen through the systematic literature review, the ways of understanding nature and environmental holds a sociocultural variation. Therefore, marginalising their voices may undermine a fair and inclusive ecological transition. Also, and as stated before, poverty is a vulnerability in the country, specifically in the adoption of ecological behaviours.

Table 13 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Portugal

Vulnerabilities	Risks	Opportunities
Absence of data regarding citizens' participation in environmental decision-making by gender, social status, age, and ethnic group	Discriminatory ecological transition	To create a system of monitorisation that enables to understand which social groups are included and excluded
Vulnerability of immigrants and ethnic minorities		
Structural gender inequalities		

4.2.2.6.2. Primary data: Social perceptions on inclusiveness

Participation in environmental decision-making should be universal, fair and democratic. Our respondent is aware of the environmental decision-making in his region and intervenes in two different ways:

"As a member of the Academy working on environmental and sustainability issues, I not only produce scientific knowledge in these areas but also collaborate in management decision-making." (Portuguese male scientist, 50 years old, Portugal)

As a scientist, our interviewee participates in the production of knowledge and, in a second phase, by transferring and communicating the knowledge produced into environmental decision-making. Despite the validity and importance of this participation, and because

there are no interviews with citizens and local organisations, it is not visible participation that aims to introduce the plurality of knowledge that circulate in societies, including the lay knowledge beyond the scientific one. And as stated before through the secondary data, the absence of this information needs to be reverted. Nevertheless, the interviewee recognizes that the participation of both social agents and vulnerable groups in environmental decision-making, with their diversity of perspectives and knowledge, is very important to the construction of new knowledge, decisions and practices.

4.2.2.7. Synthesis

According to the Portuguese socio-ecological concerns described in the Grant Agreement (GA, 2021, p.17-21), five main topics were identified as the main concerns to tackle in the ecological transition: clean energy, renovation of the human settlements, sustainable mobility, reduction of pollution in cities and increasing organic agriculture. The secondary and primary data previously analysed reinforces all these concerns, which were expressed by the local diagnosis and stakeholders, but unveils two main issues that could be understood as aggregators of them.

Firstly, the structural socio-economic-cultural inequalities of the country that persist through years and generations and that tend to be reproduced in the same social groups: immigrants, ethnic minorities, youth, and women. Therefore, it is important to develop strategies that allows these groups to participate in and benefit from the ecological transition.

Secondly, the climate change vulnerability. Portugal is particularly vulnerable to climate change (Schleussner et al., 2020), so an integrated strategy that considers the multiple impacts is crucial towards the ecological transition. As the data showed, the measures adopted to provide an efficient use of water sources will have direct impact not only in the sustainable use and in its quality, but also in the productivity of the agriculture sector and in public health. The same occurs in the mobility, since reducing road traffic (private cars) through the creation of sustainable alternative solutions will reduce the GHG emissions, improve air quality and consequently the public health outcomes. In this sense, climate change mitigation and adaptation should be the core of the ecological transition debate in Portugal.

Some highlights regarding Portugal's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Sociocultural diversity - consider the sociocultural diversity of people in the environmental decision-making and their involvement through the creation of integration and monitoring strategies;

- Climate action - understand climate change as a priority in the country that directly and indirectly affects all sectors of society – it is the unifying link - the interviewee reveals also this concern, especially the impacts on water scarcity and sea level rise;
- Clean and fair energy – democratise the energy transition for all, considering the challenges faced by a significant amount of population that are not able to keep their dwellings warm during the winter and cold during the summer;
- Natural resources – address socioenvironmental conflicts regarding non-renewable resources, as lithium, by integrating local communities, miners and stakeholders in the conversation, to a collective management of these resources;
- Inequalities - consider the economic and structural inequalities within the Portuguese society, since they can be a driver or a barrier towards the ecological transition;
- Mobility – urgent to deepen the discussion and to understand the main barriers faced by the population in the adoption of alternative ecological transportation.
- Food sovereignty – engage farmers, food chains and local markets towards sustainable agriculture practices with emphasis in organic farming, revitalising the agriculture sector - the interviewee understand this topic as the biggest challenge of the Portuguese society towards the ecological transition, since recovering food sovereignty is crucial to tackle with future socio-ecological challenges and reduce food dependence form the exterior.

4.2.3. Odemira[19]

4.2.2.1. Sociodemographic

Population structure by sex, age group, educational level and ageing

The Odemira population's structure by sex differs from the national profile, since males are more prevalent (55.3%) (Pordata, 2020). Despite this, the territory presents a higher percentage of population above 65 years old (27.3%) (Pordata, 2020), which makes the ageing of population even more evident: only 10.9% of the population are 0-15 years old, with 225 elderly per 100 youth (Pordata, 2021a). Besides being a coastal territory, it is integrated within the region of Alentejo, which have been facing a depopulation phenomenon and growing ageing, with significant difficulties in attracting people, a result of the demographic and multifactorial 20th century dynamic, that mainly concentrated population in the two metropolitan and coastal areas of the country, Lisboa and Porto (Guimarães et al., 2013; Ribas-Mateos, 2015).

[19] In Odemira, 2 interviews were collected.

The social conditions of senior citizens of the municipality are low wages, difficult access to healthcare, physical isolation, mobility impairment, loneliness, and low education levels. In Odemira, the rate of school evasion is high, and there is a scarcity of activities outside of school hours, as well as considerable exposure to risky and dangerous situations (A. C. Oliveira et al., 2015). Additionally, Odemira also experiences a lower life expectancy than the global national, 80.2 years (INE, 2019b), which may be related to the lack of health infrastructures and the insulation weight that characterises the Alentejo region (A. I. Ribeiro et al., 2016; Vidal et al., 2018).

Most of the population held the basic education level (47.7%) in 2021, and 15.2% holds no diploma or primary education. Only 10.7% hold an university degree (Pordata, 2022g).

Unemployment and income

The social diagnostic of Odemira conducted in 2015 revealed that women are more affected by unemployment than men, respectively 16% and 11,6% (A. C. Oliveira et al., 2015), which is quite above the national rate. The purchasing power in the municipality is 71,8 % of the national average. Even though it has been improving over the decades, characterising the most significant improvement in Coastal Alentejo, this region presents the lowest purchasing power (A. C. Oliveira et al., 2015).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Odemira is presented in Table 14. Even facing data scarcity, Odemira faces sociodemographic challenges that highlights the southern European trend of ageing. Alongside, it makes the challenges that low-density territories face clear, located in geographical areas experiencing depopulation, low education level, a reduced life expectancy when compared to the national average (despite the possibility of this not being significant) and few job opportunities, expressed by the high unemployment rate. However, and due to the combination of these factors, this territory may be of utmost relevance to enhance a transformational change, as a case-study.

Table 14 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Odemira

Vulnerabilities	Risks	Opportunities
Ageing	Climate change impacts are more intense; lack of attractivity for younger generations	Revitalise the territory; attract youngers
Depopulation		

4.2.3.2. Natural resources

4.2.3.2.1. Secondary data on natural resources

Land use

Odemira is considered one of the most rural territories in mainland Portugal, since one-third of the economic activities are occupied by the primary sector (agriculture). It encompasses 267,66 km^2 of agricultural land, 210,34 km^2 of pastures, 118,84 km^2 of agroforestry systems, 958,39 km^2 of forests, 124,53 km^2 of scrubland, 5,3 km^2 of sparse vegetation, 2,94 km^2 of wetlands (INE, 2020).

Water resources

The Odemira territory comprises 19,12 km^2 of water masses (INE, 2020). By being in the coastal area of the Alentejo region, Odemira holds 12 km of beaches that are proper for bathing due to their good quality water. Despite the sea, the Mira River in the territory also plays an important role on the hydrography of the region. It is born in the Serra do Caldeirão mountain range and runs mainly in the direction southwest-northwest throughout its 130 km towards the beach of Vila Nova de Milfontes. The Mira River watershed is limited to the North by the river Sado watershed, to the east by the Guadiana river watershed, to the South by the Algarve streams watershed and to the west by a coastal strip that leads to the sea. The main tributaries of the Mira River are the Ribeira do Torgal stream and the river Luzianes, Perna Seca, Macheira, Guilherme e Telhares. The dam of Santa Clara-a-Velha is claimed to be a reservoir responsible for the development of the coastal area; it is responsible for supplying most of the water for drinking purposes, besides a series of channels for the intensive agriculture that takes place in the whole Odemira region (APA, 2016).

Minerals and deposits

The geology of the region Odemira-Cercal is composed of the structure of the Cercal anticline and overlapping formations of Abertas and Mira. The Cercal Anticline sequence is volcanic-sedimentary. There is a tremendous geological heritage in the Odemira region, from Cercal to Santa Clara-a-Velha and on the Coast from Porto Covo to Odeceixe. Emphasis should be given to coastal cliffs, outcrops from the Fysch group (Mira and Brejeira outcrops) and near São Luis, landscapes from river Mira's mouth, Cercal mines, and more.

In the Cercal-Odemira region, dozens of small mines are inactive and of non-economic interest, namely iron, manganese, magnesium, copper, lead and barium. The lithology of the volcanic-sedimentary complex host most of the mines. Until the 1950s, 128 mines were

mapped, some from roman times. In 2001 the oven at the company Siderurgia Nacional was closed, thus leading the company Empresa Mineira da Serra do Cercal to stop the extraction of iron and manganese produced at the Rosalgar mine - it was a small mine extracting 24000 tons of minerals/year. The Cercal-Odemira region was identified as having iron and manganese of five different kinds, besides philonian deposits (Serra da Mina and Rosalgar) of paramount importance, stratoid-type mineralisations, schist impregnations, Cenozoic sandstones, among others. Evaluation of deposits done in the 1950s indicated 4,65 Mt of mining reserves (43% Fe, 8% Mn and 14% SiO2) distributed across the following sites: Rosalgar 2,2 Mt, Serra da Mina 1,25 Mt and Serra da Velha 1,2 Mt. The sulfide deposit of Salgadinho is the most important mine of the Cercal region, however, with no economic interest and in a prospection phase. The Torgal deposit in the filonian presents about 5800 t with 13,2% Pb and 6,4 Zn, 0,6 % Cu and 153 ppm Ag and about 3200 t with 19,5% Pb, 6,8% Zn, 0,2% Cu and 185 ppm Ag (Rosa et al., 2013)

Socio-environmental conflicts

Regarding the socio-environmental conflicts in the region of Odemira, a source of pollution derived from agro-industrial production was identified. This activity is based in the intensive use of water[20] that results in the contamination by oil-based or other chemical fertilisers:

- air pollution, including pesticides harmful to sensitive local species;
- water pollution, since contaminated water overflows natural water bodies;
- soil pollution due to the chemical substances, disposable plastic materials employed (greenhouse covers, pots, tubes, wires, boxes) and production of waste;
- beach and ocean pollution due to the contaminated water runoff and plastics which invariably end up in seas and oceans.

This public and private conflicts arise from pesticide and fertiliser-contaminated streams (APA, 2016). Toxicological studies pointed to the Brejo do Cagarrão as a moderate to a high polluted swamp, not reaching the "good" ecological status (C. S. L. M. Silva, 2012). In 2019, sea contamination from agricultural social housing caused the beaches of Zambujeira do Mar and Alteirinhos to suspend their blue flag status temporarily (C. Dias, 2019).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Odemira is presented in Table 15. Odemira holds a long tradition of agriculture practice, and its history and potential should not be neglected. This can be done by revising the farm policy, perhaps at regional level, by promoting local food chains. With this revision,

[20] This problem has been previously identified in the pilot of Portugal and it appears to be one of the main challenges of the country that is directly linked with climate change impacts and adaptation.

it should be important to discuss and incentivize local farmers through support in the transition away from chemical agriculture. This will significantly reduce the impact of pollution in air, soil and water, reducing economic costs and minimising the risk of problems in the tourism sector, since some beaches are being contaminated. Through the support of conservation and climate-friendly farming, the agriculture activity of Odemira can be an example regarding climate-change mitigation and adaptation strategies based on sustainable farming practices.

Table 15 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Natural Resources of Odemira

Vulnerabilities	Risks	Opportunities
Agro-industrial pollution	Ecological destruction; poor air quality, water and soil pollution; negative impacts in tourism due to beaches contamination affecting the economy	Implementation of sustainable farming systems; Support local farmers practising more sustainable growing methods by buying from a neighbourhood market; revise farm policy
Water inefficiency	Harmful climate change impacts; high-costs economic costs	Implementation of efficient systems of use of water sources

4.2.3.2.2. Primary data: Social perceptions on natural resources

The perceptions about natural resources in Odemira are framed by two interviewees. Air, forest, sunlight, plants, soil, beach, oceans, landscape and cork are understood by both interviewees as the natural resources most important in the territory. Regarding the availability and scarcity of natural resources, only one interviewee answered:

"Abundant sun for solar panels, too much for the human body, landscape in danger of extinction due to economic interests, cork, abundant ocean, abundant beach." (Portuguese male representative of an economic group, 28 years old, Odemira)

The interviewee's answer focus on the availability of natural resources, which identifies the territory's potential for the energy transition – abundant sun and oceans – but also some risks, such as the impacts of economic interests on the landscape.

Concerning the environmental conflicts in Odemira, all those mentioned by the two interviewees are related to the negative impacts of economic interests through natural resources exploitation:

"Conflicts between the preservation of an area extremely rich in natural values, with an extraordinary landscape and the existence of intensive agriculture. This type of agriculture, apart from all the problems arising from intensive use of the soil, the use of agrochemicals and degradation of the

landscape, is also causing social problems associated with the mainly migrant workforce." (Female municipal technician, 64 years old, Odemira)

"Mining, eucalyptus plantations, land privatisation." (Portuguese male representative of an economic group, 28 years old, Odemira)

Despite being different forms of conflicts, they have in common the economic benefits that can be derived from it: the exploitation of the natural values in the region, the intensive agriculture to increase the yield of the land and improve productivity – mainly due to exploited migrant workforce -, the exploitation of minerals, the eucalyptus plantation with a very significant cost-benefits to its producers and the privatisation of land, and consequently, the privatisation of natural resources and the reduction of access to them. These are conflicts already identified through secondary data namely the pollution impacts of intensive agriculture and the contamination of water sources in the region.

4.2.3.3. Socio-environmental concerns

4.2.3.3.1. Secondary data on socio-environmental concerns

Climate-related economic losses

During the last 25 years, the municipality of Odemira has been affected by critical climatic events such as intense precipitation causing floods, intense winds provoking tree falling, meteorological conditions conducive to forest fires, and the Hercules storm. The significant climatic impacts observed in the municipality are high temperatures and heat waves, intense precipitation, storms and drought (APA, 2016).

A potential increase in temperatures is expected, especially maximum temperatures between spring and autumn. Furthermore, an increase in frequency of heat waves and intense or very intense precipitation events is expected. Despite the uncertainty concerning such changes, a sea level rise can present important challenges in the municipality coastal zones. APA (2016) highlights the importance to analyse, develop and implement climate adaptation measures to increase resilience and take associated opportunities concerning the changes, given that their impacts affect not only the territory, but also natural and social systems in their environmental, social and economic dimensions. The municipality recognises the adoption of mitigation measures "equally essential, namely the reduction of Greenhous Gas emissions.

Precipitation

Annual average precipitation levels range between 600-800 mm. Between November and April there is a typically Mediterranean torrential rainy season, while maximum precipitation happens in December. Climatic models predict a potential decrease in total annual precipitation for Odemira. (APA, 2016).

Farming types, fisheries, and scales of production

The activities related to the primary sector in Odemira are agro-forestry-based. The extractive industry is inexistent, and fishing has an irrelevant weight regarding the total population employed. In the last decade, a tremendous financial investment has been made in intensive agriculture to export. This sector's gross value added (GVA) varied by 58,7% from 2004 to 2012 (A. C. Oliveira et al., 2015).

This municipality presents a high monthly payment (965,20€) for agriculture, animal production, game and fishing activities when compared to the national average (A. C. Oliveira et al., 2015). Despite the success of intensive agriculture on an industrial scale carried out in the coastal area, in the countryside region of the county, traditional agriculture based on the forest is being lost and seeking technology to be economically sustainable.

According to the social diagnostic (A. C. Oliveira et al., 2015), there are fewer agricultural jobs available. A reduction in the temporary crops from 2009 to 2019 was observed, including cereals, wheat, rye, barley, oats, triticale, corn, rice and other cereals, namely from 274 ha to 169 ha (INE, 2022).

There was minimal information about organic agriculture in the county. In 2009, there was no record of organic farming in Odemira, while in 2019, 4 hectares of temporary crops were recorded (INE, 2019a). The region has a few organic agriculture projects, such as the Tamera community, 25 km northern of Odemira (Esteves, 2020). Esteves (2022) states that, as a significant bulk buyer of organic and biodynamic produce in the region, Tamera influences the production choices of neighbouring farmers. It also promotes local fairs and provides training and consultancy services in organic agriculture. Nevertheless, organic agriculture seems to be for a selected group of people who can afford better-quality food. Its expression may be reduced in the face of mainstream intensive agriculture.

Energy

In Odemira, Propane and Butane gases are used substantially in residences and services. The energy matrix of the municipality is composed mainly of diesel due to transportation, followed by electricity related to services. Biomass is still predominant in residential heating and natural gas in agriculture and fishing activities (APA, 2016).

Data on the electricity consumption per economic sector in Odemira by DGEG (2022) has shown that domestic use is the most consumptive use (37.800.429 kWh), followed by agriculture (21.324.665 kWh), activities related to personal services (5.757.934 kWh), accommodation (5.063.165 kWh), public lighting (3.342.463 kWh) and others, totalising 92.628.128 kWh in 2020. Specific information on how the energy system is managed was not available.

The municipality recognises in its municipal strategy for climate change adaptation the need for economic sustainability and maintenance of public equipment, through measures which promote better energy efficiency in the buildings. The municipality, in partnership with the Instituto Superior Técnico, was developing a plan for the sustainable energetic development of Odemira, but this document is not available online (APA, 2016).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Odemira is presented in Table 16. The main socio-environmental concerns in the region relates with agriculture sector and energy consumption. There are several challenges in the agriculture of Odemira: one related to human resources and the fewer availability of jobs; a second related to the intensive agriculture practice and the lack of strategies regarding organic farming; and a third related to the negative impacts of intensive agriculture and a higher vulnerability to climate change. Regarding energy, the high consumption of fossil fuels, as the predominant source use in Odemira, implies the development of local strategies towards the adoption of clean energy.

Table 16 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Socio-Environmental Concerns of Odemira

Vulnerabilities	Risks	Opportunities
Fewer agricultural jobs available	Food dependence of exterior; Unemployment	High tradition of agriculture and land available
Climate-change	Intensive agriculture; food insecurity	Analyse, develop and implement climate adaptation measures to increase resilience and take associated opportunities concerning the changes
Divestment in traditional agriculture	Dependence on intensive agriculture which is highly pollutant	Develop technology to be economically sustainable; Improve local organic farming chains
High consumption of fossil fuel	Increase in GHG emissions and air pollutants; Impacts on public health	Develop measures which promote better energy efficiency in the buildings and clean energy

4.2.3.3.2. Primary data: Social perceptions on socio-environmental concerns

Odemira socio-environmental risks identified by the interviewees are deeply associated with the socio-ecological vulnerability of the region already illustrated by the secondary data: loss of biodiversity, groundwater pollution, landscape degradation, drought, desertification, fires and water shortage. To face these challenges, the ecological transition appears as part of the solution and as a strategy, despite being differently understood by the interviewee:

"…take the human being off the top of the pyramid, turn the pyramid into a circle, putting the different species on the same level and reconfiguring the role of the human being by putting them at the service of other species." (Portuguese male representative of an economic group, 28 years old, Odemira)

"Transition from unsustainable production and consumption systems to others that guarantee development without destroying the environment." (Female municipal technician, 64 years old, Odemira)

The first understanding reveals a paradigm rupture, a profound change in humanity's position concerning non-humans, moving from a superior position to a relational one, even at the service of the non-humans. The second understanding is more aligned with the sustainable development discourse, in a logic of passiveness where the main goal is to not cause damage to the environment through a change in consumption patterns.

When it comes to identifying who is responsible for the ecological transition, both interviewees stated that everyone should do their part, individually and collectively. However, the recognition of the biggest obstacle to the ecological transition is differently understood:

"The hypocrisy of the policies adopted, "Do as I say, not as I do." (Female municipal technician, 64 years old, Odemira)

"Mechanistic world perception, separation of human and Earth. Manifestation of this separation in extractive companies, dysfunctional governments or toxic relationships between humans." (Portuguese male representative of an economic group, 28 years old, Odemira)

The municipal technician identifies the mismatch between policies and practical examples/actions of those responsible for their design, which she considers "hypocrisy". In the case of the representative of an economic group, the issue is more complex and relies on the ontological separation, mechanic as he states, that legitimises extractivist activities exacerbated by certain companies, governments and humans. And this difference regarding the main barriers is not unique. The challenges that need to be considered towards the

ecological transition, from the point of view of the interviewees, are as follows: for the municipal technician the main challenge is the encouragement of local products consumption, the decentralisation of services to minimise travel and the creation of an efficient public transport network; for the representative of the economic group the main challenges are the socio-cultural integration (of migrants, especially those exploited in the agriculture sector), the access to land, housing and the droughts. These two visions of the ecological transition and socio-environmental risks reinforce the need to consider different points of view in environmental decision-making, which will contribute to enriching the debate and avoiding the exclusion of parts.

4.2.3.4. Sociocultural ecological behaviours

4.2.3.4.1. Secondary data on sociocultural ecological behaviours

Waste production and treatment

In 2020, 1542 tons of recyclable materials were collected (Pordata, 2022h). In 2018, the amount of urban waste destined to landfills was 70.8% and 29.2% to organic, energetic and multimaterial valorisation. However, in 2020, this situation worsened: 89.2% of the urban waste had landfills as final destiny and only 10.8% was valued.

Mobility

The total emissions by car traffic are 1067 tons of carbon dioxide equivalent (CO_2e). In 2018, the consumption of fuel per person (tep/hab) in Odemira was 0,558, while in 2020, it dropped to 0,468.

The offer of public transportation is somewhat limited, with only four lines. Challenges include the absence of services securing the connection between the main urban settlements, reduced frequency of the service (often once daily), scarcity during the day and absence during weekends and out of school periods. Odemira is also poorly connected to the train system. Grândola is the only train station for such a large county (A. C. Oliveira et al., 2015).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Odemira is presented in Table 17. Recent data shows a concern regarding waste treatment in the region that should be monitored. A significant increase in urban waste destined to landfills has been observed. This brings some challenges to the

local circular economy and impacts in air quality through the emission of pollutants that are triggered by this type of waste destiny and treatment.

The second vulnerability is associated with the lack of mobility sustainable alternatives in the territory, a situation already identified in the previous pilot (Portugal) that mainly derives from the lack of railroads. Since most of the daily travels occurred within the territory it can be an opportunity to develop a municipal public transport network that can reduce the difficulty to access it and, consequently, reduce the road traffic through private passengers' cars.

Table 17 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Sociocultural Ecological Behaviours of Odemira

Vulnerabilities	Risks	Opportunities
Increase of waste destined to landfills	Air and soil pollution	Develop local strategy to reduce urban waste production; Increase awareness in waste treatment and recycling
Lack of public transports	Increase GHG emissions and air pollutants; Impacts on public health	Develop a municipal public transport network

4.2.3.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

The adoption of ecological behaviours is a complex issue. The interviewees believe that contact with nature since childhood and formation on ecological topics is the most effective strategy to raise ecological awareness. But this should be done, explained both interviewees, through concrete actions involving communities and the territories to enhance regeneration and reconnection with Nature. As the municipal technician states:

"Only those who know, love and protect it" (Female municipal technician, 64 years old, Odemira)

The adoption of ecological behaviours is related to the need to acquire sustainable products. However, in a society experiencing socio-economic inequalities and difficulties to have a well-paid job, which can be a barrier, the interviewees joined the expensiveness of these kinds of products and the little supply due to lack of conditions given to producers as other limitations. Nevertheless, based on the interviewees discourses it is possible to identify the main barriers associated with the adoption of ecological behaviours in Odemira (Table 18).

Table 18 – Ecological behaviours to be adopted in Odemira and respective barriers identified by the interviewees

Ecological behaviour	Barriers
Purchase of sustainable and local products	Expensive and there is little supply; Time
Use public transport	Lack of a good network
Reduction of energy consumption	Difficulties to access clean energy (reduction imposed for economic reasons)

The interviewees corroborate what has been discussed through the secondary data available: the adoption of ecological behaviours must consider that individual choices are not determinant on their own. It is important to consider the structural constraints that affect individual choices and that vary in each territory.

4.2.3.5. Experiences in Nature

4.2.3.5.1. Secondary data on experiences in Nature

Tourism

Tourism used to be a marginal sector, but it is currently a very relevant activity. In the 1900s, several fairs were famous and attracted the masses, and coastal holidays started to popularise, starting with children's holidays (Quaresma & Falcão, 2021). The tertiary sector has been increasing due to the increase in touristic activities, rural tourism, and demand for accommodation (A. C. Oliveira et al., 2015). Zambujeira do Mar, Longueira, Almograve and Vila Nova de Milfontes concentrate most of the touristic activity (Câmara Municipal de Odemira, 2022). Parishes such as Milfontes were famous destinations for navigation and explorers from faraway lands in previous centuries. This growth is also visible in the number of tourist accommodation, that from 2011 to 2021, in ten years, increased 556.3%.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding experiences in Nature in Odemira is presented in Table 19. Based only in the tourism statistics, significant increase in tourist accommodation that can translate a greater demand of the territory can be seen. This can be a risk due to the massification of tourism, with negative impacts on the natural elements and in the territory, despite the economic benefits. To enhance a balanced growth, it would be important to respect the limits of nature and the territory by adopting sustainable touristic activities, such as ecotourism.

Table 19 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Experiences in Nature of Odemira

Vulnerabilities	Risks	Opportunities
Increase in tourist accommodation	Massification of tourism with negative impacts on natural areas in the region	Regulate tourism activities through the adoption of ecotourism practices that respect the limits of territories

4.2.3.5.2. Primary data: Social perceptions on experiences in Nature

The understanding of Nature for the two interviewees have in common the representation of something pristine, without human intervention, native, natural:

"That which exists and is alien to human intervention." (Female municipal technician, 64 years old, Odemira)

"That which is by itself. Native, natural." (Portuguese male representative of an economic group, 28 years old, Odemira)

Both definitions of Nature translate a separation of Nature from Society which, in the case of the representative of an economic group, is somewhat contradictory since he explained that this separation is based on the ontology that legitimises the exploitation of non-humans from humanity. Therefore, this supports the theory of Nature as a sociocultural construction whose complexity must be considered in the definition of ecological measures. The representation of the interviewees regarding Nature is presented in Figure 19.

Figure 18 - Words attributed to Nature by the Odemira interviewees

All words have positive and translate Nature components – fire, air, water, earth – but also the values associated – gratitude, balance and love. It is also visible the wealth, chosen by the municipal technician which may translate into the instrumental value of Nature. The instrumental value – cultural ecosystem services - recognized by the municipal technician is also implicit in the description of her experience when she is in contact with Nature:

"Enjoy activities that promote physical well-being and emotional balance." (Female municipal technician, 64 years old, Odemira)

While a more relational approach is seen in the description of the other interviewee, with a focus on care (respect), humility (moral recognition) and beauty (aesthetic):

"Humility, purpose, care, planting, food, beauty." (Portuguese male representative of an economic group, 28 years old, Odemira).

4.2.3.6. Inclusiveness

4.2.3.6.1. Secondary data on inclusiveness

Vulnerable groups

Three social groups are mentioned as vulnerable in Odemira: the older people, the youth, and the immigrants. The social conditions of senior citizens of the municipality are low wages, difficult access to healthcare, physical isolation, mobility impairment, loneliness, and low education levels (A. C. Oliveira et al., 2015).

Immigrants

The territory has been dealing with current inward flows of migrants, most of them to work in the agricultural sector, with high labour demand. Agriculture workers are a significant part of Odemira's society. In 2015, the predominant nationality registered in the population was Bulgarian and Thai. Since then, this composition has changed (A. C. Oliveira et al., 2015). Most immigrants come from Asia and live in the coastal strip of the county, where most agriculture businesses need labourers. Their culture is very different from the Portuguese culture, and challenges are reported to be posed to the Town Hall to welcome and integrate immigrants while overcoming language barriers and assisting them to have adequate living conditions.

The living conditions to which many immigrants are submitted to are an ongoing discussion since many are undocumented, and there are no official numbers. Denunciations showed women subject to prostitution and workers sold for work contracts that must be reimbursed to their bosses. Social conditions are rough: Greenhouse temperatures can exceed 45°C, payment varies between 20-30 €/day, and housing is precarious. Without an agricultural development strategy capable of integrating immigrants, they cannot constitute local development agents (Palhinhas, 2019)

Gender pay gap

In 2019, women were less than half of the population of Odemira - women employees were earning 904€ and men employees 885,7€ (Pordata, 2019).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Odemira is presented in Table 20. Beyond the poor living conditions of elderly and the significant difference of income between men and women, which are transversal in the country, Odemira faces an urgent challenge related to the integration of immigrants and their labour exploitation in the agriculture sector. Despite the challenges of the integration of elderly, women, and immigrants in the process of ecological transition, the risk to human and labour rights regarding elderly can undermine this transition or its fairness. The previous issues identified regarding the agriculture sector in Odemira, fewer jobs available, water inefficiency, vulnerability to climate change and the reduction of pollution caused by intensive agriculture cannot be addressed while the work force consists of exploited immigrant workers.

Table 20 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Odemira

Vulnerabilities	Risks	Opportunities
Poor living conditions of elderly	Poor quality of life	Develop community networks and municipal integrated strategies
Labour and human right	Ecological transition supported by work without conditions that jeopardises the rights of life and workers	Development agricultural strategy capable of integrating immigrants
Structural gender inequalities	Discriminatory ecological transition	To create a system of monitorisation that enables to understand which social groups are included and excluded

4.2.3.6.2. Primary data: Social perceptions on inclusiveness

Despite being aware of the environmental decision-making related to natural resources management in Odemira, the interviewees' perception of the inclusion of citizens into this dynamic is a very critical vision of traditional processes due to the discredit and lack of trust in politics in general. This disbelieve in traditional forms of participation is reaffirmed by both of the interviewees:

"I believe that participation, by anonymous citizens, is often to fulfil formalities." (Female municipal technician, 64 years old, Odemira)

"Signing petitions? Sharing on Facebook? is that participation? How to participate if no one asks, if it's not open?" (Portuguese male representative of an economic group, 28 years old, Odemira).

In the discourse of the representative of an economic group is visible the concern in the exclusion issues that may derive from these traditional forms of participation, since both interviewees recognize the need to integrate socio-cultural-eco plurality, from bottom to top and from left to right, i.e., no one should be left behind.

4.2.3.7. Synthesis

According to the Odemira socio-ecological description in the Grant Agreement (GA, 2021, p.17-21), eight main topics were identified as the main concerns to tackle the ecological transition: removal of invasive species, fisheries, the safeguarding of biodiversity, alternative energies (including the production of wind and solar production, alternative mobility, water efficiency, waste optimisation and collection, municipal plan for social integration of farm labourer immigrants that includes participatory actions and increase of local participatory citizen actions. The secondary and primary data previously analysed reinforces some of these concerns, which were expressed by the local diagnosis and stakeholders, but does not reveal the preoccupation with the need to remove invasive species and with fisheries.

From the data analysed, the main concerns in Odemira were related to the agriculture sector, subdivided in labour force and climate change impacts; and mobility, related with the need to create alternative solutions to road traffic.

Some highlights regarding Odemira socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Labour and human rights – the unsustainable and inhumane situation lived by immigrants in the agriculture sector should be a priority. An ecological transition cannot be achieved based on the exploitation of workers, which is corroborated by the municipal technician of Odemira.
- Climate action – the agriculture sector highly needs a clear strategy that considers the transition to sustainable forms of farming, food sovereignty, the use of water and the adaptation to climate change;
- Natural resources – the significant growing of tourism activity in the region implies the development of strategies to protect the natural elements;

- Mobility – Odemira, such as several municipalities in the interior regions and Alentejo, have a lack of public transport that makes the adoption of sustainable mobility and the reduction of private cars for travels within the territory – this is a barrier already identified by the interviewees' discourses that should be considered;
- Disbelieve in traditional forms of participation – the interviewees revealed that these forms should be reformulated since they exclude and are not effective, being a simple formality.

4.2.4. Tavira[21]

4.2.4.1. Sociodemographic

Population structure by sex, age group and ageing

The municipality of Tavira is located on the Algarve coast of Portugal and counts a population of 27 475 inhabitants in 2021 (Pordata, 2022g), of which 50,7% were women and 49,3% were men, making Tavira the eighth-most populous county in the Algarve region.

Regarding the population distribution by age group, 11,6% of the population is between 0-14 years old, 58,9% is between 15-64 years old, and 29,5% is above 65 years old (Pordata, 2022g). The ageing index (number of citizens over 65 years old for a hundred citizens under 15) has been increasing since 2001, reaching 253,8 in 2021, indicating a significative predominance of older individuals in the municipality (Pordata, 2021a).

Income

The *Coefficient of Gini* in Tavira recorded 40,6% in 2020, which is a number inferior to the national, indicating a relatively egalitarian distribution. However, a contradiction to this measure can be found with the P90/P10 index, that for Tavira is 7,2 compared to 6,7 at the National level, which means that the 10% richest earn 7,2 times more net income than the 10% poorest, which places Tavira as a more unequal than the national average.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Tavira is presented in Table 21. Tavira's sociodemographic trend is aligned with the Portuguese reality but also with Odemira, even being a coastal municipality in a tourist region of Portugal. The ageing of the population is the major concern regarding

[21] In Tavira, 6 interviews were collected.

the data available, posing a risk of a higher vulnerability to climate change impacts – especially in an area highly exposed -, being an urgent need for the adaptation to future scenarios where the territory revitalization could be done by attracting youngers.

Table 21 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Tavira

Vulnerabilities	Risks	Opportunities
Ageing	Climate change impacts are more intense; lack of attractivity for younger generations	Revitalise the territory; attract youngers;

4.2.4.2. Natural resources

4.2.4.2.1. Secondary data on natural resources

Water resources

Tavira holds a variety of watercourses, the most known is the Gilão river - also called Séqua River and Ribeira da Asseca. It is the most important river in the hydrographic system of Ribeiras of Eastern Algarve, with a source in Serra do Caldeirão, and it meets the Atlantic Ocean in Tavira. There are two other streams, Ribeira de Odeleite and Ribeira da Foupana, that cross a uniform and diverse landscape (*Network Natura 2000*), playing an essential role in supporting the area's rich biodiversity. Another river of importance in the county is the Ribeira do Beliche. Finally, up in the county's mountains is the Fonte Férrea de Cachopo, a water source that gave origin to a small park.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Tavira cannot be presented due to the absence of data regarding the socioenvironmental conflicts and minerals and deposits. However, it should be stated that the municipality holds a significant amount of water sources that should be sustainably managed to avoid water scarcity due to the vulnerability of the region to heat waves.

4.2.4.2.2. Primary data: Social perceptions on natural resources

The social perceptions of Tavira's natural resources, as identified by the interviewees, are consistent with the most important ones in their territory: water, soil, sun, and trees. However, this importance is somewhat related to the availability or scarcity of the natural resources. The interviewees consider water to be the scarcest natural resource, with negative impacts on biodiversity, agriculture, and tourism activities due to the effects of

climate change and droughts. On the other hand, sun and sand are identified as the most readily available natural resources in Tavira.

Regarding socio-environmental conflicts, the respondents mainly focus on those related to avocado plantations, which consume a significant amount of water and have other impacts on the ecosystems. They denounce the economic interests behind these plantations:

"Yes, avocado plantations that deplete the water that is 100% important, above all the deforesting and lack of environmental inspection; happen to landlords (autocrats) without consulting anyone, with only profit as their main interest." (Portuguese male, 75 years old, Tavira)

According to the interviewee, these types of conflicts emerged from citizens who are aware of the environmental impact of these activities and are dedicated to changing the course of intensive agriculture that is shaping Tavira's landscape.

4.2.4.3. Socio-environmental concerns

4.2.4.3.1. Secondary data on socio-environmental concerns

Climate-related economic losses

Tavira, part of the Algarve region, is considered highly exposed to climate variability, especially in a scenario of climate change. Climate change has been felt in the region through heat waves, forest fires, floods and flash floods, overtopping and coastal erosion. These changes will impact different areas and socioeconomic sectors in the region. Sixteen municipalities form the region: at the moment, Loulé, Lagos and Faro are the only municipalities presenting a climate adaptation plan or strategy, while Tavira's plan is ongoing. In the specific case of Tavira, the projection shows that the territory is particularly sensitive to decrease water availability, high temperatures, floods, and sea level rise, amongst others. Water availability depends on precipitation, which tends to decrease as drought duration and intensity increase. Saline intrusion and other phenomena are going to diminish the availability of groundwater and surface water (L. F. Dias et al., 2019).

Precipitation

The average annual precipitation is 576 mm, distributed across 65 days between October and April. Dry months are from May to September (L. F. Dias et al., 2019).

Farming types, fisheries, and scales of production

The primary sector in Tavira represents 8,5% of the employment, a higher percentage than the regional and national levels, being responsible for around 10% of Tavira's economy (Serpa et al., 2005).

Industrial agriculture is predominant in the territory. The county's area has a significant portion of the mountain range, so agriculture plays an important role - fruit orchards, honey, and cork are essential products, besides the fishing and aquiculture productions. Salt production is, up to current days, another important economic activity developed on the coast. On the coast and islands, tourism is the main economic activity. The medronho brandy and other products were traditionally produced in Tavira, and trees in the mountain range were used to produce wood charcoal. It is also relevant to say that a grass species popularly known as Morraça (*Spartina maritima*) was traditionally removed from shallow estuary waters and used as animal fodder.

In terms of organic farming, it is not a mainstream practice. Production is made on a small scale, while industrial agriculture is on an industrial scale. At least three organic farms in the county produce and sell locally. Data from 2009 revealed that Tavira had 11 ha of organic production, of which 2 ha of olive trees, 5 ha of nut trees, 1 of citrus trees, and 2 ha of fresh fruits.

Energy

Regarding energy consumption, Tavira registered 28 679 energy consumers in 2019, of which around 24 422 are domestic, 3 456 are non-domestic, 418 are industries, and 383 are agriculture. In the same year, the total electricity consumed in the country reached 112 371 406 kWh. In 2021, Tavira sold 91 tons of butane gas, 876 tons of propane gas, 19 522 tons of diesel (multiple ends) and 3 643 tons of petrol (gasoline super, 95 and 98) (Pordata, 2022d).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Tavira is presented in Table 22. The main socio-environmental concerns in the region relate to the vulnerability to climate change impacts on agriculture, water and, consequently, population health. Alongside, the agriculture sector is mainly industrial with an insignificant presence of organic farming, impacting negatively on soil and consuming high amounts of water.

Table 22 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Socio-Environmental Concerns of Tavira

Vulnerabilities	Risks	Opportunities
Climate change	Intensive agriculture	Analyse, develop and implement climate adaptation measures to increase resilience and take associated opportunities concerning the changes
Reduced presence of organic agriculture	Dependence on intensive agriculture which is highly pollutant	Develop technology to be economically sustainable; Improve local organic farming chains

4.2.4.3.2. Primary data: Social perceptions on socio-environmental concerns

The environmental risks in the Tavira region are mostly related to water scarcity. The interviewees mentioned fires and water shortages as well as desertification, loss of biodiversity, and social inequalities - all of which could be linked to the impacts of climate change.

Regarding the ecological transition, two interviewees had never heard of it. The other interviewees' understanding of ecological transition is mostly related to the need to change behaviours and activities to respect ecosystems. However, one interviewee mentioned that this ecological transition starts from an inner experience and then becomes a collective philosophy of life:

"I went through an ecological transition when I had an illness, I started to change my lifestyle, it was a mental and social change, I became more aware of what the world is like and how I participate in it. I wasn't the only one who went through this. So I went to Europe's first ecological demonstration, when the first citizens began to object to the comforts of Western life when we realized how much they cost everyone. Pandemics also come from these imbalances." (Portuguese male, 75 years old, Tavira)

According to the interviewees, the responsibility for this transition lies with all sectors of society. Only with this collective commitment is it possible to successfully implement this transition. However, similar to other pilots, economic factors and the difficulty of giving up personal comfort appear as the main barriers to the ecological transition for the interviewees.

4.2.4.4. Sociocultural ecological behaviours

4.2.4.4.1. Secondary data on sociocultural ecological behaviours

Waste production and treatment

Solid waste collection and transportation to the Transfer Station of Tavira, which the ALGAR company operates, is the responsibility of the local municipal company TaviraVerde. Specific residuals are collected and followed to the station (Câmara Municipal de Tavira, 2023). There are 1384 *Ecopoints*, bins and underground storage for waste and disposal of urban waste throughout the county. Recyclable waste is a responsibility of ALGAR and can be disposed of at 253 *Ecopoints*, as well as they offer a waste collection service for local commerce, the *Algarlinha*. In 2020, Tavira produced 2083 tons of waste, of which 78% went to the landfill, 9,9% was composted, and 12,2% was recycled (Pordata, 2022k).

Mobility

Concerning mobility patterns, approximately 80,5% of inhabitants' travels are within the county of Tavira, predominantly cars, including public transportation. In Tavira, 66% of residents use private cars, 3% buses, 2% trains, 5% bikes or bicycles and 21% walk to work. Tavira has a total of 4 km of urban infrastructure for bicycles (Câmara Municipal de Tavira, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Tavira is presented in Table 23. Data on waste management reveals a concern regarding the low percentage of selective separation, which has negative impacts on soil and air pollution and, consequently, on human health. Another matter of concern relates to the intensive use of private cars for daily travel, which leads to the emissions of pollutants into the atmosphere. Even with the existence of public transport networks and alternative solutions, such as urban infrastructure for bicycles, people tend to resist adopting these habits, which is a trend already visible in the other Portuguese pilots, at the national and local levels.

Table 23 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Sociocultural Ecological Behaviours of Tavira

Vulnerabilities	Risks	Opportunities
Reduced selective waste practices	Air and soil pollution	Develop a local strategy to reduce urban waste production; Increase awareness of waste treatment and recycling
Intensive use of private cars	Increase GHG emissions and air pollutants; Impacts on public health	Develop sustainable mobility patterns and increase awareness

4.2.3.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

The interviewees presented some suggestions to improve ecological awareness, ranging from formal education to informal methods. While environmental education programs can be useful at an early age, television remains effective among older age groups. Among the strategies proposed by the interviewees, informal methods appear to be more suitable for children, especially in kindergartens, where teachers play a decisive role in contributing to future adults who respect the planet's limits.

When considering whether the interviewees are able to adopt a more frugal lifestyle, some of them react by saying that they already have, namely by reducing water and energy consumption and being more mindful of their usage. However, they clearly stated once again that structural difficulties are a barrier to changing behaviours:

"However there are some difficulties of course, a lot of things in supermarkets are packaged in plastic, there is little bulk, little urban transport network outside the big cities. And I admit that I have some disbelief in the change when I see a lot of people around me who don't know, or don't care, so for me it has to be something more from the top down and help with the changes, mandatory plastic reduction in large surfaces." (Portugese female, 34 years old, Tavira)

Another obstacle to adopting a more frugal lifestyle is the disbelief in others who are not doing anything, causing interviewees to feel a lack of support and commitment to this change. Therefore, they suggest a top-down approach, starting from macro structures and moving towards micro ones – they need role models.

4.2.4.5. Experiences in Nature

4.2.4.5.1. Secondary data on experiences in Nature

Protective functions of forests

In the city of Tavira, there is the Ria Formosa Natural Park (Natural.PT, 2023) with 17,900.77 ha which many people depend directly on it for food and work. Many tourism companies survive from it since it is a great attraction, and its health and beauty affect its touristic value, so it is socially and environmentally relevant.

Tourism

The economy of Tavira is mainly based on services and tourism (de Sousa Fernandes, 2016), responsible for revealing the importance of the tertiary sector to the municipality. In 2020, hospitality companies generated 18% of the wealth in the county, while consulting services 10%, commerce was 17%, real estate 3,9%, management and support services 4,2%, artistic

activities 3,4%, and other services 1,5%. Combined, the tertiary sector potentially generates over 58% of the wealth in the municipality.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding experiences in Nature in Tavira is presented in Table 24. Since the Algarve region economy is highly dependent on the tourism sector there may be a risk of massification that can affect negatively the natural areas, especially the natural park, on which many residents are dependent for their daily income.

Table 24 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Experiences in Nature of Tavira

Vulnerabilities	Risks	Opportunities
Increase in tourist accommodation	Massification of tourism with negative impacts on natural areas in the region and on the income of people that depend on the natural park	Regulate tourism activities through the adoption of ecotourism practices that respect the limits of territories

4.2.4.5.2. Primary data: Social perceptions on experiences in Nature

Five of the six interviewees understand nature as "everything," encompassing all life and natural phenomena, including the “work of humans and the cosmos”. This perspective is associated with the interdependency category, which was previously identified in the literature and reflects an ecocentric paradigm. In contrast, the NGO representative view nature as something pristine and untouched by humans, which is associated with the separation category already identified in the literature review.

“For me, nature is the most natural thing in the world. When we are in places where the human hand has not "touched".” (Portuguese female, NGO representative, 34 years old, Tavira).

This interviewee perspective aligns with a "preservation" paradigm that aims to protect nature from human use and keep it in a wild and unmodified state. The interdependency between all elements was recognized by most of the interviewees, and this is reflected in their responses when asked about what comes to their minds when they think about nature (see Figure 20).

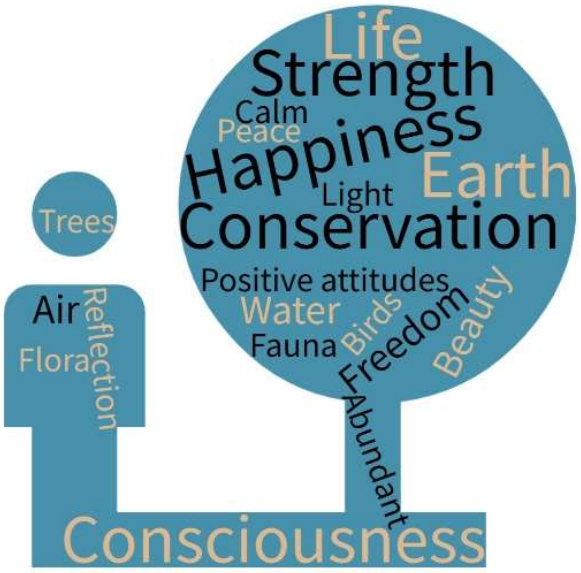

Figure 19 – Words associated to Nature according to the interviewees

Nature is a space of calmness and reflection that enhances positive attitudes and peace, where one can appreciate the air, the life, and the freedom it provides. Furthermore, it is important to recognize its strength and resilience in facing adversities, which depends not only on conservation but also on our consciousness. This viewpoint is evident in the speech of an interviewee:

"Being in contact with nature is being in balance with myself. It's feeling like I belong to this world, and how beautiful it is. In emotional and psychological terms it is undoubtedly very important to me. I believe that if everyone spent more time in contact with nature, and with themselves, the physical, emotional and psychological stability of society would be much greater!" (Portuguese male, 75 years old, Tavira).

The benefits of being in contact with nature go far beyond the physical and psychological dimension, according to this interviewee. It a way to rebalance, to feel part of something bigger, to reframe our identify, individual and collective, and to be stable as society.

4.2.4.6. Inclusiveness

4.2.4.6.1. Secondary data on inclusiveness

Vulnerable groups

The vulnerable groups identified in Tavira are socially fragile families, the unemployed, children, the elderly and ethnic minorities. The municipality counts on an emergency residency for people or families in situations of vulnerability, with a capacity for 25 people; a residency for reintroducing narcotics addicts into the community; and an apartment for

vulnerable youth, with a capacity for four young persons. In 2011, more than half of the unemployed professionals were from civil construction, hospitality, restaurants and commerce, and agriculture sectors (Custódio & Vieira, 2017).

Immigrants

Tavira's percentage of foreign citizens with residence permits was 13,3% in 2008 and doubled, reaching 26,3% in 2021, which might be explained due to its tourist attractivity, especially for retired European couples. Immigrants are mainly from the United Kingdom, Brazil, France, Nepal, other Asian countries, and other European countries. In 2011, central parishes hosted more immigrants from European countries, while the inner part of the county showed immigrants from Asia or East Europe, the latter composed of younger people and children. The immigrants are mainly employed temporarily (outsourcing) and underemployed, especially in the agricultural sector (silviculture) (Custódio & Vieira, 2017).

Gender pay gap

In 2021, 43,1% of the unemployed were men while 56,3% were women and only 41,52% of women were economically active, compared to 49,66% of men (Pordata, 2022i).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Tavira is presented in Table 25. Tavira presents a paradox regarding immigration: from one side there is a considerable amount of wealthy retired immigrants that chose the territory to live in due to the favourable climatic conditions; on the other hand, there are also immigrants who experience socioeconomic privation that chose this territory for the jobs opportunities in the tourism and agriculture sector, being exposed to situations of vulnerability regarding work conditions. This is a trend visible in Odemira and therefore should be addressed as a socio-environmental injustice. Also, as a common trend in the previous pilots, the gender gap is visible not only at the income level but also at the unemployment one.

Table 25 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Tavira

Vulnerabilities	Risks	Opportunities
Labour and human rights	Ecological transition supported by work without conditions that jeopardizes the rights of life and workers	Develop an agricultural strategy capable of integrating immigrants
Structural gender inequalities	Discriminatory ecological transition	To create a system of monitorisation that enables one to understand which social groups are included and excluded

4.2.4.6.2. Primary data: Social perceptions on inclusiveness

The responses regarding inclusiveness in Tavira do not allow for a precise description of this reality in the territory. Only one interviewee stated that they were aware of decision-making processes regarding natural resources. This is similar to the awareness of opportunities to intervene, as only the same interviewee was aware of the possibility to do so (a 75-year-old Portuguese male from Tavira). He states that the reason for this disinterest relies on the lack of interest of people in these issues.

However, the situation is quite different regarding the possibility of considering the diversity of perspectives and knowledge in decision-making processes. All interviewees recognized that by integrating more people with different backgrounds, the decisions would be richer, more effective, and realistic. When it comes to considering the voices of vulnerable social groups in these processes, two interviewees stated that this is very important but difficult since immigrants have no rights to intervene.

"Yes, as I'm an immigrant I don't have a say in that." (Brazilian female, 39 years old, Tavira)

"I do not believe, because immigrants do not have political rights, that it is only with political rights that a difference can be made." (Portuguese male, 75 years old, Tavira)

From these speeches, it can be seen that being an immigrant is still a barrier to participating and having a voice in these processes, which is directly linked to the lack of human rights. The integration of different perspectives, understandings, and ideas from all elements of society is needed for the fairness of this transition.

4.2.4.7. Synthesis

According to the Tavira socio-ecological description in the Grant Agreement, eight main topics were identified as the main concerns to tackle the ecological transition: the impacts of intensive agriculture, the solar panel installations, the loss of biodiversity, the lack of public transport, the foreign population and their rights to participate in decision processes, the climate change vulnerability, the waste management and the tourism. The secondary and primary data previously analysed reinforces all of these concerns, which were expressed by the local diagnosis and stakeholders.

Similarly to the Odemira pilot, from the data analysed, the main concerns in Tavira were related to the agriculture sector, subdivided into the labour force and climate change impacts; and mobility, related to the need to create alternative solutions to road traffic. Also, due to the increase in tourist activity, the waste generated is a matter of concern since there is a low level of waste recycled.

Some highlights regarding Tavira socio-cultural-bio specificities to be considered in the participatory process and the involvement of populations and stakeholders are:

- Climate change and droughts have a significant impact on the agricultural sector, with heavy consequences on water scarcity and biodiversity loss. Additionally, the reduced presence of organic agriculture needs to be addressed in order to minimise the impacts of climate change on the sector;
- Waste production is significantly increasing due to tourism activity in the region, which requires the development of strategies to protect natural elements. Furthermore, the municipality faces challenges with reduced selective waste separation, exacerbating the impacts of waste production;
- Mobility is a common issue in the territory, as the lack of public transport implies the use of private cars;
- Foreign population and the risk of being marginalised of participatory and deliberative processes;
- There is a lack of knowledge about the decision-making process regarding natural resources and how to intervene – which contrast to the city history of citizen engagement in environmental issue. Therefore, pilots will need to mobilise people to participate in these decision-making processes since it seems that this is not a common practice in the territory according to the interviewees.

4.2.5. France[22]

[22] In France, 2 interviews were collected.

4.2.5.1. Sociodemographic

Population structure by sex, age group, educational level, and ageing

France holds a population of 67,897,000 inhabitants, being considered the 20th most populous country in the world (Institut national de la statistique et des études économiques, 2022a). The population by sex is predominantly female (51.5%) and the age groups can be considered to be distributed in a balanced way: 0-14 (17.9%). 15-29 (17.5%), 30-44 (18.6%), 45-59 (19.9%), 60-74 (16.6) and 75+ (9.45%) (Institut national de la statistique et des études économiques, 2022d).

Regarding education level, it can be pointed out that most of the population holds a Certificate of Professional Competence (CAP), Professional Qualifications (BEP) or equivalent degree (24.7%) but almost 22% holds no diploma or primary education certificate. Only 10.5% of the population holds an university degree of 5 years and over, being more men (11.7%) than women (9.5%) (Institut national de la statistique et des études économiques, 2022d).

Following the European trend, the population is ageing and about a fifth of France's population is 65 or over, with a life expectancy of 82.7 years at birth (The World Factbook, 2022). However, it presents a significant active ageing index of 38.6%, representing the percentage of people who are more than 65 years old that live independent lives, and participate in employment and social activities, and their capacity to age actively (United Nations Economic Commission for Europe, 2019).

Unemployment and income

France experiences a percentage of unemployment of 8%, that is slightly lower in women (7.8%) (Eurostat, 2022g). Regarding mean income, 24842 euros were registered in 2021, being men those that present higher values (25241 euros) compared to women (24465 euros) (Eurostat, 2022d). In fact, inequality in living standards is slightly higher for men (4.4) than for women (4.3). They are slightly lower (3.8) for the over 65 years old population: the smaller disparity in retirement pensions, compared to the working incomes of 18-64 year olds, more than compensates for the large disparities in wealth income within this age (International Monetary Fund, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of France is presented in Table 216. The sociodemographic structure of the French population is aligned with the European ageing pattern. Despite this

vulnerability, and the risks associated with it, i.e., higher vulnerability to climate change, morbidity, and resistance to change, active elderly in France are significant, which means that they are active and that their potential should not be neglected. On the other hand, the considerable percentage of people with no education diploma is also a vulnerability, but this can be somewhat an opportunity to apply formal and informal education practices for a just ecological transition. This can be done by maximising their participation in environmental decision-making.

Table 26 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of France

Vulnerabilities	Risks	Opportunities
Ageing	Resistance to adopt ecological behaviours	Significant rate of active ageing
Low educational level		Formal and informal education for a just ecological transition

4.2.5.2. Natural resources

4.2.5.2.1. Secondary data on natural resources

Land use

The agricultural land in France occupies 51% of the territory. The country is considered the leading European agricultural power (the 6th largest exporter in the world). Wooded areas represent 31% of the metropolitan territory (Antoni & Magnier, 2020).

Water resources

Water reserves are considered sufficient: 193 billion m^3 of water available per year, while the country's water needs amount to 32 billion m^3 per year. Nevertheless, there are risks of water stress during short periods in the summer. Metropolitan France has seven major rivers, whose catchment areas cover most of the country: the Adour, Garonne, Loire, Meuse, Rhine, Rhône and Seine. They are themselves made up of a multitude of smaller catchment areas, whose rivers have often given their name to French departments: the Eure, the Gard, the Indre, the Lot, the Moselle, etc. Overseas, the islands are often affected by numerous small rivers with small catchment areas, known as ravines. Guiana is crossed by several large rivers, the largest of which is the Maroni (Antoni & Magnier, 2020).

Minerals and deposits

The extraction of natural resources in France - energy, biomass, land, mineral resources, water - does not allow it to fully cover its needs in terms of raw materials: 99.7% of metal ores are imported. The country is heavily dependent on other countries for fossil fuels and metal ores. Indeed, these two categories of materials are hardly extracted from the French subsoil anymore (Antoni & Magnier, 2020).

Socio-environmental conflicts

The Yellow Vest movement (*gilets jaunes*) that emerged in France in 2018 is widely acknowledged. Characterised as an unstructured and sporadic protest movement, this spontaneous social movement, whose dissemination mainly occurred through social media, aims to fight against the increase in the price of motor fuels resulting from the rise in the domestic consumption tax on energy products (TICPE) (Chrisafis, 2018). The protest was organised around illegal blockades of roads and roundabouts and demonstrations every Saturday. These protests mainly mobilised the inhabitants of rural and suburban areas, but they were also organised in metropolises, where several violent episodes occurred, notably on or near the Champs-Élysées Avenue.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in France is presented in Table 27. France holds a significant potential regarding agriculture with a long tradition of well-established farming companies. This potential can be capitalized towards the transition to sustainable and organic farming in the country. On the other hand, there are some vulnerabilities, such as the exterior dependence on fossil fuels and minerals and, indirectly linked with this topic, the resistance to the increase of price of motor fuels by some sectors of the society. This increase was intended to enable the ecological transition, but it is an example that taxing options may not be efficient. A commitment that considers different viewpoints of all actors involved is necessary, which can be an opportunity to experiment with different participatory methodologies. In fact, energy issues are a core topic in France, since French people support the adoption of renewable energies slightly less than other Europeans, respectively 54% vs 63 %. And, this is somehow related with the higher percentage of French people that are supportive of nuclear energy when compared with other Europeans, respectively, 16% vs 12% (European Investment Bank, 2021).

Table 27 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the Natural Resources of France

Vulnerabilities	Risks	Opportunities
Dependence on minerals and fossil fuels	Economic costs	Enhance the transition towards clean energy
Socio-environmental conflicts regarding the increase in the price of motor fuels	Resistance to ecological transition	Involve different citizens and stakeholders in the discussion towards energy transition

4.2.5.2.2. Primary data: Social perceptions on natural resources

Natural resources in France are described by the two interviewees – one male policymaker and one male scientist - as numerous and some of them were identified: water, agricultural land, forest, sand and biodiversity. According to the same interviewees, some of these resources are abundant, as is the case of water, forest and agricultural land, and scarce, as is the case of metals and fossil fuels, but some are also being threatened (Table 28).

Beyond the impacts of global warming through drought, diseases and insects and also of the intensive agriculture production framed by the interviewees, these natural resources are involved in different environmental conflicts with different actors:

"Typically numerous and violent conflicts over the sharing between the different uses of water (between farmers, industrial households)." (French male policymaker, 33 years old, France).

"There are many environmental conflicts in France. One could cite the mega-basins which have recently made the news. We have an opposition between farmers who want to retain water when it is abundant, often in winter, which we use during times of drought. Opponents denounce, among other things, the hoarding of this water. There are also conflicts over the forest. Forests are experiencing a high mortality rate due to global warming (drought, disease, insects) which pushes some managers to practise, when the law allows it, shallow cuts. Many opponents denounce this type of practice, which would rather aim, according to them, to feed the industry." (French male scientist, 33 years old, France).

From these two discourses, two natural resources are at the centre of conflict in France: the first one relates to water use, involving farmers and industrial households[23] since the firsts want to accumulate water during periods of abundant precipitation and others are against the creation of artificial "lakes" or reservoirs since it destroys the soil and landscape (Morgan, 2022); the second relates to forests, where due to the droughts and some diseases

[23] As already seen through the systematic literature review, farmers are very often involved in conflicts regarding the use of natural resources.

there is a legitimization of shallow cuts which, for some actors, is a camouflaged practice to serve the industry and the economic benefits.

Table 28 – Natural resources identified by the interviewee as available, threatened, scarce, increasing and in a conflict in France

Available	Threatened	Scarce	Increasing	Conflicts
Minerals		Fossil fuels		
Forest	Global warming	Metals	Due to urbanisation (new forests which have different properties from old forests)	High mortality rate due to global warming pushes some managers to practise, when the law allows it, shallow cuts.
Water	Global warming and intensive agriculture			Different uses of water between farmers, industrial households
Biodiversity				
Agricultural land	Increasing urbanisation			

4.2.5.3. Socio-environmental concerns

4.2.5.3.1. Secondary data on socio-environmental concerns

Air pollution

The study on the main pollutants (sulphur dioxide, suspended particles, fine particles, ammonia, nitrogen oxide) shows that the most populated areas of France are Ile-de-France, Hauts de France, Brittany, Rhône, Isère and the Mediterranean coast. With regard to air pollution, Brittany has emissions 2.7 times higher than the national average, in particular

because of ammonia pollution, due to the region's industrial livestock farms (FUTURA, 2022).

Farming types and scales of production

France is still the European Union's leading agricultural power, with a turnover of 72.6 billion euros in 2018. This means that its production is 15 billion euros higher in value than that of its main rivals, Germany and Italy. A gold medal winner in the cultivation of cereals, wine and potatoes, France is nevertheless seeing its agricultural production potential eroded, starting with an agricultural area that is constantly shrinking. Since 1961, the country has lost the equivalent of the Grand Est region in agricultural land. The contingent of farmers is also losing members every year. There were 448,500 of them in 2018, compared with 514,000 ten years earlier. France is increasingly dependent on imports. Since 2000, these imports have doubled, taking up a significant part of the French diet. In 2018, according to customs figures, the country bought 38.4 billion euros worth of food products from its European neighbours, an increase of 24% in barely seven years. As a result, France now imports an estimated 20% of its food (Gully, 2020).Relatively, 10% of the agricultural area in France is farmed organically, with an increase of 9% between 2020 and 2021. The area has doubled in 5 years (Ministère de L'Agriculture et de la Souveraineté Alimentaire, 2022).

Energy

France can cover only 12% of its consumption, as all uranium is imported and France produces very little oil and gas (Antoni & Magnier, 2020). Regarding energy efficiency, the country presented, in 2020, 208.36 million tonnes of oil equivalent, which is the amount of energy saving that could improve the security of the energy supply by reducing the dependence on fuel imports.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in France is presented in Table 29. The main opportunity in the country is the well-established tradition in agriculture, which can be a source of transformation towards the ecological transition. However, the current agriculture practices are heavily pollutant, resulting in negative impacts in human and environmental health. Therefore, the topic of organic farming, whose projections seems to be quite significant in a near future, may be a solution. Also, the energy dependence of the country, especially from fossil fuels, needs to be assumed as priority and a solution needs to be co-constructed with all interested parts to avoid conflicts, as identified in the previous section.

Table 29 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Socio-Environmental Concerns of France

Vulnerabilities	Risks	Opportunities
Air pollution from agriculture	Impacts on public and environmental health	Great potential to organic farming (future projections)
Energy dependence	Economic costs; lack of sovereignty; impacts on GHG emissions and air quality	Paradigm shift towards clean energy

4.2.5.3.2. Primary data: Social perceptions on socio-environmental concerns

The interviewees stated clearly in their interviews that climate change is the major socio-environmental risk that France faces, with impacts on several sectors of society. They are both aware of the ecological transition but their understandings are different in some terms:

"The ecological transition is an evolution towards a new economic and social model that respects planetary limits." (French male scientist, 33 years old, France)

"The ecological transition can be defined as the evolution of our society, our lifestyles, and our model of production and consumption to sustainably preserve the habitability of the Earth." (French male policymaker, 33 years old, France)

For the scientist, the main focus of the ecological transition is on the need to respect Planet limits. For the policymaker, the focus is on the need to change behaviours to preserve the habitability (of humans) on Earth, which suggests a more anthropocentric perspective. The divergence of who remains responsible for the ecological transition is visible in both discourses. For the policymaker, everyone and every sector of society are responsible for this commitment to conduct a societal transformation. But for the scientist, the responsibility rests on the government since the main environmental policies must have a top-down approach. In this discourse, the scientist highlights that a clear regulatory plan is necessary to make everyone comply with the public policies defined by the government. Therefore, the interviewees identified the main obstacles to the ecological transition in France. For the policymaker:

"The ecological transition is based on public policies that have specificities. They are part of the long term, are transversal, are radical, affect the intimate, and are difficult to implement socially. Faced with these specificities, I see three main obstacles: 1) These transition policies confront each component of the social body with its contradictions. Everyone wants more transition but everyone considers that the neighbour must do more, without agreeing to raise their level of commitment. We must overcome these contradictions to move forward. 2) Our public action as a whole is not organized, not structured, and not equipped to meet this challenge. This is true of our institutions, our

administration, our rules, our instruments of public policy, and our communication habits. 3) There is still a lack of voluntarism on this issue." (French male policymaker, 33 years old, France)

Here, the obstacle of the ecological transition relies on the impacts of its measures on personal comfort, resulting in high resistance to change; the mismatch between the urgency of this transition and the disorganisation of public action; and the lack of voluntary action. In the case of the male scientist, the main obstacle is the maladjustment of the political software to tackle the urgency of climate change:

"This is precisely the politico-institutional functioning. Ecology raises the question of political software. Whenever our societies have had to take up major challenges, such as reconstruction after the Second World War or the fight against mass unemployment, political software has adapted. At the moment, although there is a consensus that climate change is a fundamental challenge, the reality is that the political software has not yet been updated accordingly." (French male scientist, 33 years old, France)

The main challenges in France are identified by the interviewees:

"Adapt the general framework of public action to this challenge. Manage to positively project a narrative about a carbon-neutral society. Organise and plan the transition of our economy by reconciling incentives, support and constraint at the end of the race. (French male policymaker, 33 years old, France)

The political and institutional functioning, the culture of the administration, the mode of governance, the instruments of public policies and the tools of communication are contradictory to ecology. Our way of governing is contradictory to the ecological challenge. (French male scientist, 33 years old, France)

Both interviewees focus on the identification of the challenges of the need to change the course of public action and institutional functioning. This suggests a rupture with the current way of governing since, in the scientist's words, it is contradictory with ecology. The scientist also calls attention to the challenge related to the implementation of ecological measures, since they can be unpopular, costly and not profitable in political terms, undermining the ability to meet the climate emergency.

4.2.5.4. Sociocultural ecological behaviours

4.2.5.4.1. Secondary data on sociocultural ecological behaviours

Waste production

Of the waste managed by local authorities, approximately 80% comes from households and 20% is produced by companies or public bodies (Vie publique, 2022).

Mobility

In France there were 567 cars per 1000 inhabitants in 2020, showing up as 11th in world statistics (OECD.Stat, 2022). 70.4% of French people go by car or truck to work (Institut national de la statistique et des études économiques, 2022d)

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in France is presented in Table 30. Data scarcity makes it difficult to identify the main socio-environmental concerns in the country. Nevertheless, considering the available data, mobility appears as a national concern, especially the predominant use of road traffic. However, in this specific pilot, mobility should consider the agriculture tradition in the country and the use of trucks, which will be a challenge, since farmers need trucks to work.

Table 30 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Sociocultural Ecological Behaviours of France

Vulnerabilities	Risks	Opportunities
Road traffic	Air pollution and impacts on public and environmental health;	Develop an integrated strategy that consider the use of car and truck

4.2.5.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

To improve collective ecological awareness, the interviewees' viewpoint diverges. For the policymaker, the most effective strategy is to invest in training and the promotion of science. For the Scientist, the strategies are quite different and are related to the need to innovate democratically and enhance a bottom-up approach where lessons are learned from citizens.

But the male scientist is sensitive to the fact that adopting a more frugal lifestyle not only depends on personal choices:

"Personally, yes I try to adopt a more frugal lifestyle but I believe that the main changes are structural. I have enough income to be able to buy organic products for example. I also try to avoid flying." (French male scientist, 33 years old, France)

The structural barriers, previously discussed, cannot be put aside in this debate. The ecological transition assumes a global transformation that should embrace the living

conditions of citizens. The French policymaker makes his classification by the degree of difficulty regarding the adoption of a more frugal lifestyle (Table 31):

Table 31 – Adoption of ecological behaviours by the degree of difficulty according to the interviewee

Degree of difficulty	Behaviour
Low - made possible given his standard of living	Ex: choose a diet with local, organic, seasonal, and unprocessed products
Medium - loss of reasonable comfort	Ex: reducing heating at home, reducing the duration of showers, reducing the consumption of meat (or even stopping it), favour transport by train rather than by plane for certain distances
High - restrictive measures in daily life	Ex: Change mobility patterns that will multiply travel and time, reducing work time or free time

According to this classification, it is clear that the adoption of behaviours that affects personal comfort and restricts daily habits is harsh to achieve. Therefore, the behaviours considered of high difficulty can be minimised through structural transformations, from energy saving by improving built infrastructure quality, promoting water efficiency and developing a fair and inclusive public transport network.

4.2.5.5. Experiences in Nature

4.2.5.5.1. Secondary data on experiences in Nature

Protective functions of forests

As stated before, forests have an important role regarding the protection of natural resources and, simultaneously, benefiting humans and protecting them from natural risks. According to the last data available, in 2015, France accounts for 906.39 thousand hectares of available forest with protective functions (Eurostat, 2021e). Also, in the same year, 6179.99 thousand hectares of forest area within legally established protected areas in thousand hectares were identified (Eurostat, 2021d). Regarding investment on protection of biodiversity and landscape, France presents a quite impressive value of 6 257 million euros (Eurostat, 2022b), being the country in Europe that mostly invest in this area.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in Nature in France is presented in Table 32. Due to the extensive hectares of forest and legally established protected areas in the country, together with the national investments, France holds a huge potential to support actions towards biodiversity conservation and safeguard but also to enhance a new way to relate with Nature and its elements. This is also a part of

the ecological transition, maybe implied and not immediately visible, but necessary to a deep transformation.

Table 32 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Experiences in Nature of France

Vulnerabilities	Risks	Opportunities
Exploitation of natural resources	Biodiversity loss; negative impacts on public and environmental health	To support actions towards biodiversity conservation and safeguard; To enhance a new way to relate with Nature and its elements

4.2.5.5.2. Primary data: Social perceptions on experiences in Nature

The perception of Nature and what it means is a divergent point between the interviewees. For the policymaker, Nature is everything that is not human and does not have human intervention, suggesting the separation already identified through the systematic literature review:

"All the non-human and non-anthropogenic components of what surrounds us." (French male policymaker, 33 years old, France)

While for the scientist, the understanding of what is Nature is significantly different and refers to the acknowledgement of the whole, the web of life (Moore, 2016), that humanity is not separate from Nature, the interdependency category identified in the systematic literature review:

"Nature is the stars, the oceans, the birds, the sand, the air but also us. There has been a tendency, since Descartes, to separate nature from man. But thanks to the work of ethnologists like Descola, we have been aware for thirty years that we are part of a whole." (French male scientist, 33 years old, France)

The identification of five words related to Nature by the interviewees is somewhat aligned with their definitions of Nature. For the scientist, the words are the stars, the oceans, the birds, the sand, the air and the humans, in an attempt to illustrate the whole, everything and everyone. While for the policymaker the words are beauty, wonder, fragility, smell and comfort. From these words, a mix of symbols can be retrieved, namely the aesthetic component of Nature and the comfort (benefits) given to humans. But also, the wonder for the unknown and the inexplicable Nature dynamics and cycles, and the fragility which, somehow, attributes the vulnerability role, the dependence of humans and the unrecognition of resilience and agency of Nature.

The interviewees' experiences of contact with Nature and what they get from it are similar:

"Contact with nature rejuvenates me, amazes me, disorients me, helps me to take some distance." (French male policymaker, 33 years old, France)

"I am used to hiking, it gives me a feeling of happiness. It is through effort in natural environments that I managed to empty myself of my worries and take a step back." (French male scientist, 33 years old, France)

Beyond the benefits mainly for health in a broader sense (happiness, rejuvenation), both interviewees refer to the importance of contact with Nature for giving a "step back", to have "some distance" to think about their own life and decisions. The multiple roles of Nature are here visible going far beyond the ecosystem services.

4.2.5.6. Inclusiveness

4.2.5.6.1. Secondary data on inclusiveness

Vulnerable groups

In France, in 2020, 19.6% of people were at risk of poverty. Additionally, 7.9% of children were living in households without an employed adult (Eurostat, 2022a).

Immigrants

Immigrants have an average income that is one third lower than that of non-immigrants, twice as many have no qualifications and three times as many live below the poverty line. However, for the same social situation, their educational background and income are close to those of French-born people. Furthermore, 26.1% of immigrant families live in housing that is too small, 3.7 times more than non-immigrants.

Gender pay gap

In 2019, women's wage income remains 22% lower on average than men's (28% in 2000) (Institut national de la statistique et des études économiques, 2022c).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in France is presented in Table 33. The situation in France is quite similar with the one in Portugal. There is an absence of data regarding citizen participation in environmental decision-making which, once again, makes it impossible to portray the current situation.

Regarding the data on vulnerable groups, immigrants emerge as the main social group that faces challenges of social-cultural-economic integration and, probably, difficulties to have their visions and expectations heard in environmental-decision making processes.

Table 33 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in France

Vulnerabilities	Risks	Opportunities
Absence of data regarding citizens' participation in environmental decision-making by gender, social status, age, and ethnic group	Discriminatory ecological transition	To create a system of monitorization that enables to understand which social groups are included and excluded
Vulnerability of immigrants and ethnic minorities		
Structural gender inequalities		

4.2.5.6.2. Primary data: Social perceptions on inclusiveness

The awareness of environmental decision-making in France, according to the two interviewees, is somewhat limited. In fact, according to the policymaker, this is mainly due to the lack of information, lack of awareness and lack of promotion that undermines the possibility to intervene in their management. The scientist's viewpoint is more direct: he cannot intervene because it is simply not possible.

The integration of a diversity of perspectives into environmental decision-making is crucial for both interviewees:

"Yes. To combine expertise, create acceptability, consider the plurality of interests and points of view before deciding. but when it comes to ecology, it's incredibly complex." (French male policymaker, 33 years old, France)

"Sure! The climate challenge and the democratic challenge are two sides of the same coin. Take the example of the water policy. The South-West of France will face water shortages in about thirty years, which may require rationing. How to anticipate and manage the situation? To implement the required public policies, two options are emerging. We can adopt new collective decision-making tools to decide together on solutions that are certainly binding but accepted because they are thought out with a concern for social justice. Otherwise, we can go towards brutal decisions which will then appear as authoritarian." (French male scientist, 33 years old, France)

Both highlight the need of considering the plurality of interests, even if antagonist, before deciding since if this is not done there is a risk of deciding an ineffective measure or being understood as an order or authoritarian, which may result in more conflict because people feel that selective viewpoints were heard and some were excluded. And this is even more evident for the interviewees when it comes to vulnerable social groups since these are the groups that will be not only more vulnerable to socio-environmental risks but also to the measures implemented that very often they are not part of.

4.2.5.7. Synthesis

According to France's socio-ecological description in the Grant Agreement (GA, 2021, p.17-21), twelve main topics were identified as the main concerns to tackle the ecological transition: energy, radioactive materials and waste prevention and management, the gold mine project in French Guiana, the Roissy-Charles de Gaulle airport extension project, the offshore wind farms projects and their electrical connection, the large solar photovoltaic park project, the national biomass mobilisation strategy, the preservation of the marine environment, the economic development of maritime and coastal activities, preservation and restoration of ecological continuity, protection of waters against nitrate pollution from agricultural sources and forestry. These concerns reflect the stakeholders' visions and some of them are confirmed by the secondary and primary data. However, and due to the scarcity of data available, some topics have not emerged and therefore it can be risky to discuss them further (however, this does not mean that the socio-ecological concerns expressed in the Grant-Agreement should not be considered).

From the data analysed, the main concern in France relates with the agriculture sector and its pollution impacts and energy dependence. Yet, and despite not mentioned in the GA, the conflicts related to energy transition and the barriers faced by immigrants should also be considered.

Some highlights regarding France's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Immigrants' integration and full citizenship – the need to integrate immigrants beyond labour, housing, education, and health dimensions. It is important to give them the opportunity to use their citizenship, to mobilize their rights and expectations in participatory processes;
- Agriculture transition – to take advantage of the enormous potential of the agriculture sector in the country and enhance a deep transformation that both contribute to reduce pollution in soil, water and air, and that allows to introduce organic farming and it's sustainable growth. It is also worth to consider the intensive

use of trucks as a topic that should be discussed, since 70% of French people use a car or a truck to work - an integrated plan is necessary;

- Energy transition and conflicts – this can be a significant challenge to the ecological transition in France, translated by the several incidents with the *gilets jaunes* movement regarding the increase of taxing fuels. Furthermore, and as previously mentioned, generally, French people can be supportive of nuclear energy, and along with the socio-environmental conflict mentioned before, it is possible to envision some barriers to the ecological transition - the importance of considering individual and structural constraints emerged from the interviews. Therefore, all interested parts should be involved in the participatory process to allow them to express their expectations and reluctance to the measures to be adopted especially the most vulnerable groups.

4.2.6. Rouen Metropole[24]

4.2.6.1. Sociodemographic

Population structure by sex, age group, education level and ageing

Rouen metropole accounts for a population of 494,299 in 2019 (Institut national de la statistique et des études économiques, 2022b) in which 53% are women (Cerema, 2018). It is a territory that can be considered to be populated predominantly by youth since 38.9% of the population is under 30 and only 8.9% is above 75 (Institut national de la statistique et des études économiques, 2022b).

Regarding education level, the majority holds a CAP, BEP or equivalent -vocational qualification (24.8%). Only 23.6% of the population holds no diploma or certificate of primary education. The percentage of population with a bachelor's degree is 16.2% (Institut national de la statistique et des études économiques, 2022b).

Employment and unemployment

In 2019, of the population aged 15 to 64 by type of activity, 71.3% are active (59.6% employed and 8.9% unemployed) and 28.7% inactive (13.4% pupils, students, and unpaid trainees, 6.4% retired or pre-retired and 8.8% other inactive).

Vulnerabilities, risks, and opportunities

[24] In Rouen, 7 interviews were collected.

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Rouen is presented in Table 34. The education level in Rouen, similar to France's national average, is somewhat low, which can result in some difficulties to implement ecological transition measures due to the possible lack of awareness.

However, this can be counterbalanced, since the territory presents a huge potential due to the youth amongst its population. The future generations' willingness to change the course of living patterns, both at individual and institutional levels, can be a driver of ecological transition within this territory. The acknowledged awareness and pre-disposition to change among youth may be a facilitator in the adoption of pro-ecological behaviours.

Table 34 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Rouen

Vulnerabilities	Risks	Opportunities
Low education level of population	Resistance to change behaviours	Increase formal and informal awareness on socio-ecological challenges and ecological transition;
		the significant present of youth may also be a strong driver to the adoption of pro-ecological behaviours

4.2.6.2. Natural resources

4.2.6.2.1. Secondary data on natural resources

Land use

The territory of the Rouen Normandy Metropolis covers nearly 66,000 ha (664 km^2). It is made up of 1/3 urban areas, 1/3 forest areas and 1/3 agricultural and natural areas outside forests. The agriculture area corresponds to 18,400 ha, including 430 ha of organic farming (Métropole Rouen Normandie, 2015).

Water resources

Regarding water sources in the territory, they correspond to 70km in the area, 90km of the Seine and 40 water catchments (Métropole Rouen Normandie, 2015).

Minerals and deposits

Data about materials in the region are very scarce. Despite this, some materials have been identified, such as sand and gravel from the fluvial alluvial deposits of the Seine, but also to a lesser extent from chalk and marl (Métropole Rouen Normandie, 2015).

Socio-environmental conflicts

Similarly to what happens at the national level, the yellow vests movement (*gilets jaunes*), has also reached the Rouen Metropole, which has seen several protests in its territory. The movement originated against the increase in fuel taxes, and then became the "malaise" of a population that feels forgotten and downgraded in territories neglected by public services. They expressed themselves in demonstrations and blockades of towns and roundabouts. There have been movements of violence (Moiroud-Musillo, 2019).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Rouen is presented in Table 35. Data on Rouen's natural resources is very scarce and disables the opportunity to clearly identify their main vulnerabilities, risks and opportunities. However, and by the fact that is a French metropole, socioenvironmental conflicts regarding energy transition should also be considered, triggered by the yellow vests social movement.

Table 35 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Rouen

Vulnerabilities	Risks	Opportunities
Socio-environmental conflicts regarding the increase in the price of motor fuels	Resistance to ecological transition	Involve different citizens and stakeholders in the discussion towards energy transition

4.2.6.2.2. Primary data: Social perceptions on natural resources

Since we had a higher number of interviewees in Rouen it was possible to categorize which are the most important natural resources in their territory (Table 36).

Table 36 - Frequency of natural resources referenced by Rouen interviewees

	Sub-category	Frequency (n)	Percentage (%)
1	Forests/Biodiversity	6	22.2
2	Water resources	5	18.5
3	Precipitation	3	11.1
4	Stones	3	11.1
5	Sunlight	3	11.1
6	Air quality	2	7.4

7	Sand	2	7.4
8	Soil	1	3.7
9	Wind	1	3.7
10	Metals	1	3.7

Interviewees' perceptions of the importance of natural resources are aligned with the secondary data that refers to the significant presence of forests and water in the region. All interviewees are aware of the climate change risks on natural resources, especially to forest and water sources. They also stress the importance that currently any natural resources can be considered abundant since water sources are being impacted by population and biodiversity by climate change and increased urbanization, both affecting the air quality and soil.

Regarding socio-environmental conflicts, four of them have been identified through the interviews and some of them have been able to identify the actors involved (Table 37).

Table 37 – Conflicts about natural resources in Rouen identified through interviews

Type of conflicts	Actors involved
Forests	Loggers VS nature protectors
Gas exploitation	Resources operators VS citizens
Waste	Farmers VS citizens VS tourist activities
Land dispute	Not specify

This information unveils the contradictory movements around natural resources and how they are framed by different interests. If for some of them, exploiting forests and cutting trees is a threat to the rights of nature and consequently to biodiversity preservation and human life on Earth, for some of them is a way to obtain economic benefits, as stated by the following interviewee, which curiously works for the forest preservation:

"There are conflicts over the forest, the cuts are scary, people think that the forest is disappearing when this is not the case, they do not see the sector behind the cuts and the economic resources that the forest can generate." (Female citizens, 44, master degree, Rouen)

This discourse also unveils the complexity of different viewpoints, even within groups that aim to preserve natural resources.

4.2.6.3. Socio-environmental concerns

4.2.6.3.1. Secondary data on socio-environmental concerns

Pollution

In the Rouen territory, 127 polluted or potentially polluted sites have been identified within the perimeter of the “Schéma de coherence territoriale” SCoT, accounting for almost half of all the sites in the department and a third of the sites in the region. These sites integrate sectors of industrial establishments (metallurgy, paint manufacture, refineries, storage and production of fertilisers, detergents, etc.) in operation or abandoned, more or less legal depots containing polluting products, pipelines, etc. These sites are mainly concerned with pollution by hydrocarbons, solvents, lead, copper, nickel, cyanide, zinc, arsenic, mercury and chromium (Métropole Rouen Normandie, 2015).

Climate-related economic losses

Several impacts due to climate change have been already identified in the Rouen report (Métropole Rouen Normandie, 2015): a continued rise in temperatures during the 21st century (the average temperature would increase by about 1°C from 2030) as well as a 10 to 30% decrease in annual precipitation in 2080 compared to that recorded between 1970 and 2000 (summer precipitation would be significantly lower from 2030). While the average parameters seem to change only slightly, the changes in the "extremes" would be more spectacular: there would be a sharp increase in the number of days with high temperatures and heatwaves, in a region that is relatively spared today; projections for 2080 are of the order of 10 to 40 days/year of hot weather and 2 to 15 days/year of heat waves; significant reduction in the number of days of frost, by about half to 15 to 25 days/year by 2080; stabilisation of heavy rainfall episodes; an increase in drought episodes, which is consistent with the decrease in summer precipitation and the general increase in temperatures; and a critical level of 35% to 70% of drought days per year would be reached by 2080.

These previsions envisage the appearance of several conflicts related with:

- water resources: the scarcity of resources would introduce conflicts of use (drinking water / industry / agriculture / leisure). It could also aggravate turbidity problems, with potential impacts on the quality of water distributed to consumers;
- biodiversity: changes in climatic parameters may have an impact on certain species and contribute to redefining their distribution area and modifying their life cycle (earlier budburst, later leaf fall in forests, for example). In addition to this, new species are likely to appear and disrupt ecosystems. Finally, possible changes in river flows would have impacts on water quality and aquatic ecosystems;
- agriculture: crop development times could be modified. About yields, a positive effect can be expected from the increase in temperature, but a negative effect from the possible development of new pests or the increase in water stress conditions. Finally, extreme phenomena (strong winds, heavy rainfall), the intensity of which could change but is difficult to predict, will also have an impact on crop yields;

- natural risks: intense rainfall events will continue to generate erosion and runoff phenomena which already affect the CREA territory, and lead to flooding and mudflows.

Farming types and scales of production

The agricultural land represents one third of the territory of the Rouen Metropolis. The 450 farms based in the area generate 950 direct jobs. Regarding organic farming, there is a low proportion of locally produced products (430 ha out of 18,400 ha). Therefore, the Metropolis has defined in its politique Air Climat Energie Territorial - Territorial Air Climate and Energy Policy - an objective of reaching 50% of land in organic farming on the territory of the Metropolis and its catchment areas by 2050. However, the sector of agriculture, forestry and fishing represents only 0.1% of the salaried jobs in the region (76actu, 2018). The food autonomy remains low for the territory (10.6%), which is totally or almost totally self-sufficient in cereals (138%), meat (98%), fish (97%) and milk (92); and more dependent on eggs (0.2%), fruit (3%) and vegetables and potatoes (43%) (Métropole Rouen Normandie, 2021).

Energy

The energy production is 1,300 GWh/year, providing 12% of electricity consumption, coming mainly from the wood-energy sector (78%). No wind power in the area, due to lack of potential (Métropole Rouen Normandie, 2015). The residential sector is the second largest energy consumer, after the industry sector. In 2014, it represented about 25% of energy consumption in the metropolitan area.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Rouen is presented in Table 38. The socio-environmental concerns in Rouen are of two types: a first one relates to the impacts of climate change in agriculture, biodiversity and water resources, which can lead to the occurrence of natural risks and, consequently, the emergence of socio-environmental conflicts; a second one relates to food sovereignty, which remains quite low in the area, along with the need to improve organic farming production.

Table 38 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Rouen

Vulnerabilities	Risks	Opportunities
Low precipitation and intensive agriculture production	Droughts - Reduction on the agriculture production	Implementation of sustainable farming systems
	Droughts - Impacts on water quality; Water scarcity	Implementation of efficient systems of use of water sources
Dependence of exterior food production	Food insecurity	Higher interest of younger in organic farming

4.2.6.3.2. Primary data: Social perceptions on socio-environmental concerns

Ten socio-environmental risks in the region of Rouen have been identified by the interviewees (Table 39) and the loss of biodiversity alongside social inequalities are at the top of concerns.

Table 39 - Frequency of socio-environmental risks referenced by Rouen interviewees

	Sub-category	**Frequency (n)**	**Percentage (%)**
1	Loss of biodiversity	4	20.0
2	Social inequalities	4	20.0
3	Climate change	3	15.0
4	Water scarcity	2	10.0
5	Air pollution	2	10.0
6	Climate migration	1	5.0
7	Fires	1	5.0
8	Floods	1	5.0
9	Water pollution	1	5.0
10	Droughts	1	5.0

However, it is worth noting that some of them are interconnected. Climate change and forced migration (climate migration) with impacts on water scarcity, fires, floods and droughts and, consequently, on biodiversity loss. Another important clue here is the social inequalities which are as climate change the link among them since they reflect on the ability to cope with socio-environmental risks, both in vulnerability and recovery.

Regarding ecological transition, one interviewee had never heard about it while the remaining yes. Some definitions have been presented and are categorised as follows (Table 40):

Table 40 – Categorization of ecological transition definition according to Rouen interviewees' narratives

	Sub-category	Transcriptions
1	Ecological transition as a behavioural change	*"…ecological transition would be the changes to adopt in the way of consuming (energy, food, leisure), and therefore of producing. It would allow in the longer term, if applied, to restore balances in terms of biodiversity."* (French male citizen, 25 years old, Rouen)
2	Ecological transition as a rupture	*"This is the radical paradigm shift that humanity must make if it wishes to continue to exist."* (French female working in NGOs, 46 years old, Rouen)
3	Ecological transition as a change in the economic model	*"This is the set of measures that can be taken to change the economic model by taking better account of the planet."* (French female citizen, 44 years old, Rouen)

These different understandings of what means the ecological transition highlights the need to improve communication top-down and to give clear insights on what is intended with this concept. Also, perhaps it would be more effective to deepen the discussion on the concept after implementing measures that cannot be well understood by civil society: from an alteration in consumption habits to a focus on an economic model and, in some cases, a paradigm shift or rupture. Different viewpoints on who relies the responsibility for this transition are also visible in the interviewees' discourses (Table 41):

Table 41 – Responsibility perception on the ecological transition according to Rouen interviewees' discourses

	Sub-category	Transcriptions
1	Everyone	*"Everyone must be the engine of the ecological transition. We must operate at all levels to establish a development model that is resilient and sustainable."* (Moroccan citizen, 25 years old, Rouen)
2	Citizens	*"Citizens 1st actors."* (Female citizen, 47 years old, Rouen)

3	Public power	*"The driving force must be public power (regulatory and tax constraints, subsidies for sectors that are initiating the transition."* (French female working in NGOs, 46 years old, Rouen)

The assignment of responsibilities in the ecological transition holds a risk of removing the feeling of commitment to some sectors of society that can undermine its implementation. With different levels of responsibility, all sectors of society, and everyone, should be involved and committed to this transition. In Rouen, the implementation of the ecological transition may face some obstacles of different nature (Table 42):

Table 42 – Main obstacles to the ecological transition according to Rouen interviewees' discourses

	Sub-category	Transcriptions
1	Lack of ecological awareness	*"The awareness of society in general terms of the issues put to the test if there is no ecological transition..."* (Moroccan citizen, 25 years old, Rouen)
2	Lack of effective public policies	*"The lack of incarnation of the policies…"* (Female citizen, 47 years old, Rouen)
3	Economic interests	*"At first glance the influence of the economic system on the way of life."* (French male citizen, 44 years old, Rouen)

These obstacles refer to three different levels: the first one relates to society's ecological awareness, since people, with different backgrounds and trajectories, have different levels of awareness which can be in some cases a driver, when high, or a barrier, when low; the second one is about the public policies and its effectiveness, at structural level; and the third one is related with the economic interests involved and that can undermine the implementation of ecological measures. These levels of obstacles should be considered in an integrated way and not isolated. Aligned with these obstacles are the main challenges identified by the interviewees in Rouen. They can be somewhat associated with the three previous obstacles: the need to consider individual behaviours, the change in the economic paradigm and the effectiveness of measures and public policies.

4.2.6.4. Sociocultural ecological behaviours

4.2.6.4.1. Secondary data on sociocultural ecological behaviours

Mobility

According to the survey carried out in 2017 at the Rouen Metropole (2018), work-related journeys (linked to the home or another activity) represent 20% of daily trips. Of this, 74% of these journeys are made by car, where the average distance of a trip is 4.3 km.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Rouen is presented in Table 43. As previously mentioned, the adoption of sociocultural ecological behaviours is constrained by a myriad of factors that cannot only be considered individual choices. The excessive use of private cars for daily travels, fuelled by fossil fuels, results in poor air quality and negative public health outcomes. However, and as largely explained, the energy transition in France is in fact one of the biggest challenges, due to the several opposition voices that it faces. This needs an integrated solution that considers both the need for an energy transition and a shift of consumption patterns.

Table 43 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Rouen

Vulnerabilities	Risks	Opportunities
High utilization of motor vehicles	Poor air quality	Co-design of solutions that restrict the circulation of motor vehicles in high density areas; Discuss the need of sustainable mobility solutions
	Increase of GHG emissions	

4.2.6.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

The adoption of ecological behaviours is a key issue to the effectiveness of the ecological transition. But previously that is a need to improve ecological awareness and to do that different strategies can be activated. According to our interviewees, five different strategies can be used (Table 44):

Table 44 – Strategies considered most effective to improve ecological awareness according to Rouen interviewees' discourses

	Sub-category	Transcriptions
1	Subsidy organic and sustainable production and consumption	*"…subsidy to sustainable production/consumption sectors (make these products accessible) …"* (French female working in NGOs, 46 years old, Rouen)
2	Consider cultural specificities	*"…it is necessary to apply the strategies which go in the direction of the culture of the country in the measurement of developing the collective consciences…"* (Moroccan citizen, 25 years old, Rouen)
3	Contact with Nature/education	*"Nature education and renewing the sensitive link with nature..."* (French male municipal technician, 46 years old, Rouen)
4	Formal and informal education	*"Education remains the best strategy, whether formal or informal."* (French female citizen, 44 years old, Rouen)
5	Enhance local communities' movements and actions	*"How to encourage people to respect the environment? We could try to create emulation to improve our immediate surroundings. Offer a pot of geraniums to adorn a balcony…"* (French female representative of an economic group, 79 years old, Rouen)

From the strategies identified, they have in common the need to contact nature to improve ecological awareness and, also importantly, to consider local socio-cultural specificities – there is no one solution fits all so strategies and measures should be in accordance with territories' realities. Regarding the adoption of frugal lifestyles, the interviewees' answers are quite similar and focus on two main issues: the economic barriers associated with the buying of organic and sustainable products and services (food, energy, clothing, etc.); the inaccessibility to public transport which undermines the possibility to change mobility patterns.

4.2.6.5. Experiences in Nature

4.2.6.5.1. Secondary data on experiences in Nature

Green areas

In the middle of the dense urban fabric of Rouen there are 900 ha of vegetated areas (Métropole Rouen Normandie, 2015). The territory experienced an urbanization of 1,278 hectares of natural, agricultural and forest areas between 1999 and 2012, of which more than half was dedicated to housing, a quarter to economic activities, and the remaining

quarter to roads, facilities and areas undergoing urbanisation (Métropole Rouen Normandie, 2015).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in Nature in Rouen is presented. Through the available data, it is not possible to identify significant vulnerabilities or risks associated.

4.2.6.5.2. Primary data: Social perceptions on experiences in Nature

Different understandings of Nature have been found in the interviewees' discourses and all were related to two different categories (Table 45). The first one is related to Nature as a whole, considering the web of relations between humans and non-humans, in all its interdependencies; the second is related to Nature as what does not have been altered by human intervention, untouched, pristine.

Table 45 – Categorisation of Nature definitions according to interviewees' discourses

	Sub-category	Transcriptions
1	Nature is everything	*"All species, ecosystems, intra and interspecific relationships, abiotic phenomena (soil composition, sunshine, hydrology, hygrometry, etc.)"* (French male municipal technician, 46 years old, Rouen)
2	Nature is everything without human intervention	*"What is not influenced by the way of life of the human being from a certain scale…"* (French male citizen, 25 years old, Rouen)

In Figure 21 it is possible to see the interviewees words associated with Nature[25]. Among the many words visible in the figure some of them stand out, such as "alive", "living beings", "well-being", "green", "Breathing", "Inclusion" and "Earth". From these words, an association with the immaterial benefits that derive from contact with Nature is possible to be done. Nonetheless, it is also worth mentioning other words, such as "Inclusion" and "Diversity" that suggest that not everyone has access to nature and that exists a plurality of meanings regarding nature, and different Natures.

[25] The size of each word represents the frequency in which it appears in the interviewees' discourse.

Figure 20 – Word cloud associated with Nature through Rouen interviewees' discourses

These words are linked with the description of the interviewees concerning their contact with Nature, mostly associated with spirituality and well-being, development of knowledge and identity construction. However, it is also possible to observe in the two interviewees' discourses that contact with Nature has been limited since they live in cities, where Nature is not so abundant, at least in the savage and wild way that people tend to characterise it.

4.2.6.6. Inclusiveness

4.2.6.6.1. Secondary data on inclusiveness

Vulnerable groups

The poverty rate by age group of the tax reference in 2019 is 17.2% (excluding community and homeless). The Rouen Normandy Metropolis shows strong income disparities and a poverty rate that is 1.7 points higher than the average in metropolitan France (Institut national de la statistique et des études économiques, 2022d).

Gender pay gap

The average hourly net wage gap between women and men in 2020 is -14.2%. Of the population not attending school aged 15 or over by gender in 2019, the breakdown is as follows:

- No diploma or certificate of primary education: 20.5% for men and 26.2% for women;
- Elementary Education: 4.3% for men and 5.8% for women;
- Secondary School: 29.1% for men and 21% for women;

- Bachelor Degree: 16.2% for both;
- Licentiate Degree: 10.4% for men and 11.3% for women;
- Master Degree: 7.8% for men and 10.4% for women;
- Doctoral Degree: 11.7% for men and 9% for women;

As regards to jobs by sector of activity, there is very little difference between the sexes. More women than men hold permanent positions in the civil service or permanent contracts (76.2% versus 72.5% for men). They are less often self-employed (4.4% compared to 5.4% for men) and employers (2.4% compared to 5.5%). They are more often on fixed-term contracts (11.7% compared to 8.3% for men) but less often on temporary contracts (1.4% compared to 3.8% for men). They are much more likely to work part-time than men (25.9% compared to 9.7%) (Institut national de la statistique et des études économiques, 2022b)

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Rouen is presented in Table 46. The situation in Rouen is similar to France's national panorama. The absence of data continues to be a challenge, more evident at a local scale, which undermines the possibility to monitor participation. Another important information is the significant percentage of people experiencing socio-economic inequalities, being higher than the national average. Once again, this highlights some challenges on the need to integrate these voices in environmental decision-making processes.

Table 46 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Rouen

Vulnerabilities	Risks	Opportunities
Absence of data regarding citizens' participation in environmental decision-making by gender, social status, age, and ethnic group	Discriminatory ecological transition	To create a system of monitorisation that enables to understand which social groups are included and excluded
Gender and social inequalities		

4.2.6.6.2. Primary data: Social perceptions on inclusiveness

The awareness of environmental decision-making in Rouen, according to the interviewees, exists but it is mainly concentrated in the public power. However, there is a need to consider all, independently of their socio-economic background, whose life and trajectory may raise important knowledge:

"We don't listen to them enough. Let us not forget the people who work modestly in their field but who have a long and practical experience." (French female representative of an economic group, 79 years old, Rouen)

The opportunity to intervene in environmental decision-making exists but some barriers undermine this, according to our interviewees: firstly, lack of mobilisation and resources; secondly, lack of time to immerse in this process; and the traditional ways of participation that do not fit contemporary socio-ecological problems.

The integration of a diversity of perspectives into environmental decision-making is crucial for all the interviewees:

"Yes … modify public inquiry procedures by integrating real citizen participation, which makes it possible to achieve a double objective: to train citizens in the issues and allow them to express themselves." (Female citizen, 47 years old, Rouen)

"Yes, because it takes everything to make a world. The diversity of actors and opinions is enriching to promote creativity, innovation and raise awareness." (French female working in NGOs, 46 years old, Rouen)

The need of considering the plurality of interests is decisive for all the interviewees. They highlight that everyone is an expert in their daily life and so they need to have something to say about a decision that will impact them. In the case of vulnerable groups, the interviewees stated that these populations are often those who suffer the most from the socio-environment consequences while having the least means of asserting their voices. Therefore, their inclusion is a question of justice.

4.2.6.7. Synthesis

According to Rouen's socio-ecological description in the Grant Agreement (GA, 2021, p.17-21), twelve main topics were identified as the main concerns to tackle in the ecological transition: public transportation, urban planning and sustainable construction, protection of the biodiversity, local industrial economy ecological transition and industrial risks, need for dialogue and transparency. These concerns reflect the stakeholders' visions and some of them are confirmed by the secondary data. However, and as explained previously, due to the scarcity of data available, especially at local level, some topics have not been corroborated by secondary and primary data and therefore it can be dangerous to discuss them further (however, this does not mean that the socio-ecological concerns expressed in the Grant-Agreement should not be considered).

From the data analysed, the main concern in Rouen, and that is transversal to local scales, is the absence of data. This is a serious problem that undermines a fair and reliable monitorization of ecological transition implementation. The main issues also relate with the low education level of a significant part of the population, which can be a barrier to the adoption of pro-ecological behaviours. However, the presence of youth, which is a very positive trend that contradicts the southern European trend, may help facilitate the ecological transition. Also, the socio-environmental conflicts triggered by the yellow vest movement are also felt in this territory and this should be considered in the implementation process, since they are against the rise of fuel prices, desire more democracy and more purchasing power. Somewhat associated with the energy transition is the use of cars for daily travels and the dependence on fossil fuels. This is challenging when the goals are to reduce the territory's energy consumption by 70%, reduce the territory's greenhouse gas emissions by 80% and to develop renewable and recovered energy by multiplying the production of renewable energy by 2.5 and by participating in a regional strategy for the development of renewable energy. The threats caused by climate change regarding food sovereignty of this territory are of significant importance.

Some highlights regarding Rouen's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Presence of youth – this social group can be the agent of change in this territory and perhaps influence other social groups with their willing to have a better and sustainable future. Their presence in participative processes is highly suggested;
- Agriculture transition – as similar to the French reality and to take advantage of the enormous potential of the agriculture sector, it is important to develop a strategy of organic farming with a constant growth tendency in the future, and this needs to be done by including all actors involved in food chains, from producers to sellers - primary data revealed some conflicts between farmers and local citizens that should be considered in the participatory process;
- Energy transition and conflicts – as a national worry, the protests regarding the increase of fossil fuels prices poses significant challenges. This is a question of matter not only in this pilot, but in France, and should be a priority. This has implications also in the mobility patterns of citizens, but also in the climate change mitigation impacts and the need for adaptation - the adoption of ecological products and services has as main barriers structural inequalities according to interviewees discourses.

4.2.7. Emilia Romagna Region[26]

[26] In Emilia Romagna Region, 2 interviews were collected.

4.2.7.1. Sociodemographic

Population structure and ageing

The population of Emilia Romagna consists of 4.459.866 residents. Alongside with the loss of population that was felt in 2021 (0,32%; 14.426 inhabitants), the regional natural balance has been negative since 1976. This means that from then on, the number of deaths has always been greater than the number of new-borns. Consequently, the overall population balance has been positive until 2010 thanks to migrants coming from other Italian regions, or other countries.

As a trend of southern Europe, due to the decreasing birth rate and a long-life expectancy, the average age has progressively increased. Furthermore, the average age of women at childbirth is 32 (68% per cent of new-borns has a mother in her thirties). As a result, the amount of 15-34-year-old population has decreased by 2,3% if compared to 2008 (from 21,5% to 19,2%), and by 7,2% compared to 1999. Notably, the population over 80 years old has increased from 6,8% in 2010 to 8,1% in 2019. Given that newcomers are usually younger than the regional average, immigration trends have slowed this ageing population process down (which is still ongoing though). The “ageing index” (indice di vecchiaia), which measures how many people over 65 years old there are compared with children between 0 and 14 years old, has reached, on average, the value of 182,6, while the Italian data is 173,1 – a number over 100 indicates that elderly people are more numerous than children. 51,3% per cent of the population is composed of women. This discrepancy between men and women is even more evident in the population over 80 years old, where women comprise 61,7% (Regione Emilia-Romagna, 2022c).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Emilia Romagna is presented in Table 47. Beyond the population ageing challenges that have been further discussed previously, the sociocultural diversity of this territory can be particularly relevant in the integration into the environmental decision-making. In fact, newcomers’ contributions cannot be seen only by the impact of the natural balance but also in the enrichment of cultural diversity. On the other hand, and as seen through the results of the systematic literature review, different views and understandings of nature and environment are constrained by cultural variability. Therefore, this also poses a challenge to consider this diversity of views in the ecological transition.

Table 47 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Emilia Romagna

Vulnerabilities	Risks	Opportunities
Ageing	Resistance to change behaviours	Balance population grow; Accumulated expertise, knowledge, and experience; Sociocultural diversity

4.2.7.2. Natural resources

4.2.7.2.1. Secondary data on natural resources

Land use

In 2016, over 75% of the regional surface (approximately 1,4 million hectares) was dedicated to agriculture, which corresponded to 8,4% of Italian cultivated land. The cultivated areas consist of arable land (80%), tree crops (11%), and grassland or grazing land (9%). More specifically, arable lands are mostly intended for cereal (25% durum wheat), followed by fodder (particularly common in mountainous areas) for animal farming, potatoes, and vegetables. The latter consists mainly of tomatoes for the food industry, and other products DOP and IGP certified. Tree crops (especially pears, peaches, apples, and apricots) are also diffused, and they are common in the hilly regions. Viticulture, although being present, is not as relevant as it is in other north-eastern regions such as Veneto (Regione Emilia-Romagna, 2022e).

Water resources

The water system is composed of 739 water river bodies, which consist in parts of rivers, streams, or canals. There are just five bodies of water with an area greater than 0,5 km and they are artificial lakes used for multiple purposes (reservoir for potable water, irrigation, or hydroelectric power plants). The remaining bodies of water are small ponds of glacial origin located in the mountainous areas, or different-sized artificial reservoirs located in the Po valley. The low and sandy coast is 158 kilometres long (108 of them are dedicated to bathing and related activities) and the wideness of the beach spans from a few meters to 200 meters. The total water consumption of the region is estimated to be between 1.400 and 2000 million cubic meters per year, and 68% comes from superficial waters and 32% from groundwater. The latter, refers to a complex underground system of waterbodies. The most common and superficial aquifer of the Emilian plain is the phreatic aquifer, of alluvial origin, which can be usually found 10 m below the ground. The aquifers' water balance – which is of great importance for agriculture – depends on their use for human activities and the atmospheric precipitation stored therefore it can vary yearly (ARPAE, 2021a).

Minerals and deposits

As a result, extractive materials such as sand, gravel (used as concrete aggregates and mostly located nearby rivers and the seacoast), clay (used for the realisation of bricks), marl, granite, and gypsum (used for constructions) are common. Minerals, metals, and fossil resources are also present in smaller quantities (Regione Emilia-Romagna, 2020).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources of Emilia Romagna is presented in Table 48. From the data available, no significant vulnerabilities concerning natural resources can be pointed out in this territory. Nonetheless, water consumption is relatively significant, which represents a risk in a climate scenario of water scarcity, namely when the system is heavily dependent on human management and precipitation. Therefore, it is necessary to develop a co-management strategy on local water resources.

Table 48 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources of Emilia Romagna

Vulnerabilities	Risks	Opportunities
Water consumption	Water scarcity; impacts on agriculture	To develop an integrate strategy regarding the collective management of water resources

4.2.7.2.2. Primary data: Social perceptions on natural resources

Data on the perceptions about natural resources in Emilia Romagna is limited since interviews are not very detailed. The interviewees – one policymaker and one scientist - identified the soil, air, water and biodiversity as the main natural resources in the region. Only one interviewee, the scientist, mentioned that soil is being extensively used which can result in its scarcity. There is no information on conflicts.

4.2.7.3. Socio-environmental concerns

4.2.7.3.1. Secondary data on socio-environmental concerns

Air quality

Air pollution is one of the main environmental concerns for Emilia-Romagna, and it is estimated to cause premature deaths just as much as smoking tobacco. Fine particulates are mainly a consequence of vehicular traffic and transport (45%), and residential heating (40%). 90% of the population lives in areas where $PM_{2.5}$ concentration is higher than 10 $\mu g/m^3$ (the legal limit is 25 $\mu g/m^3$). The worst air quality is measured in the north-western

plain areas and, surprisingly, there is not much difference between urban and rural areas. In 2020, the $PM_{2.5}$ concentration average has always been below the legal limit. On the contrary, PM_{10} exceeded the legal limit (50 µg/m^3) for more than 35 days in 25 out of 45 monitoring stations (Regione Emilia-Romagna, 2022a).

Climate-related economic losses

The traditional climate classification of Emilia Romagna is going to be influenced by climate change. Measurements carried out during the last 25 years revealed that the average temperatures have risen more than 1 Celsius degree and, if compared to the 1961-1990 period, 2020 proved to be 1,5 Celsius degrees higher. Besides the higher temperatures, other changes are occurring as well. Rainfalls have already slightly decreased in terms of the overall quantity but, more importantly, they have changed their patterns over the year. This is also linked to the occurrence of extreme weather events (i.e., floods, droughts, heatwaves), which has increased. For example, in 2017 the region was impacted by a severe drought, and the highest temperature since 1961 was recorded. May 2019 has been the rainiest month since 1961. Winter in 2019-20 has been exceptionally warm. During the last decade, numerous floods have occurred, causing a significative number of damages and, only in 2014, the four most relevant floods cost more than 500 million euros. The consequences of climate change are serious, and they ultimately affect several fields (including the agriculture and energy sectors). Moreover, due to its morphology and geology, Emilia-Romagna is an especially vulnerable region. Indeed, the regional hydrogeological hazard is estimated to be the highest in Italy (45% of its territory is considered at medium risk and 11% at high risk, while the national average is respectively 8% and 1%) (ARPAE, 2021b).

Farming types and scales of production

During the last two decades, a reduction of cultivated lands in terms of surface is noticeable, as well as a significant reduction of enterprises in terms of numbers, an increase of their average dimension, and an increase of rented lands. These transformations are interlinked with each other, more generally, issues like the generational turnover, the modernization of technics, climate change – and the challenges around it. In 1990, agricultural companies amounted to 148.000, while in 2020 this number was only 53.753 (4,7% of the national ones). Cultivated lands cover 19,4 ha in average (5 ha more compared with 2000), which is one of the highest Italian data (the national average 14,5 ha). 55% of cultivated lands refer to businesses occupying more than 50 hectares. There is also a reduction of family-run businesses, substituted by limited companies. In absolute terms, the primary sector has a low impact on the overall regional economy since it only comprises 2,5% of it. Emilia-Romagna shows a high concentration of livestock companies (which characterize all north-

eastern regions), and this is a vital sector for the regional economy (Regione Emilia-Romagna, 2022g).

As of 2016, there were 9.404 zootechnical companies (approximately 16% of the overall regional companies), mostly farming bovines, pigs and chickens. 60% of the total production refers to bovine milk, 15% to pig meat, 8% to bovine meat, and 16% to chicken meat. Particularly, production and transformation of pig meat, together with the bovine milk transformations is deeply rooted in the regional economy and its culinary heritage. These activities lead to the certification of many DOP, IGP, and organic products intended for both domestic use and the international market. Despite their relevant role in the national economy, the environmental impact of these companies is high, and this is particularly relevant if one considers their proximity with other pollutant activities and urban settlements (Regione Emilia-Romagna, 2022e).

Energy

Emilia-Romagna's energetic demand – driven in large part by industrial activities – was 9% of the national one in 2017, which is 13% less compared with 2002. Data show that during this time span, industrial consumption has been reduced by 44%. As of 2017, 29% per cent of energy was consumed by factories, 27% by transport, and 27% by residential activities. Civil, residential, and tertiary sectors reach 42% of total energy consumption. Since 2002, residential demand for energy has reduced by 9,6% and transports consume 6% less. In 2017, the per-capita consumption ranged approximately from 10 to 25 MWh, depending on the location and other socioeconomic variables (ARPAE, 2017).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Emilia Romagna is presented in Table 49. The region is extremely vulnerable to climate change impacts: the rise of temperatures affects both the agriculture sector but also the water quality, demand, and efficiency. And this is particularly relevant due the livestock companies being vital in the region. No less important is the big concern associated with air quality and pollutant emissions, especially from road traffic. As data reveals, 90% of the population lives in areas where $PM_{2.5}$ concentration is higher than 10 $\mu g/m^3$ and this exposure for a long time may lead to negative consequences to human health.

Table 49– Synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Emilia Romagna

Vulnerabilities	Risks	Opportunities
Low precipitation and intensive agriculture production	Droughts - Reduction on the agriculture production	Implementation of sustainable farming systems
	Droughts - Impacts on water quality; Water scarcity	Implementation of efficient systems of use of water sources
Urban planning and road traffic	Global warming; poor air quality; public health impacts	Reduce road traffic; Implementation and monitoring of national strategies

4.2.7.3.2. Primary data: Social perceptions on socio-environmental concerns

Both interviewees stated that they are aware of what means the ecological transition. For the scientist, this transition is:

"A process of reconfiguration of consumption and disposal habits of both goods and energy to reduce the impact on the environment." (Italian male scientist, 26 years old, Emilia Romagna).

The focus of the Scientist's understanding is that ecological transition is a change in consumption habits to reduce the impact on the environment, but it does not consider the transformation of our relationship with nature and the natural environment. This understating is aligned with a passive transformation, where the objective is to not cause damage but does not intend to regenerate nature.

While for the policymaker everybody is responsible for the ecological transition, the scientist focuses on nations' leaders and individuals as the main actors of this transition. There was no information on the biggest obstacle to the ecological transition nor on the main challenges that the region faces.

4.2.7.4. Sociocultural ecological behaviours

4.2.7.4.1. Secondary data on sociocultural ecological behaviours

Waste production and management

In 2020, Emilia-Romagna's urban waste production amounted to 2.875.122 tons (645 kg per capita), showing a slight reduction with respect to 2019 (-3,4%). Only 0,5% of this waste ended up in landfills. The latter reached its maximum ever since, 72,5% laws with peaks of 85% depending on the municipality, above 65% which is the minimum according to national. This means that over two million tons of separated waste were produced (467 kg per capita). In 2002, the separate collection was only 28% of the total. More specifically, in 2020, wet waste amounted to 75 kg per inhabitant, greenery waste to 102 kg, paper to 84 kg, plastic to 39 kg, glass to 42 kg, metals to 8 kg, wood to 36 kg, RAEE (waste deriving from electronic devices) to 6 kg, cumbersome waste to 21 kg, construction and demolition waste to 20 kg, streets waste to 13 kg, and others to 21 kg. This data refers to a peculiar year, which was characterised by a great amount of packaging deriving from e-commerce purchases, and by a massive use of masks and personal protective equipment in general (moreover, the separate waste collection was suspended for people in quarantine) (Regione Emilia-Romagna, 2022b).

Mobility

Motorcycles and automobiles are the most common means of transport (78%) and only 5,3% of the employed population uses public transportation (lower than the national average). For students, this percentage reaches 29,2%. Considering non-commuters, trams and urban buses are used more than once per week by more than 401.000 people (over 14), buses by 169.000, and trains by 132.000. These numbers are slightly below the national average. Indeed, the favourite mean of transport for people living in Emilia-Romagna is the private car. More than two million people use their car every day (57,6% of people over 18, while the national average is 51,4%) (Regione Emilia-Romagna, 2022f).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Emilia Romagna is presented in Table 50. In Emilia Romagna, there is a pro-ecological pattern of recycling, which shows signs of consistent progress. As most of the pilots, changing mobility habits will be very challenging. Emilia Romagna is not an exception, and the car is the most used transport for travels. In fact, in this region the use of public transport is below the national average, which leads to the importance of understanding why people in this region prefer private cars to public transport.

Table 50– Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Emilia Romagna

Vulnerabilities	Risks	Opportunities
Road traffic	Air pollution and impacts on public and environmental health;	Develop an integrated strategy that consider the use of car

4.2.7.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

The most effective strategy for improving ecological awareness, according to the scientist, is formal and informal education for children. For the policymaker, there is a mix of strategies that are needed, but no specification is provided.

For the scientist, the adoption of a more frugal lifestyle is not a hard task:

"Change of both everyday and extraordinary transport habits, choosing more sustainable means of transportations such as bicycles, trains or fully loaded cars. Reducing the consumption of animal products in favour of plant products. I find that those are not true renunciations if one understands the necessity and usefulness of these gestures. I think that these degrowth actions can be experienced in a completely positive way, and they can also not be experienced as sacrifices." (Italian male scientist, 26 years old, Emilia Romagna).

However, this cannot be seen as universal, since it can be related to a pre-lifestyle that is closer to this kind of measure.

4.2.7.5. Experiences in Nature

4.2.7.5.1. Secondary data on experiences in Nature

Protective functions of forests

More than 600.000 hectares – almost one quarter of the region's surface – are covered by forests. These woods (typically oaks, chestnuts, beeches, or brushes depending on the altitude), are of great importance not just for supporting the ecosystems and their biodiversity, but also for their role in enhancing the soil's capacity to hold water and preventing its erosion. They can be found both on state-owned land (national parks, regional parks, or natural reserves) or on private properties (usually highly fragmented). In the latter case, which is the most common, the forest can be used for logging, but this activity is highly regulated and requires specific authorizations (Regione Emilia-Romagna, 2015).

Overall, the natural habitat typologies are the following: forests (18,3%), freshwater habitats (15,5%), natural and semi-natural grasslands (14,1%), coastal environments (14,1%), maritime and rural sand dunes (12,7%), rocky environments (12,7%), wetlands (7%), scrubs (2,8%) and shrubs (2,8%). The region is home to almost half of the species and subspecies of plants that can be found in Italy, some of them being endemic. In total, there are more than 2700 species of plants and over 350 species of vertebrates. According to a recent biodiversity assessment, wetlands and freshwaters showed to be the most endangered habitat typology (Regione Emilia-Romagna, 2019)

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in nature in Emilia Romagna is presented in Table 51. In Emilia Romagna's nature diversity is quite significant, which contributes to healthy ecosystems and healthy people. The links between nature and human and environmental health are very complex and multidimensional, so there is a need to care and safeguard the natural elements and to develop a regional strategy of co-management and responsibility for them, especially facing the impacts of climate change.

Table 51– Synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in nature in Emilia Romagna

Vulnerabilities	Risks	Opportunities
Rich diversity is vulnerable to climate change	Loss of biodiversity and impacts on human and environmental health	Develop an integrated strategy of co-management and responsibility of biodiversity

4.2.7.5.2. Primary Data: Social perceptions on experiences in Nature

The definition of Nature provided by the scientist suggests the consideration of the web of relations between all living beings:

"The expression of the balances and cycles of planet earth, between environments and living beings." (Italian male scientist, 26 years old, Emilia Romagna).

For the same interviewee, Nature is green, alive, immense, powerful and incredible, all words that relate to the same kind of agency, with the power to change and influence. While for the policymaker, the words chosen are an ecosystem, networks, systems and interconnection, a vision closer to an instrumental one. These two different visions of Nature are also visible in the description of their experiences when they are in contact with Nature: the scientist states that slowing down and calming is what he gets when is in contact

with Nature, giving him time to think and accept what happens in his life; the policymaker focuses on the mental and spiritual benefits, but also in the financial benefits that he can get from it.

4.2.7.6. Inclusiveness

4.2.7.6.1. Secondary data on inclusiveness

Vulnerable groups

First, regarding the economic factors at play, between 2008 and 2014 a reduction of 4,1% in the families' income was measured and, consequently, a drop of 2,1% in consumption. Although this decrease in earnings and spending – a consequence of the global financial crisis – was not as severe as in other parts of the country, it contributed to enhancing socioeconomic inequalities – as confirmed by the GINI index rising from 0,304 to 0,327). In the same period, the relative poverty diffusion had risen from 10,7% to 10,9%. Interestingly, poverty is no longer associated with elderly people, often living alone, but is increasingly affecting younger families. This is caused by the rise of unemployment and by a general change in the market labour. More extreme phenomena include homelessness. It is estimated that approximately 5.500 people have no access to housing. This group is mostly composed of vulnerable men, Italian or foreign, without employment, often suffering from social exclusion and physical and/or mental pathologies. Among them, there is an increasing number of young people (18-25-year-old) without family support, solid social networks and/or means to sustain themselves. Particularly serious in this sense is the condition of young mothers (Regione Emilia-Romagna, 2022d).

Another vulnerable group is the one of migrants, both staying regularly or irregularly. This group include people excluded by reception hubs, migrants coming from countries that do not allow them to have the right of asylum, or migrants waiting for their stay permit. In absence of a regular stay permit, migrants can only access basic services like first aid or meals. This category is also at risk in terms of labour exploitation, social exclusion, and cultural discrimination. As already noted, the regional population has a multi-ethnic character and migrants in poverty conditions are particularly prone to fall into forms of labour exploitation (that might consist of non-regulated cash-in-hand work without regular contracts). Agriculture (especially picking fruit or vegetables) and animal farming are the sectors where these kinds of practices are more diffused, followed by logistics, warehousing, construction works, and tourist services.

Gender pay gap

In general, Emilia-Romagna is one of the Italian regions where incomes are higher, and women earn on average 20.600 euros per year – over 30% more than Sicilian women. Despite earning more on average, the gender pay gap is calculated to be 1.400 euros per year (relative pay gap 6,5%, while the national data is 5,6%). This is mostly caused by part-time job contracts, which is often an unvoluntary choice.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Emilia Romagna is presented in Table 52. The situation in this territory is similar to Portugal. Vulnerable groups are mostly elderly people but also younger people having difficulties in the labour market and consequently in housing. Also, immigrants are extremely vulnerable to labour exploitation due to cultural discrimination and segregation.

Table 52 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Emilia Romagna

Vulnerabilities	Risks	Opportunities
Poor living conditions of elderly	Poor quality of life	Develop community networks and municipal integrated strategies
Labour and human right	Ecological transition supported by work without conditions that jeopardises the rights of life and workers	Development agricultural strategy capable of integrating immigrants
Structural gender inequalities	Discriminatory ecological transition	To create a system of monitorisation that enables to understand which social groups are included and excluded

4.2.7.6.2. Primary data: Social perceptions on inclusiveness

The perception of the environmental decision-making regarding natural resources in Emilia Romagna is understood quite differently by the interviewees. The policymaker frames that there is not only one decision regarding natural resources since the process is very diverse. The scientist says that he is little aware of it. Considering the possibility to intervene, the scientist states that he perceives few opportunities to do that.

When it comes to expressing their opinions concerning the importance of diversity of perspectives and knowledge on environmental decision-making, the policymaker states that it would be useful and the scientist frames:

"…the richness of different contributions can allow us to undertake this path most suitably for each one." (Italian male scientist, 26 years old, Emilia Romagna).

Finally, the matter of including vulnerable groups in the environmental decision-making is somewhat put aside by the policymaker, while the scientist states:

"I believe that it is essential both to welcome and to listen to people who are escaping situations of great discomfort." (Italian male scientist, 26 years old, Emilia Romagna).

From these two interviewees, it is possible to see that more work is needed especially regarding the policymaker and the municipal technician to improve their sensibility to the multidimensionality of ecological transition.

4.2.7.7. Synthesis

According to the Emilia Romagna socio-ecological concerns described in the Grant Agreement (GA, 2021, p.17-21), eleven main topics were identified as the main concerns to tackle during the ecological transition: air quality, agriculture, waste management, protected areas, forests, education on sustainability, reducing GHG emissions from agriculture, green economy, energy saving and efficiency, transport, research, innovation, and training. The secondary and primary data previously analysed reinforces all these concerns, which were expressed by the local diagnosis and stakeholders.

As seen from the data available in this pilot, the territory expresses several concerns regarding air pollution, mainly due to road traffic and industrial activities. The agriculture sector is also facing challenges due to the impacts of climate change, which will imply integrated solutions regarding the management of natural resources, especially water. On the side of potentialities, that also intrinsically bring challenges, the rich biodiversity of the region, with plenty of species and forests, may lead the necessity to develop, discuss and reflect not only on the benefits for human and environmental health, including ecosystem regeneration, but also on the rights of Nature and the limits that should be respected and how this should be a core issue in the ecological transition: move from an instrumental vision to a relational one. Another important element is the sociocultural diversity of the region, expressed by the immigrants living and working in Emilia Romagna, that face difficulties with integration in society, experiencing labour exploitation and, consequently, difficulties to be part of local environmental decision-making. So, there are two different challenges that emerge from this opportunity: one related to the need to make sociocultural diversity part of environmental decision making in participatory processes; a second one related to the different meanings and understandings of nature and environment that due

to their cultural variability should be considered in the ecological transition, where one size fits all does not exist.

Some highlights regarding Emilia Romagna's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Sociocultural diversity and labour rights - consider the sociocultural diversity of people in the environmental decision-making, their meanings and expectations and their involvement through the creation of integration and monitoring strategies, but also discuss the labour exploitation that mostly affects vulnerable groups where immigrants are included;
- Climate action - understand climate change impacts on agriculture and the need to develop new strategies and prioritising organic farming;
- Clean and fair energy and mobility– these two issues should not be dissociated and urge to find first a common solution regarding sustainable mobility among different populations and, only after, implement these alternative solutions – it is important to consider different viewpoints of citizens and stakeholders to give meaning to the solutions proposed;
- Biodiversity – safeguard biodiversity to improve local resilience and ecosystem regenerations, but take this opportunity and the rich biodiversity of the region to deepen the discussion and reflection on the rights of Nature.

4.2.8. Bologna[27]

4.2.8.1. Sociodemographic

Population structure by sex and age group, education level and ageing

The resident population of the Bologna municipality is 391.382 inhabitants (-0,2% compared with 2021), with an average age of 46,9 years. Only 64% of residents have an age between 15 and 64 years (250.660 individuals). In accordance with the regional overview, the elder population exceeds the younger one, and it is estimated that for every 100 people under 14 there are 215 above 65 years old (54.051 are below 18 years old). More specifically, almost 25% of residents are above 65 years old, 12,7% are between 65 and 79, and 9,3% are above 80 years old. 256 people are more than 100 years old (217 are women) (Comune di Bologna, 2021a). Between 2006 and 2020, the number of young people and people over 80 years old has increased with respect to others. Women are 52,5% of the residents, and this

[27] In Bologna, 3 interviews were collected.

discrepancy depends both on the population structure and on women's longer life expectancy (Comune di Bologna, 2021a).

Unemployment and income

Bologna's income level is the second highest in Italy after Milan, approximately 28.000 euros per year. However, wealth is far from being equally distributed in society, since economic vulnerability is more diffused among lone elders, young people and immigrants. The unemployment rate is 3,9%, while the inactivity rate is 26,8% (one of the lowest among the big Italian cities). Inflation increased 2,1% in 2021, and the price of commodities also increased (Comune di Bologna, 2021b).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Bologna is presented in Table 53. Bologna is a territory where the income is quite above the national average, being even the second territory with the highest income in the country, below Milan. Once again, this may not translate to all the population benefiting from this, and data have shown that wealth is unequally distributed among the population, being the most vulnerable people the ones that experience economic barriers. Together with the ageing phenomena, this may result in some resistance to the ecological transition, due to the economic and social barriers.

Despite the challenges previously identified, and similarly to other pilots, it is important to see ageing not only as a negative issue but also as an opportunity to value the knowledge accumulated over the years, in favour of intergenerational experiences regarding local environment and natural elements.

Table 53 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Bologna

Vulnerabilities	Risks	Opportunities
Ageing	Resistance to change behaviours	Balance population growth; Accumulated expertise, knowledge, and experience
Income inequalities	Economic barriers to adopt pro-ecological behaviours	To discuss the economic and structural barriers of ecological transition

4.2.8.2. Natural resources

4.2.7.2.1. Secondary data on natural resources

Land use

Bologna's territory has been historically shaped by forestry and agricultural activities (especially arable land, fruit trees, and vineyards). However, these activities have declined, leading many fields to the state of abandonment. The increasing mechanisation of agricultural lands has changed the landscape, and the unused areas are now more fragmented and non-homogeneous. Despite this evidence, this leads the opportunity to spontaneous vegetation spread allowed the formation of new bushes and woods creating environments that are now home to many wild species (e.g., roe deer, wild boars, and the porcupine). The vegetation is particularly concentrated along the water courses (especially along the Reno river), that are relevant ecological axes for the local environment – some of them are publicly accessible through walkable paths (Comune di Bologna, 2022b).

Water resources

The hydrological system is a mixture of natural and anthropic components. The natural water courses are the Reno and Savena, together with the Lavino and Navile and other streams running down from the hills. All of them have a torrential character. The countryside is characterised by a complex network of canals, which has traditionally allowed for fields irrigation and goods transportation. Some of them have been covered during the city expansion, while others are still visible. The aqueducts system comprehends 32 municipalities and 55% of collected waters are needed just to satisfy Bologna's needs. The sewage system is 800 km long and it covers 99% of the municipal area (Comune di Bologna, 2022b).

Concerning water quality, the assessments revealed that superficial waters tend to deteriorate closer to the city centre, especially downstream of the purification plant (Canale Navile). Water analysis showed contaminations by organohalogens, which are organic compounds with atoms of halogens (e.g. bromine, chlorine, fluorine, iodine) deriving from manufacturing or industrial processes (Comune di Bologna, 2022c).

Also, the extractive activities were diffused around Bologna, and their presence entailed the use of pollutants with long-term effects in the soil and in the aquifers, requiring decontamination. However, the decline of this activity (as is visible in the following topic description) had positive impacts in the reduction of water pollution from this source.

Minerals and deposits

Some minerals are present in the territory, such as chalk, clay, sand, and gravel, which have been extracted for centuries in the municipal areas, and some quarries are still functioning, although their activity is in decline (Comune di Bologna, 2022b).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Bologna is presented in Table 54. The Bologna territory comprehends a significant set of water sources that aims to satisfy human needs and biodiversity. However, the municipality of Bologna needs 55% of the water that is distributed with 32 more municipalities, which translate to a high consumption of this natural resource that, in a time of climate change, can rapidly lead to situations of scarcity, posing a risk to agricultural and others economic sectors, but also to the maintenance of biodiversity and human lives. Also, water contamination is a serious problem, especially when it stems from industrial activity that should be regulated.

On the other hand, the vulnerability that forest and agriculture activity decline poses has resulted in an opportunity to allow new and spontaneous vegetation to flourish that, consequently, attracts the presence of new animal species that enrich the biodiversity of the region.

Table 54 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Bologna

Vulnerabilities	Risks	Opportunities
Decline of forestry and agriculture activities	Food and natural resources dependence	Opportunities to regenerate biodiversity
High consumption of water resources; Pollution of water sources	Water scarcity and poor quality	To develop an integrate strategy regarding the collective management of water resources

4.2.8.2.2. Primary data: Social perceptions on natural resources

In Bologna, nine natural resources have been identified by the interviewees as the most important in the territory (Table 55).

Table 55 - Frequency of natural resources referenced by Bologna interviewees

	Sub-category	Frequency (n)	Percentage (%)
1	Sunlight	3	16.7
2	Plants	3	16.7
3	Animals	3	16.7
4	Forests	2	11.1

5	Water	2	11.1
6	Air	2	11.1
7	Natural gas	1	5.6
8	Minerals	1	5.6
9	Soil	1	5.6

At the top of the natural resources are sunlight, plants and animals. These natural resources have not been identified through the secondary data available and frame that populations' perceptions value a certain type of resource. In the case of sunlight, it is of high importance due to its potential for renewable energy and, in the case of plants and animals, for biodiversity safeguarding.

Regarding the availability and scarcity of natural resources, those considered most important by the interviewees are the same ones that are perceived as most available: sunlight, animals and plants. The scarcity relies on gas, metals and fossil fuels, as well as water in certain periods of the year.

Regarding socio-environmental conflicts, three conflicts have been identified through the interviews but the actors involved were not mentioned: conflicts due to the reduction of water resources, soil consumption and reintroduction of nuclear energy.

This information is crucial since the possibility of reintroducing nuclear energy is a contradictory force of the ecological transition implementation that should not be neglected. It is important to discuss how the presence of water and sunlight in the territory may be the most ecological solution – clean energy – to undermine the possibility to opt for nuclear energy.

4.2.8.3. Socio-environmental concerns

4.2.8.3.1. Secondary data on socio-environmental concerns

Air Pollution

Air pollution is one of the major problems of the municipality – it is estimated that 1,1% of deaths are caused by it. Although the problem has been mitigated over the years thanks to increasingly compelling norms on vehicular traffic and pollution, the industrial activities still impact the air quality of Bologna – along with the geographical and meteorological context. Data are not much different from the ones referring to the major Italian cities. The most diffused pollutants are PM_{10}, dioxides, nitrogen oxides, ozone, and benzene. The city centre is particularly affected by traffic, whose effects are more evident depending on time and weather conditions (Comune di Bologna, 2022c).

Climate-related economic losses

Bologna's climate has been affected by some of the consequences of climate change. The analysis carried out for the realisation of the local plan shows that the vulnerabilities in the municipal area consist mainly of droughts, water scarcity, heat waves, extreme events, and hydrogeological risks (Comune di Bologna, 2022b).

Energy

Regarding the energy demands, in 2018 – the last available data – the esteem of the overall energy consumption in the Bologna municipality was 1.671.074 MWh (431.447 of which relatable to residential buildings). Between 2005 and 2018, the city has reduced it by 2,6% (16,5% if one does not consider railways demand). In the same time span, the consumption per capita has gone from 1.335 KWh to 1.104 KWh. Between 2016 to 2019, the number of solar panels increased from 1.101 to 1.331, eventually producing 33,1 MW per year (Comune di Bologna, 2018). It can be considered that energy efficiency is in progress in the region.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Bologna is presented in Table 56. In the region of Bologna, urbanisation did not allow for the primary sector to grow significantly. Therefore, the data available only enable to identify two socio-environmental concerns: the air pollution caused mostly by road traffic and industrial activities and the climate change vulnerability that will have a significant impact on water quality, demand, and efficiency, especially in a region that needs 55% of the water to supply a set of 32 municipalities and satisfy the population's needs. It is an opportunity to develop alternative and efficient solutions for water management.

Table 56– Synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Bologna

Vulnerabilities	Risks	Opportunities
Climate change impacts	Droughts - Impacts on water quality; Water scarcity	Implementation of efficient systems of use of water sources
Road traffic and industry activities pollutants emissions	Global warming; poor air quality; public health impacts	Reduce road traffic; Implementation and monitoring of national strategies

4.2.8.3.2. Primary data: Social perceptions on socio-environmental concerns

Seven socio-environmental risks in the region of Bologna have been identified by the interviewees (Table 57) and the loss of biodiversity, global warming and water scarcity (all interrelated) are at the top of concerns.

Table 57 - Frequency of socio-environmental risks referenced by Bologna interviewees

	Sub-category	Frequency (n)	Percentage (%)
1	Loss of biodiversity	2	20
2	Global warming	2	20
3	Water scarcity	2	20
4	Lack of food sovereignty	1	10
5	Air pollution	1	10
6	Soil degradation	1	10
7	Droughts	1	10

Among these socio-environmental risks, it is visible the absence of social inequalities. These risks are aligned with those identified through the secondary data to mitigate climate change impacts and intensive road traffic.

The interviewees are all aware of the ecological transition and all understand that this transition includes a change in the economic and social systems. However, there is one interviewee that points out why this transition is needed and what will imply, especially some barriers:

"It is about the possibility of moving from a type of energy and goods production that involves the exploitation and subsequent drying up of the land and raw materials, to an equally satisfactory approach from the point of view of costs and performance, but derived from renewable sources and clean energy. The transition obviously requires a certain investment to be started, but this investment is excessively demonized by those who profit from the current system, while there is evidence that in the long run, it would be a more sustainable solution in every sense." (Female Italian citizen, 34 years old, Bologna)

From this interviewee discourse, it is possible to see that the main barriers came from those who profit from the current social and economic system – big companies and producers of intensive agriculture, industry and energy are the sectors identified through the interviewees' discourses. It is quite interesting to see that all interviewees from Bologna – all citizens – believe that the ecological transition responsibility does not fall on them, but rather on national and European governments – a top-down approach.

4.2.8.4. Sociocultural ecological behaviours

4.2.8.4.1. Secondary data on sociocultural ecological behaviours

Waste production and treatment

The municipality of Bologna produces approximately 600 tons of waste each day (about 1,5 kg per resident). In 2020, the amount of waste per capita was 575 kg, 55% of it being collected separately. In this regard, Bologna is still below the regional requirements, since a regional norm enacted in 2015 indicates 70% as the minimum percentage of separate waste collection. However, during the last decade, improvements have been made, especially if one considers that in 2000 this data was only 25%, and then increased to around 39% in 2013 (Comune di Bologna, 2022a).

Mobility

Regarding vehicular traffic, in 2018 the municipality measured 0,53 automobiles per inhabitant (lower than the metropolitan area where the ratio is 0,61). Between 2015 and 2018, the number of polluting cars dropped in favour of hybrid and low-emission vehicles. The percentage of gasoline-powered vehicles has decreased, while natural gas and LPG vehicles have become more diffused. Between 2005 and 2013 the number of cars has diminished, but since 2018 this trend changed. In 2018, the number of private cars was 207.500 (+1,6% compared with 2005), while commercial vehicles were 18.269. Motorcycles have constantly become more common, and in 2018 there were 56.743 of them (+22,5% compared with 2005). The city has a dense network of cyclable pathways, extending for 120 km in both the historical centre and the periphery. Recently, investments in this sense have intensified, and just between 2019 and 2020, the network increased its length by 8,7%. Since 2018, the city has approved the “Piano Urbano per la Mobilità Sostenibile” (PUMS) which intends to incentivize sustainable mobility. Accessibility for walking and cycling has been improved, electric bicycles and sharing habits were prioritised, and public transport use was recommended (PUMS Bologna Metropolitana, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Bologna is presented. Through the available data, it is not possible to identify significant vulnerabilities or risks associated with sociocultural ecological behaviours. In fact, data show that recycling habits regarding waste management are very satisfactory and show a positive trend. Regarding sustainable mobility habits, the number of private cars is below the national average, and the municipality has implemented a strategy to enhance alternative mobility solutions such as the cyclable pathway, walking,

electric bicycles and sharing habits, along with incentivizing the use of public transport. It would be interesting to understand how the adherence to these solutions has been and perhaps what makes citizens reduce the use of private cars.

4.2.8.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

For the interviewees, the main strategies to improve collective ecological awareness are formal and informal education – from an early age – and economic incentives to favour conscious actions on the use of land, water and biodiversity.

The interviewees were able to identify which are the behaviours that they considered to be more easily to adopt and the correspondent barriers that they have experienced/will experience during this process (Table 58):

Table 58 – Ecological behaviours considered to be more easily adopted by Bologna interviewees and correspondent barriers

Behaviour	Barrier
Respect for plants, animals and territory	Public administration and local authorities' inaccessibility
Sustainable mobility - bicycle	Danger and lack of public transport
Sustainable mobility – less use of private car	Change of habits Giving up personal comfort Lack of alternative solutions
Reduction of domestic energy consumption	
Change of diet	

The behaviours here identified are at the individual level but have two different types of barriers. The first one is structural and relates to the difficulties faced by citizens to be heard by local authorities and the lack of alternative solutions to progress with the alteration of consumption and mobility patterns; and the second level is related to the willingness to give up on personal comfort for the common greater good.

4.2.8.5. Experiences in Nature

4.2.8.5.1. Secondary data on experiences in Nature

Protective functions of forests

Hills represents 28% of the municipal surface, and they offer natural and recreational functions. The public green amounts to more than 1.000 hectares, and it is subdivided into more than 750 separated areas. There are approximately 250 green areas and parks, for a total of 600 ha. These areas are both historical and recently built, and they can be found inside the historical centre (e.g., the Parco della Montagnola, or some historical buildings' gardens) as well as in peripheral neighbourhoods (e.g., Prati di Caprara, Giardini Margherita)

and in the peri-urban areas (e.g., San Michele in Bosco). Given the lower density of 20th century urbanizations – and the public's obligations on the minimum green areas per inhabitant – peripheral parks are more common. There are also green areas along roads and infrastructure (160 ha), green areas related to sports centres (110 ha), and other green areas related to schools and public buildings (180 ha). Most of the urban greenery has been accomplished during the city's expansion (approximately between the 60s and the 70s), and their maintenance has been often neglected in the subsequent decades. More recently, the attention to green and unbuilt areas is increasing, and their quality is gradually improving (Comune di Bologna, 2022b).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in nature in Bologna is presented. Similarly to the research topic of sociocultural ecological behaviours, through the available data, it is not possible to identify significant vulnerabilities or risks associated with experiences in nature. Bologna holds a considerable number of green areas that are equally distributed in the territory, with a lot of public parks within the municipality. Being an urbanised municipality, the existence of these natural areas enhances the possibility to contact with nature and to improve physical, mental and social health of citizens, by also providing important ecosystem services to the urban environment.

4.2.8.5.2. Primary data: Social perceptions on experiences in Nature

All interviewees mentioned in their discourses the complexity and web of relationships between humans, non-humans and all non-living entities, which is linked with the category of interdependency found in the literature (Table 59):

Table 59 – Nature definition and correspondent words associated by the Bologna interviewees

Nature definition	Words associated
"Nature is what I tread, breathe, touch, look, eat, feel." (Female Italian citizen, 34 years old, Bologna)	underwood, brambles, wild boars, light and perfume
"All living beings, non-living entities and phenomena that occur naturally." (Male Italian citizen, 41 years old, Bologna)	Life, plants, animals, environment, beauty
"Perhaps the complex of the universe that surrounds us made of earth plants water basins wild and farmed animals but also the alternation of the seasons." (Female Italian citizen, 69 years old, Bologna)	plants, lands not inhabited by humans, wild animals, water that flows free from levees, but also storms and natural disasters

In the first interviewee – a female citizen 34 years old -, from her definition emerged a plurality of senses that is linked with what she experiences when in contact with Nature: "a walking with oneself", i.e., with the capability to build and rebuild our identity, the Self. In the case of the second interviewee – a male citizen 41 years old – the definition is anchored on the notion of the whole, the web of relationships and the words chosen reflect that: life, the plants and animals, all living beings, but also the environment and beauty. The last interviewee – a female citizen 69 years old – frames her definition of Nature by the complexity involved and the natural cycles and dynamics.

4.2.8.6. Inclusiveness

4.2.8.6.1. Secondary data on inclusiveness

Vulnerable groups

In Bologna's municipality, there are several vulnerable groups identified: the elderly (on third of people over 65 years old live alone), the mono-nuclear families (28.3% in 2021), the children living with one parent (23%), inducing the municipality to estimate social fragility as "medium-high" in the municipality (Bologna Città Metropolitana & Comune di Bologna, 2020). But these are not the only vulnerable groups in Bologna: students and immigrants are also included, since 20,3% of residents has declared an income consisting of less than 10.000 euro per year, and 29% declared less than 12.338 euros, which is considered the threshold that measures relative poverty. However, the social network is very strong in the territory, where 90% of people declared to be able to count on their social network (families and friends) for obtaining support (Bologna Città Metropolitana & Comune di Bologna, 2020).

It is worth to remark that some measures have been taken by the municipality to reduce inequalities in the territory, focused on low-income families, elders, poorly educated adults, minors and disabled people. Some services provide specific help to homeless people, that are estimated to be over 1000. During winter, a special plan called "Piano Freddo" is intended to support homeless and people in extreme poverty with free meals and shelters. Between 2016 and 2020, the overall economic support provided by the municipality amounted to 40,4 million euros and regarded over 15.000 people (Bologna Città Metropolitana & Comune di Bologna, 2020).

Gender pay gap

Women's education levels are higher at all levels (with the only exception of elementary and middle school degrees, which are more diffused due to the larger number of elder women)

and their presence at the university is 55,6%. Notwithstanding this, women's statistics on employment, career, and income are below men. Three years after graduation, the percentage of employed men is 3,5% higher compared to women. Only one year after graduation, women earn 11,4% less than men, and five years later they earn 16,9% less on average. The Covid-19 pandemic has impacted the job market and the employment rate, damaging women particularly. In 70% of cases, the jobs lost during 2020 were women. This situation is reflected on the income distribution. 56,2% of women have an income below 20.000 euros per year (men are 42,3%), while only 1,7% of women exceed 80.000 euros per year (men are 5,3%). However, the province of Bologna is one the more virtuous in the national context. The women's employment rate is 66,2%, while the Italian is 49% (Bologna Città Metropolitana, 2021).

Some measures have been taken by Bologna's municipality and province (Città Metropolitana) with regard for the promotion of gender equality. These interventions encompass the economic dimension, as well as the legal rights area. Since 2014, the municipality has approved the "Bilancio di Genere" (a sort of general gender evaluation) which intends to analyse statistics and summarize all relevant information in a single document. Moreover, in 2021 the province enacted the "Piano per l'Uguaglianza di Genere" with the intention of tackling the issue. Regarding political representation, women are 20% of the mayors in the province of bologna, and approximately 46% of the council members (Bologna Città Metropolitana, 2021).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Bologna is presented in Table 60. The municipality clearly identifies the vulnerable groups and the issues concerning gender inequality. This identification reveals that continuous monitoring on vulnerable groups has been taking place, and that consequently several measures have been defined to revert these situations. Transversal to all pilots and also found in Bologna is the absence of data regarding citizen's participation in environmental decision-making. After the previous pilot's characterization, it seems critical to revert this situation and seize the opportunity of ecological transition to implement a system that allow to identify how participate and how is excluded, and more importantly why.

Table 60 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Bologna

Vulnerabilities	Risks	Opportunities
Absence of data regarding citizens' participation in environmental decision-making by gender, social status, age, and ethnic group	Discriminatory ecological transition	To create a system of monitorisation that enables to understand which social groups are included and excluded; Several measures regarding

Vulnerability of elderly, mono-nuclear families, children, students**,** and immigrants		reducing socioeconomic inequalities and gender equality policies
Structural gender inequalities		

4.2.8.6.2. Primary data: Social perceptions on inclusiveness

Only one interviewee refers to being aware of environmental decision-making in Bologna. Nevertheless, all highlight that they do not know how to participate and that most of the time the decisions are top-down and based on economic benefit rather than respecting nature and its limits.

Regarding the inclusion of different perspectives and knowledge in this process, the interviewees believe that would benefit all. When it comes to including vulnerable groups, they all agree that this is the most important measure but they believe that currently does not happen.

4.2.8.7. Synthesis

According to the Bologna socio-ecological concerns described in the Grant Agreement (GA, 2021, p.17-21), seven main topics were identified as the main concerns to tackle the ecological transition: green spaces, sustainable mobility, climate change, waste collection, protection of biodiversity, energy transition and pollution reduction. The secondary and primary data previously analysed reinforce some of these concerns, which were expressed by the local diagnosis and stakeholders.

The concerns regarding green spaces and waste collection seem not to be a great concern according to the data analysed: firstly, Bologna holds several green areas available that are scattered in the middle of the dense urban fabric, which democratises access to these spaces and contributes to public and environmental health; secondly, waste collection practices are mostly pro-ecological, and recycling is a common practice within the territory. The other concerns were corroborated from the data available for Bologna: the air pollution caused by industrial activities and intensive road traffic, using private cars, which implies the need to adopt sustainable mobility patterns to pursue the energy transition. In this specific case, Bologna holds important infrastructures that may allow the adoption of sustainable mobility patterns; the climate change impacts, especially in natural resources

availability. In Bologna, water consumption is very high, which means that in a future scenario where climate change impacts become more serious, there is a risk of water scarcity and poor quality that will not only impact public and environmental health, but also trigger socio-environmental conflicts; biodiversity protection is also very important in Bologna, since there are plenty of different species, some even new that arise from the abandonment of land. Here, abandonment, which is a negative aspect, resulted in an opportunity to rewild.

Another result from this analysis, and this is also transversal to most of the pilots, is the non-recognition of socio-cultural-economic inequalities as a socio-environmental concern. In fact, inequalities aggravate socio-environmental concerns, limiting the possibilities for agency and therefore undermining ecological transition. In the case of Bologna, the vulnerability of some social groups is the inequality distribution of wealth is quite evident and should not be neglected.

Some highlights regarding Bologna's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Water resources availability and quality - consider the need to discuss an efficient and balanced consumption of water sources due to the risk of scarcity resulting from the impacts of climate change, especially droughts, that will affect not only the availability but also quality – these risks have been identified also through the interviewees' narratives;
- Climate action – consider the climate change impacts in the near future and their impacts on public and environmental health;
- Clean and fair energy, sustainable mobility and air pollution – these three interconnected issues deserve further attention in the participatory processes, since the adoption of clean energy and sustainable mobility will result in the improvement of air quality and the reduction of air pollution. As previously mentioned, Bologna holds important requirements regarding infrastructure that may facilitate this transition;
- Biodiversity protection – Bologna is a unique pilot in terms of biodiversity and natural elements that should be safeguarded. Respecting limits and co-responsibility may be of relevance to be discussed in participatory process;
- Structural inequalities – consider the socio-cultural-economic inequalities in the participatory process to ensure a fair transition for all– for the interviewees, this is a huge barrier to adopt ecological behaviours.

4.2.9. Central Transdanubia Region[28,29]

4.2.9.1. Sociodemographic

Population structure by sex, age group, education level and ageing

Central Transdanubia Region includes three counties: Fejér, Komárom-Esztergom, and Veszprém. The region's population is aging, which is aligned not only with the European trend but also with the national one. According to data from 2021, 14.5% of the population is between the ages of 0- 14, 65.3% is aged 15-64 and 20.2% is over 65 years old (Hungarian Central Statistical Office, 2022e). The birth rate (9,32) is also similar compared to the national value, but the death rate (11,83) is slightly worse (Hungary 11,46). In fact, the life expectancy at birth in years in this region is 76 years old (Hungarian Central Statistical Office, 2022a).

Unemployment, employment, and income

Unemployment rate remains well below the national average (4.1%) in the three counties of Central Transdanubia Region: 2.1% in the Komárom-Eszergom county, 2.2% in the Fejér county and 2% in the Veszprém county (Hungarian Central Statistical Office, 2021b). The same logic happens regarding employment rate. In 2021, the employment rate was above the national average (63%): 67% in Komárom-Eszergom county, 64.5% in Fejér county and 63.6% in Veszprém county (Hungarian Central Statistical Office, 2021a).

Regarding household income in the region, in the two regions of Transdanubia the income per capita exceeded the national average, respectively in Western Transdanubia (2,495,000 HUF approx. 6400 EUR annually) and Central Transdanubia (2,463,000 HUF approx. 6315 EUR annually) (Hungarian Central Statistical Office, 2022b).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of the Transdanubia Region is presented in Table 61. This region faces the transversal challenge of population ageing, but the data regarding mortality rate pushes us to reflect on which social-economic-environmental-cultural characteristics of the region

[28] In Transdanubia Central Region, 2 interviews were collected.

[29] The region as a unit is only existing statistically in Hungary. Therefore, data collection, operation of companies, services, governmental offices are not representing the region itself. Below the national level the first level , which has government and therefore some kind of legal power is the County, (NUTS3), but not the region (NUTS2).

contribute to. As seen, the life expectancy at birth is low and this must be seen beyond the individual prism, but rather as framed in the contextual factors that moderate it.

However, employment rate and household income, in a first attempt, are quite positive when compared to the national average. Considering this, it may unveil that socioeconomic factors may not be the contributors to the mortality rate and low life expectancy.

Table 61 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Transdanubia Region

Vulnerabilities	Risks	Opportunities
Low life expectancy	Poor health outcomes	Explore how structural determinants may drive life expectancy

4.2.9.2. Natural resources

4.2.9.2.1. Secondary data on natural resources

Land use

According to regional data, the main land use is mainly composed by arable land (428.5 hectares), kitchen gardens (4.8 hectares), orchards (5.4 hectares), grapes (7.8 hectares) and lawns (81.2 hectares) (Hungarian Central Statistical Office, 2022c).

Water resources

The Transdanubia region is in the hydrological basin of Danube. The region is relatively poor in higher-yielding, permanent surface streams. According to Ballabás (2012) neither inland water nor flooding pose great risks. There are also two large lakes in the region, which hold a touristic important landmark: Lake Balaton and Lake Velence. Among the water resources considered with the highest importance the subsurface water stands out (Ballabás, 2012). The water resources thus very limited, due to the geological composition, the region is rich in karstic water, which is very much precipitation-dependent.

Minerals and deposits

In case of mineral resources, the region holds a wide diversity: regarding fossil fuels, the regions are considered to have the brown coal basins with the highest heating value of the country. Other minerals can be pointed out, such as the lignite of Várpalota and Úrkút (Ballabás, 2012).

Vulnerabilities, risks, and opportunities

Data available on natural resources only allows a characterization on those that are available in the region, information in order to provide an identification of possible risks is lacking, as well as for vulnerabilities and opportunities.

4.2.9.2.2. Primary data: Social perceptions on natural resources

In Transdanubia's central region, the natural resources considered most important by the two interviewees – a female representative of an economic group and a female working at an NGO – are stone, air, sunlight, soil, water, plants forests and animals. Among the natural resources, some of them are facing some challenges: if the agricultural land is abundant, both interviewees highlight the scarcity of water due to the decrease in precipitation.

When it comes to socio-environmental conflicts, the female representative of an economic group states that the production of garbage is the main problem, however, it is worth noting that this does not refer directly to conflicts about natural resources, despite having indirect implications on it, as in the air quality and soil and water pollution.

4.2.9.3. Socio-environmental concerns

4.2.9.3.1. Secondary data on socio-environmental concerns

Air Pollution

The Transdanubia region has experienced a reduction of the environmental impact of industries in water, air pollution and waste production in the last decades. Despite these efforts, pollution is still a serious problem in the region and prevalent in the country (Ballabás, 2012). This situation mainly happens due to the history of socialist cities that were traditionally industrial and due to traffic and agricultural activities. It was identified that the excessive use of nitrogen and phosphorus fertilisers was one of the main causes of the eutrophication of surface waters, as well as the improper use and storage of plant protection products that resulted in local heavy metal contamination in soils (Ballabás, 2012).

Climate-related economic losses

Some impacts of climate change are already being felt in the region, namely due to extremely hot weather situations that have become more frequent, and cold extremes have occurred less frequently. There is also a significant reduction in precipitation and, consequently, a length of periods with persistent drought has increased. However, the daily

rainfall intensity is higher, especially in summer, which suggests that the rainfall is increasingly falling in the form of short and intense periods (Ballabás, 2012). The drought significantly affects the agriculture and the number of crops and in the case of food industry, only few companies survived the change of climate regimes.

Farming

Within the Transdanubia region, the Fejér county holds two-thirds of territory under agricultural cultivation. The products cultivated are wheat and corn, sunflower, canola and sugar beet,, but cattle farming is also very significant in the country (Hungarian Central Statistical Office, 2016). The region also has a long tradition of Viticulture and winemaking. The Balaton area of the region has the most wine-regions in Hungary. Those are very much dependent on the climate changes. Their resilience is much debated, since the average are of these wine regions are considerably small and the composition of species is very various, some of them are extremely rare.

In the case of organic farming, the Central Transdanubia Bioculture Association (KD Bioculture, 2022) is the main promoter. Despite having no data regarding organic farming, it is worth to remark that this association develops several initiatives with local schools to implement school gardens, by organising open garden programs, seed fairs, herb courses, ecological plant protection courses, lectures on the creation of organic gardens, and holds regular meetings in various environmental protection circles. This is a sign that local associations are involved with civil society in the commitment to increase organic farming in the region.

Energy

The annual energy consumption of Central Transdanubia households was distributed, in 2018, as follows: electrical energy 32,7%, piped gas 30,3%, solid and liquid fuels 20,7%, central heating, district heating 13,6% and bottled gas 2,7% (Kocsis, 2018). Due to the number of strategic documents and action plans, mainly since 2015, the country has made efforts to reduce emissions and adapt to climate change. This has been made by the increase of solar energy production. This is very necessary, since Hungary is the second weakest country of the European Union concerning climate protection, and this is visible by the carbon dioxide emission which increased by 6,5% in 2018 compared to 2015, and 13.5% compared to 2013 (WorldoMeter, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in the Transdanubia region is presented in Table 62. The

Transdanubia region has made a serious effort to reduce air pollution and some gains needs to be pointed out. However, and due to the nature of its cities, which are mainly industrial (a heritage from socialism), the transition is more difficult as it is a structural issue. This is also visible in the case of energy and the lack of clear strategies defined regarding climate change adaptation, resulting in a continuous increase of greenhouses gases. In the case of agriculture, and despite the lack of public data, there are some local organisations committed to the increase of organic farming production, among civil society and mainly focused with children.

Table 62 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Socio-Environmental Concerns of Transdanubia region

Vulnerabilities	Risks	Opportunities
Air pollution from agriculture, road traffic and industry	Impacts on public and environmental health	Great potential to organic farming – local initiatives working together with civil society
Low level of adaption to climate change impacts – energy sector	Economic costs; impacts on GHG emissions and air quality; intense climate hazards	Paradigm shift towards clean energy and transition

4.2.9.3.2. Primary data: Social perceptions on socio-environmental concerns

Global warming appears to be for the female representative of an economic group the main socio-environmental risk of the territory, despite her considering that is a global problem. Both interviewees are aware of the ecological transition and believe that everyone is responsible for but only one describes what understands by it:

"Climate neutrality, or at least approaching it, is an important goal, but it obviously comes at a price." (Female Hungarian working at an NGO, 47 years old, Central Transdanubia Region).

This interviewee resumes the ecological transition to the climate issues, with the need to be neutral. However, she also states that this option comes to a price, i.e., we, as a society, will need to abdicate certain things for the common good and, in some cases, this can be a challenge. That is why that for the female representative of an economic group, humans are the biggest obstacle to the ecological transition:

"Humans, we are moving towards environmental awareness with slow steps, many of our fellow humans are not suitable for it." (Female Hungarian representative of an economic group, 55 years old, Central Transdanubia Region).

While for the female working at an NGO, the main obstacle is the lack of incentives or adequate government support that undermines the efforts towards the implementation of the ecological transition.

Considering the socio-environmental risks in Transdanubia, interviewees have different viewpoints:

"The power of money is hard to overcome, it is behind everything." (Female Hungarian representative of an economic group, 55 years old, Central Transdanubia Region).

"As long as people are living day by day and the government is thinking about burning coal again, it will not be easy. A complete change of direction is required." (Female Hungarian working at an NGO, 47 years old, Central Transdanubia Region).

For the female representative of an economic group, and perhaps as a self-reflection based on her daily experience, economic profit is the biggest socio-environmental risk since it acts as a barrier to the ecological transition. For the female working at an NGO, the main issue is the burning of coal, which has seriously risks for public and environmental health and changing this behaviour may take some time and will not be an easy task.

4.2.9.4. Sociocultural ecological behaviours

4.2.9.4.1. Secondary data on sociocultural ecological behaviours

Waste production and management

Data on waste production and management are also lacking and, therefore, no quantitative information can be given. Nevertheless, there is some qualitative information that mentions significant progress in the region in the past decade: the establishment of three large regional self-governing associations with the mission to implement safe, controllable waste management: Regional Solid Waste Management System of the Northern Balaton Region (supported by ISPA), the Duna-Vértes Köze Regional Waste Management Association (supported by the Cohesion Fund), the Middle-Danube Region Waste Management Association (supported by the Cohesion Fund) (Ballabás, 2012).

Vulnerabilities, risks, and opportunities

Available data on sociocultural ecological behaviours are very scarce and only allow a characterization on those that are available in the region, lacking information to provide an identification of possible risks, vulnerabilities and opportunities.

4.2.9.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

The future of a pro-ecological society relies on children, according to both interviewees. Educating and raising awareness on environmental education, by spending time in contact with nature and acquiring knowledge on it may be the most effective solution to improve collective ecological awareness.

The adoption of ecological behaviours, as already stated before, is constrained by a variety of factors that encompasses both individual and structural dimensions. For these interviewees, that already have a frugal lifestyle, their experiences are different:

"I've been living this way for a long time - I reduce energy consumption, I pay close attention to packaging materials and garbage collection, I selectively collect my minimal waste, I often take a collection bag with me on my walking routes and pick up the discarded garbage." (Female Hungarian representative of an economic group, 55 years old, Central Transdanubia Region).

"My place of residence is next to a forest, it is quite simple, partially suitable for farming, I have never accumulated possessions, I do not like objects without a function in the first place, I do not lead a wasteful lifestyle, and I strive to switch to an island operation as soon as possible." (Female Hungarian working at an NGO, 47 years old, Central Transdanubia Region).

In the case of the representative of an economic group, the adoption of ecological behaviours is easy since she has been doing that for a long time ago. In the case of the female working at an NGO, the adoption of a frugal lifestyle was driven by a certain way of life by living in and close to nature her made "never accumulated possessions" and did not accumulate useless objects, which means that she rejects consumerism.

4.2.9.5. Experiences in Nature

4.2.9.5.1. Secondary data on experiences in Nature

Protective functions of forests

The Transdanubia forest is considered one of the most important natural resources of the region. The biggest natural forest areas in the region are the Bakony, Vértes, Gerecse and Velencei mountains (Ballabás, 2012)

Tourism

Due to the largest freshwater lake in central Europe, the region is the second most popular tourist destination in Hungary. The natural elements provide different opportunities to

explore and be in contact with Nature, such as beaches, recreational and spa hotels, sports, among others (Pelso Camping Kft., 2015). The attraction is not only the waterfront destinations, but also the natural values (Balaton Uplands National Park, Danube-Ipoly National Park, Vértes and Gerecse Landscape Protection Districts).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in Nature in the Transdanubia region is presented in Table 63. Due to the existence of extensive natural resources, and to the demand of touristic activities, it could result, without proper regulation, in unsustainable tourism patterns that will pressure the territories and their natural resources. As seen in the case of the Odemira pilot, and to enhance a balanced growth, it will be necessary to clearly identify the limits of nature and to adopt sustainable tourism in the near future.

Table 63 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Experiences in Nature of Tavira region

Vulnerabilities	Risks	Opportunities
Increase in tourist accommodation	Massification of tourism with negative impacts on natural areas in the region	Regulate tourism activities through the adoption of ecotourism practices that respects the limits of territories

4.2.9.5.2. Primary data: Social perceptions on experiences in Nature

Nature's definition by both interviewees is based on the meaning of the "whole", that nature is life itself. So, the words chosen to associate with Nature are water, earth, animals, plants, and humans, for the representative of an economic group; and green, freedom, peace, silence and circulation for the female working at an NGO. Looking at their experience when both interviewees are in contact with Nature, it is possible to identify that, in common, they mentioned the recharge of energy and the immaterial gifts from Nature:

"I try and not only try but also realize in my own life - this is how I raised my children - that I live in harmony with nature. I am annoyed by the littering and irresponsible attitude of many of my fellow human beings. If I draw his attention to it, I usually get rejected - we only live once, it will happen somehow, it's not up to me... these are the reasons. I take my Vizsla dogs for a walk every day, the undisturbed nature especially calms me - here by Lake Balaton in the off-season - I don't meet people during my walks, I take photos and enjoy the scenery, which fills me with energy." (Female Hungarian representative of an economic group, 55 years old, Central Transdanubia Region).

"I especially like to walk in my forest by myself, I have a special little ritual at a suitable high point where I can recharge." (Female Hungarian working at an NGO, 47 years old, Central Transdanubia Region).

In the case of the representative of an economic group, there is a risk of being rejected by calling attention to the risks of human behaviours, which means that protecting the environment continues to be, in some cases, understood as a source of rejection that can lead to demotivation of those that have this cause.

4.2.9.6. Inclusiveness

4.2.9.6.1. Secondary data on inclusiveness

Vulnerable groups

In the Central Transdanubia region, the percentage of people at risk for poverty and social exclusion is considered the lowest of all regions (in 2020: 11,9%) (Hungarian Central Statistical Office, 2022d). Considering the differences among the region counties, the Veszprém County has the highest number of people receiving basic social care. In the Fejér and Komárom-Esztergom counties, only two-thirds of the settlements provide family support services. Regarding the proportion of people receiving subsidised meals among the population over 60 years of age, after Pest County, Fejér County has the lowest rate in the county. The village guardian service is poorly developed in Komárom-Esztergom and Fejér counties, while the network in Veszprém county is significant.

Gender Pay gap

Data on gender pay gap are only available at the national level. Considering this, in Hungary, the salary between women and men is different (14.2%), despite being slightly different from the 28 European Union member states average (16%) (About Hungary, 2019).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in the Transdanubia region is presented in Table 64. There is no data on citizen participation nor regarding immigrant's which makes it difficult to give more information on these issues. Regarding poverty and social exclusion, there is a risk in considering the Transdanubia region homogenous, as it may result in the design of misadjusted and universal public policies that do not consider counties' specificities. Also, and despite the gender pay gap being slightly lower than the European Union average, this should not result in a disregard of gender inequalities, since they persist in the territory.

Table 64 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Transdanubia region

Vulnerabilities	Risks	Opportunities
Poor living conditions and socioeconomic disparities among counties	Misadjusted and universal public policies	Develop tailored local public policies according to socio-economic specificities of each county
Structural gender inequalities	Discriminatory ecological transition	To create a system of monitorisation that enables to understand which social groups are included and excluded

4.2.9.6.2. Primary data: Social perceptions on inclusiveness

The environmental decision-making in Central Transdanubia Region regarding natural resources is not very clear for both interviewees and they state that are not aware of it. And that derives from their impossibility of intervening in it since they do have not a chance. When it comes to considering the integration of vulnerable social groups in this process, they both agree on the importance of it. However, considering the integration of a diversity of perspectives and knowledge by different social agents is differently understood by the interviewees:

"Broad social consultation on the subject is definitely important, and unfortunately there are few live examples of this in my environment, almost zero..." (Female Hungarian working at an NGO, 47 years old, Central Transdanubia Region).

"Not necessarily. The interests of all of us are the protection of the planet, there is no need to fragment the decision-making, down to the details, very decisive steps must be taken in the main and most important directions. (unnecessary, excessive bureaucracy, meetings...etc.)." (Female Hungarian representative of an economic group, 55 years old, Central Transdanubia Region).

While for the female working at an NGO a broad social construction is desirable in this process, for the representative of an economic group is a source of fragmentation. However, there is a risk of not considering diversity and not overcoming the traditional way of social participation.

4.2.9.7. Synthesis

According to the Transdanubia region's socio-ecological description in the Grant Agreement (GA, 2021, p.17-21), four main topics were identified as the main concerns to be tackled in the ecological transition: sustainable tourism, preservation of natural resources and biodiversity, industrial activity, waste and pollution and improvement of built infrastructure. The secondary and primary data previously analysed reinforces all these

concerns, which were expressed by the local diagnosis and stakeholders, but do not mention the concern related with energy transition, GHG and climate change and, last but not least, differences among the region counties.

Some highlights regarding the Transdanubia region's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Sustainable tourism and biodiversity preservation – natural elements in the region are quite diverse and are therefore considered a source of attraction for touristic activities. However, there is a need to regulate this activity in order to respect the limits of Nature, and consequently to safeguard their elements;
- Industrial activity and pollution – this concern is associated with the built infrastructure and the difficulties to change socialist industrial city patterns that largely contributed to the production of waste and also water, soil and air pollution, with negatives impacts not only for people but also for the environment;
- Climate change and energy transition – despite the efforts, the region stills faces significant challenges towards clean energy, which will have direct impacts on GHG emissions and will only exacerbate climate change impacts and reduce the capacity to mitigate them - it is important to raise ecological awareness and to define a strategy that reverts the burn of coal and garbage;
- Region's socio-cultural-economic differences – it is of utmost importance to recognize that despite this being an administrative region, the counties that integrate it have profound differences that should be considered in the participatory process - and to consider this diversity in the environmental decision-making process.

4.2.10. Szeged[30]

4.2.10.1. Sociodemographic

Population structure by sex and age group, education level and ageing

The Szeged population consists of 160,2588 inhabitants, from which most are female (54%), being distributed by age groups as follow: 13% is 0-15 years old, 73.2% is 15-64 years old and 14% is 65 or more years old. Regarding ageing, between 2009 and 2018, the city has experienced a 4% decrease among the members of active society and an increase of elderly

[30] In Szeged, 6 interviews were collected.

people by more than 4%, which characterises its society as an ageing (City Population, 2019).

Concerning education level, between 2001 and 2011 a decrease of people holding a primary education degree was observed, there was an increase in people with a secondary degree and, also, an increase of people with a university degree (23.2%) (City Population, 2019).

Unemployment

The unemployment rate for the total population in Szeged is considerably low, in the recent years it was under 3%. So unemployment as a problem is not the most crucial one of the city, yet it targets some specific groups. Unemployment in Szeged mostly affects those that are less educated, especially those who only hold primary education. The unemployment rate among them varies between 21 to 24%, although it is below the national average of 43.5%. There are also concerns with other social groups: the rate of unemployment among younger people (25 years or less) is 15% and among elderly is above 40%, which is a risk factor to be considered (EURES, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Szeged is presented in Table 65. This region faces educational and unemployment challenges, especially among youth, elderly people and those with primary education, which makes them a vulnerable group. The unemployment leads to socio-economic deprivation and, subsequently, marginalisation of the society's spheres, posing a risk to democratic participation and environmental decision-making.

Table 65 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Szeged

Vulnerabilities	Risks	Opportunities
Unemployment of elderly, youngers and less educated	Marginalisation of democratic practices	Create job opportunities to ensure a more inclusive and fair ecological transition and participatory processes

4.2.10.2. Natural resources

4.2.10.2.1. Secondary data on natural resources

Land use

Almost 30% of the Szeged area, which corresponds to 82.6 km^2, is made up of large arable fields and 23% are occupied by small-scale arable fields. The agricultural land occupies 51% of the city's total area.

Water resources

In Szeged, water surfaces represent a significant area of surface coverage in the city, with a total of 24 km^2. Szeged has a river, called Tisza, which is the second largest river in Hungary, and another one, called Maros (Mures). Both are originated from the neighbouring countries, therefore they are very exposed to uncontrolled pollution. Among them, the largest area is occupied by the fishponds, which is practically Fehér-tó, in the northern part of the city, on a total of 15.7 km^2. This area of the city is crossed by two rivers, which are also important waterbodies. Smaller areas are occupied by natural lakes with permanent water, such as the Holt-Tisza in Gyálarét and Holt-Maros, as well as the artificial lakes and reservoirs throughout the city (Vértó, Maty-ér, Búvár-lake, Sancer-lakes, etc.) (Szegedi Vízmű Zrt., 2022).

Regarding water supply and drinking water accessibility, it can be stated that the city provides drinking water with deep wells installed on 10,000-year-old drinking water bases, with an average temperature of 22-25 degrees. However, some concerns have been identified, such as water pollution and waste that is disposed in the upper parts of the river Tisza and that causes socioecological damages through the entire river course, affecting local wildlife.

There is also concern related to the inland water, due to the increase in build areas and inadequate drainage, as well as the increasingly frequent flash floods causing significant problems in urban and agricultural areas. The probability of inland water exposure reaches 30-40% in some parts of this region (Szegedi Vízmű Zrt., 2022).

Minerals and deposits

The region is rich in raw mineral materials, and important natural gas and oil deposits can be found here, near Algyő (Szeged Panoráma, 2014).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Szeged is presented in Table 66. Natural resources in Szeged are facing some challenges that may pose some risks in the future. Despite having a considerable percentage of arable land and agriculture, the municipality is experiencing an increase in the build infrastructure that impacts the ecosystem negatively. Firstly, Szeged holds a variety of water

resources that are being polluted and destroying the ecological system or rivers, both in the water supply and drinking supply. Secondly, due to urbanisation, some inland water is causing floods, in urban and also in agricultural ones. Secondly, the minerals available in the region may result in overexploitation of natural resources, especially regarding the extracted oil and natural gas that are transported from the area as raw materials.

Table 66 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Szeged

Vulnerabilities	Risks	Opportunities
Water sources pollution	Ecocide; destruction of riverine ecosystem	To regulate the illegal discharges; to develop an integrate strategy regarding the collective management of water resources
Overexploitation of non-renewable resources	Socio-environmental conflicts	Integrate citizens and organisations in the environmental decision-making

4.2.10.2.2. Primary data: Social perceptions on natural resources

In Szeged, five natural resources have been identified by the interviewees as the most important in the territory (Table 67).

Table 67 - Frequency of natural resources referenced by Szeged interviewees

	Sub-category	Frequency (n)	Percentage (%)
1	Water	5	45.5
2	Biodiversity	2	18.2
3	Forest	2	18.2
4	Agricultural land	1	9.1
5	Sunlight	1	9.1

Water is at the top of the natural resources perceived by the interviewees as the most important, a transversal choice for most pilots. In Szeged, water occupies a serious concern, already identified through the secondary data, since illegal discharges are provoking the destruction of the ecosystem.

Regarding the availability and scarcity of natural resources, the interviewees are very worried about the scarcity of water, which is already happening and its impacts on biodiversity and agricultural land, both natural resources considered as most important in the region that depends on water availability and quality:

"The lack of water and desertification will be a problem that must be dealt with in Szeged and its region. It can also be a problem from the point of view of agriculture. Sudden rains and floods are also

a problem, the distribution of precipitation changes, and it becomes uneven. This is important in terms of water resources and availability." (Female Hungarian working at an NGO, 47 years old, Szeged)

"Due to constructions and irresponsibly applied forestry and agricultural practices, the area of agricultural land is decreasing, and due to river regulations and the buried sewer network, a large part of the incoming river water supply does not participate to a justified extent in water retention." (Male Hungarian citizen, 62 years old, Szeged)

Both discourses reveal, first, the interconnection and interdependence among the natural resources identified and how the imbalance of one weakens the rest; and second, the need for the development and implementation of an efficient strategy to manage the natural resources.

Regarding socio-environmental conflicts, those identified through the interviews oppose different interests: economic and environmental ones:

"Disputes surrounding the construction of the Bős-Nagymarosi hydropower plant and the cancellation of the Hungarian part of the investment. It would have spoiled the view from the vacation homes of rich and influential people in Pest, so they founded the Danube Circle and successfully cancelled the investment. It was a political matter. Reservoirs should (should have) been built on the Tisza and Danube. It would also raise the groundwater level. The Paks I nuclear power plant system struggles with the maximum water temperature difference in summer when the water level is low. The Danube cannot be overheated above a certain level. The Danube should be dammed, it would also become more navigable, in addition to solving the cooling water problems of the nuclear power plant." (Male Hungarian citizen, 82 years old, Szeged)

"There are conflicts between technocratic entrepreneurs and social actors sensitive to environmental problems." (Male Hungarian citizen, 62 years old, Szeged)

Through these conflicts, it is visible in their statements the difficulty to merge interests and put the socio-environmental ones above the economic ones, to increase the availability of natural resources, such as water, that are going to face scarcity in the future.

4.2.10.3. Socio-environmental concerns

4.2.10.3.1. Secondary data on socio-environmental concerns

Air pollution

The main polluted areas in Szeged are the railway station and surroundings, the barrack areas and the outskirts and detached house areas. In what concerns transport related

pollution, there is anthropogenic copper, zinc and lead pollution in the soils of Baktó allotment gardens. Noise pollution is also mainly related to transport (IQAir, 2023).

Climate-related economic losses

Szeged is facing climate change impacts, especially droughts and lack of water, which has a negative impact on vegetation and the ecosystem.

Farming

Employment in the agriculture sector represents 2% of employment in this region. The weight of this sector is traditionally higher than the national average mainly due to the high-quality arable land and the high number of hours of sunshine. Regarding organic farms, there are two in the Csongrád-Csanád county (Széchenyi Terv Plusz, 2021).

Energy

Residential heating in Szeged is the main source of energy consumption, which is largely provided by the district. However, in isolated homes in the outskirts of the city, poor and elderly people burn solid fuels such as firewood, or even garbage (a third of the Hungarian population burns garbage to some degree). Even using uncertified firewood can lead to serious problems, as is the case of burning wet wood, which is harmful to the environment and health due to imperfect burning and the associated pollutants emitted. An even more serious problem is when people incinerate lignite or household waste (illegally) in their homes for cost-saving reasons and due to the absence of information on harmful effects. The main substances released into the air during heating are the so-called PM_{10} and $PM_{2.5}$ particles, and they are the most dangerous to the environment and humans (Habitat for Humanity, 2018).

The main energy resource in Szeged was natural gas (43,7%), which was followed by electricity (18,6%). Biomass, petrol, diesel and district heating made up around 8-11% of the energy mix each in 2008. By 2015, the energy needs of residential buildings have decreased by 11%, but it's still consuming the largest amount of energy by far (Energiaklub, 2018).

Regarding renewable energy, the promotion of solar power-based renewables can be successful, partly due to the fact that Szeged is one of the sunniest areas in Hungary (the yearly sunny hours are around 2100). Technological development and decreasing installation costs are the other facilitating factors. Based on this, it can be estimated that the amount and reliance on solar PV will further increase in the city. However, there are still great challenges ahead for the city in terms of energy production. The biggest share is still

produced from natural gas and a lot of further installations of renewables are needed to out scale this. Also, the yearly energy consumption of buildings is rather high. It was estimated to reach around 1,9 million MWh in 2015, from which a million is attributed to residential dwellings (Energiaklub, 2018).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Szeged is presented in Table 68. Szeged has a serious socio-environmental concern regarding heating, affecting the poorest and elderly. Due to the lack of socio-economic conditions and information regarding the risks of burning uncertified materials, they use solid fuels and garbage to heat their homes. Despite the public and environmental problems that can be caused, this may be perceived as a barrier to the ecological transition.

Table 68 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Socio-Environmental Concerns of Szeged

Vulnerabilities	Risks	Opportunities
Burning solid fuels and garbage to heat	Impacts on public and environmental health	Develop public awareness and provide safe heating sources
Low level of adaption to climate change impacts – energy sector and agriculture	Economic costs; impacts on GHG emissions and air quality; intense climate hazards	Paradigm shift towards clean energy and transition

4.2.10.3.2. Primary data: Social perceptions on socio-environmental concerns

Seven socio-environmental risks in the region of Szeged have been identified by the interviewees (Table 69) and global warming, water scarcity and loss of biodiversity (all interrelated) are at the top of concerns.

Table 69 - Frequency of socio-environmental risks referenced by Bologna interviewees

	Sub-category	Frequency (n)	Percentage (%)
1	Global warming	4	26.7
2	Water scarcity	3	20.0
3	Residential heating and harmful emissions	2	13.3
4	Waste collection	2	13.3
5	Desertification	2	13.3
6	Heat waves	1	6.7
7	Loss of biological diversity	1	6.7

Among these socio-environmental risks, global warming is considered the major risk to the region, followed by water scarcity. The waste collection appears once again, a problem already identified through the secondary data – in Szeged several people burn waste to keep their homes warm during the winter.

The interviewees are all aware of the ecological transition but some of them do not know what it means. For the following female citizen, the ecological transition is more like a "return", a restart, a reconnection with nature, its elements and its cycles:

"Bringing back traditional farming, bringing back animal husbandry, cow husbandry, etc. A kind of change has started in the direction of valuing green spaces and not covering everything with concrete. The "necessary minimum" is to use only as much as is necessary." (Female Hungarian citizen, 74 years old, Szeged)

But for the following citizen and even for the female working at an NGO, the understanding of ecological transition is fragmented since the problem, for the first, is that the communication is not efficient:

"Yes, I've heard of it, but I know far less about it than I should. Partly because the information is not as it should be, the information does not reach us. It would be important not to let the country go to ruin. I know more about my place of residence, Kiskunság, I was a part of it in my childhood." (Female Hungarian citizen, 75 years old, Szeged)

Here, in the case of the female working at an NGO, despite having poor information on it, the ecological transition is a preparation for the future where cooperation with nature is valued.

"I've heard the term before, but don't know much about it. A conscious preparation for the challenges of the future, with solutions close to nature, perhaps. These are more intuitions, I've heard about it, but I haven't followed it up yet." (Female Hungarian working at an NGO, 47 years old, Szeged)

When it comes to deciding who is the main responsible, four of the six interviewees stated that the example must come from above, the state and the decision-makers, leading by example. For the other two interviewees, everyone is responsible. Among the main barriers identified to the ecological transition, the state and the economic interests are highlighted. However, people's behaviours and daily habits are considered by the interviewees as difficult to change, since people tend to naturalise environmental problems, which is simultaneously the main challenge in the region.

4.2.10.4. Sociocultural ecological behaviours

4.2.10.4.1. Secondary data on sociocultural ecological behaviours

Waste production and management

Between 2010 and 2019, Szeged produced around 46 000 to 67 000 tons of garbage each year. About half to ¾-s of this was of residential origin (in 2019 41 000 tons from the overall 53 000 tons). Only around 4-7% (1 000 to 2000 tons) of the garbage had been recycled, which consists of paper, plastic and metal waste, collected separately in yellow bags. Regarding the composition of residential waste, around 31% is of compostable, organic waste, 25% paper, 16,5% plastic, 11% ash, 6,3 % mixed glass and around 5% are textiles. It also contains wood, iron and other metallic waste, rubber, leather, porcelain and bones in smaller percentages (Széchenyi Terv Plusz, 2021).

Mobility

Official numbers in Szeged reported that in 2017, 425 000 daily location changes occurred, from which 151 000 were made by public transport, 101 000 by car and 173 000 (41%) by bike or on foot. Regarding travels inside the city borders, from 2009 until 2015 it can be said that the rate of public transport had decreased, while the number of cars used had slightly increased, which can be considered negative changes (Habitat for Humanity, 2018).

Among the positive achievements, trips on foot or made by bicycle have strongly increased and were considered to be the highest (both regarding the two means together and bike travels alone) among regional centres of Hungary. This by a large part comes from the municipality of the city, which actively promotes these transportation methods through many investments (Additionally, complex and complete developments of the bike road network infrastructure are also relevant, as well as installations of P+R, or the introduction of e-rollers and lately e-bikes) and the organisation of events. However, there is a correlation between the decrease in public transport users and the increase in bike usage. This means that the promotion of bicycles hasn't changed much regarding car usage, which remains a goal and challenge for the city. The decrease in the use of public transport is also partly explained by it being less flexible compared to bikes or cars. The drop rates in the usage of public transport have been rather dramatic in the last years, reaching -5% annually (Habitat for Humanity, 2018).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Szeged is presented in Table 70. There are some concerns

regarding the adoption of sociocultural ecological behaviours in Szeged, especially related with waste production and treatment. Also, private cars are being used more than public transport, although there is a significant part of the population that uses the latter. This is somewhat related with the need to reduce the production of waste and its impact on soil and air pollution, which along with burning solid fuels and garbage may have contributed to the reduced life expectancy that Hungary experiences.

Table 70 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Szeged

Vulnerabilities	Risks	Opportunities
Increase in the consumption	Production of more waste	Circular economy
High utilisation of motor vehicles; lack of alternative mobility solutions outside urban areas	Poor air quality	Co-design of solutions that restrict the circulation of motor vehicles in high density areas; Discuss the need of sustainable mobility solutions
	Increase of GHG emissions	

4.2.10.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

The strategies identified by the interviewees as more effective to raise ecological awareness can be summarised in two main topics: communication and example. For the first one, environmental education is well valued by the interviewees, suggesting a specific channel for it:

"There could be a program in the media about, for example, how selective waste is processed. And what is the point - there is no information on the quantifiable benefits of this. It would also be possible to advertise these [solar and other renewable systems] for business purposes, for example on Facebook." (Male Hungarian citizen, 30 years old, Szeged)

The suggestion of media programs to promote ecological behaviours and effective communication of their benefits is claimed by the interviewees, for children and families. As another citizen stated, due to the lack of time to be part of environmental education programs, the use of media can reach a broader audience. But also, good role models, as suggested by the following interviewee, are needed, since for her people to follow examples and good practices, especially in their communities:

"Setting an example in smaller communities. People they look up to, people they look up to, and those around them follow. We need good role models. For example, they started growing small fruit trees in their neighbourhood and many people followed their example. (Female Hungarian citizen, 74 years old, Szeged)

And these are also the main barriers to adopting a more frugal lifestyle. Interviewees stated that they could be more motivated to change their behaviours if they have good examples or someone that inspires them.

4.2.10.5. Experiences in Nature

4.2.10.5.1. Secondary data on experiences in Nature

Protective functions of forests

Szeged holds forest areas of various types that make up 8.5% of the city, of which the largest proportion is deciduous forest plantations, located in the city. In addition, natural deciduous forests in wetlands are also significant, thanks to the floodplain forests surrounding the Tisza and Maros rivers. From the point of view of green infrastructure, another significant area is represented by shrub and herbaceous vegetation, natural lawns, which are found on 3.8% of the settlement, and urban green areas, which together occupy 3.5%, including parks, leisure areas and cemeteries (Global Forest Watch, 2022).

Vulnerabilities, risks, and opportunities

Data available on experiences in Nature is very scarce and only allows a characterization on those that are available in the region. There is a lack of information to provide an identification of possible risks, vulnerabilities and opportunities.

4.2.10.5.2. Primary data: Social perceptions on experiences in Nature

The interviewees presented different understandings of Nature that can be related to the three categories identified through the systematic literature review (Table 71):

Table 71 – Nature definition and correspondent words associated by the Szeged interviewees

Category	Nature definition	Words associated
Opposition	*"The first thing that comes to mind is the tree, or forest, a place untouched by humans."* (Female Hungarian working at an NGO, 47 years old, Szeged)	green, wood, peace, chirping birds, harmony
Domination	*"A storehouse of resources that are essential for human life."* (Male Hungarian citizen, 62 years old, Szeged)	destruction, safety, health, good mood, the Earth

Interdependency	*"We live in it. The system of land, water, and air that comes into contact with humans in some way. We live here on Earth. I go out into the yard, and then the sun shines on me, if there are clouds, then the sun does not shine on me, but it is bright during the day. At night, the sun goes down, then it's dark. I breathe air and I exist with the oxygen from it. I drink water. Nature is the cradle of humanity."* (Male Hungarian citizen, 82 years old, Szeged)	First, the water, air and soil from which we live. After that, the environment of my existence, that is, the environment of my house. My house.

These three interviews highlight the complexity of trying to define nature. The first interviewee definition suggests that her understanding of Nature is something apart from humans, untouched, pristine, and savage. The Hungarian citizen 62 years old understands nature as the reservoir to satisfy human needs, in a logic of domination of humans over nature and its elements, removing its agency. The last interviewee, a citizen 82 years old, nature is the cradle of humanity: we, humans, are part of nature and its systems, and we live in it in a relation of interdependency.

Despite these different understandings of nature, which can in some case act as a barrier or driver, all interviewees describe their experience when contact with nature through the immaterial benefits: the mental, spiritual and symbolic benefits and, also, the rise of ecological awareness by spending time in nature.

4.2.10.6. Inclusiveness

4.2.10.6.1. Secondary data on inclusiveness

Vulnerable groups

There are two main areas in the city where people's living conditions are below the average and where mainly Roma people live: the first area is in the outskirts of the city, in Kiskundorozsma (once a small village, now part of the Szeged administrative area); The other one is in a quarter called Móraváros, in the area between Móravárosi avenue, Cserepes row, and Katona József street (Creţan et al., 2020).

According to data from 2011, around one hundred people live Kiskundorozsma. The rate of (active age) people without regular income is very high, around 70% in this community. Youth (0-14) is also overrepresented (35%), whilst elderly people (above 60 years of age) only amount to 2%. The majority (90%) holds a primary education degree at best. Residential buildings in the area are of low comfort, with very poor isolation and often missing doors or windows. Even though almost every house has installed electricity, the energy company has removed electric meters due to large debts. Only a few dwellings have bathrooms or are

connected to public sewage system, flats are crowded and missing proper hygiene conditions (Málovics et al., 2019).

Móraváros has similar living conditions, although small differences can be identified. The rate of young people is somewhat lower (around 20%), and the percentage of people only holding a primary education degree is at maximum 75%. Even though flats here are crowded too, with poor isolation, and very bad conditions (mold on wall, wet surfaces inside), some dwellings have gas and bathrooms installed. The segregated population is estimated to be around 35 people. The main goal of the municipality is to displace and deconstruct the area by no later than 2029.

Meanwhile, the city hall is trying to moderate the problems of segregation through many supportive measures, such as firewood subsidies, food support, transport ticket subsidies and development of a community house. There are funds allocated to supporting the displaced population in finding a new home. In the case of Kiskundorozsma, deconstruction is not in sight, but rather renovation, through developments that improve hygiene and living conditions.

Gender pay gap

In Szeged, men can take home 20% more money than women. The Central Statistical Office (KSH) also confirms that women take home less money in the context of jobs requiring the same education level. Additionally, it also confirms that the difference is even higher as the level of earnings increases. Women in senior and leadership positions take home up to 33% less than men. The proportion of women in managerial positions is approximately only 33% in Hungary, the negative aspects of this are emphasised by the Equal Opportunities Program of Szeged, with the fact that the proportion of women in political public life is also extremely low. In the case of Szeged, only 4 of the 28 city representatives are women (City of Szeged, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Szeged is presented in Table 72. Similarly to the Transdanubia region, there is no data on citizen participation nor related to immigrants, which makes it difficult to give more information on these issues. Regarding poverty and social exclusion, there is a risk in even considering the Szeged city as homogenous, which may result in the design of misadjusted and universal public policies that do not consider counties' specificities – there are specific neighbourhoods where different people with different ethnic background live, and, therefore, they should not be neglected from participation. Also, and aligned with

Transdanubia, the gender pay gap is evident not only regarding earnings, but also when it comes to holding high positions in society.

Table 72 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Szeged

Vulnerabilities	Risks	Opportunities
Poor living conditions and socioeconomic disparities among counties	Misadjusted and universal public policies	Develop tailored local public policies according to socio-economic specificities of each county
Structural gender inequalities	Discriminatory ecological transition	To create a system of monitorisation that enables to understand which social groups are included and excluded

4.2.10.6.2. Primary data: Social perceptions on inclusiveness

The awareness of the environmental decision-making related to natural resources management in Szeged divided opinions: those who know better stated that this happens because of their occupation that deals with local authorities (2 interviewees in 6); for the other, they are not aware of this decision making (4 interviewees in 6). And this is visible through the opportunity that they have to intervene in it.

For the female working at an NGO, the possibility to intervene exists mainly because of the work she does. But for common citizens, there are few opportunities to intervene, with the exception to make some comments in the local newspaper, which seems to be a common practice in Szeged. However, these interviewees cannot see that this strategy is effective.

All interviewees recognized the importance of considering the diversity of knowledge and perspectives on environmental decision-making, which will bring richness to the discussion and it is the condition to improve human culture:

"The condition for the existence of human culture is the application of the knowledge of science. A condition for the expansion of scientific knowledge is to ensure the diversity of viewpoints." (Male Hungarian citizen, 62 years old, Szeged)

In the case of participation of socially vulnerable groups, the viewpoints are divergent. For the majority, the opinion of socially vulnerable groups is very welcome and necessary since the "Earth we live on belongs to all of us" (Male Hungarian citizen, 62 years old, Szeged). But some of the interviewees considered that this can only happen if they organised themselves or if someone helped in this process, which is the case of the interviewee working at an NGO:

"They are useful, but they can only have any chance of appearing and asserting their interests if they organise themselves or if someone helps them to organise. Community organising is an important method. The lack of information is mostly a problem for them, they don't necessarily know what it means or see the processes through. They must consciously deal with each other and assert their interests." (Female Hungarian working at an NGO, 47 years old, Szeged)

However, this is not a universal viewpoint. For the younger interviewee, the participation of socially vulnerable groups in environmental decision-making is not necessary or welcome since, as they do not have money to adopt ecological behaviours, such as solar panels, their expectation, motivations and interests should not be considered, marginalising and excluding these groups from the ecological transition and removing their agency:

"Yes and no. A horribly poor social stratum, where […] they heat with tiled stoves or gas stoves [...] and cannot buy coal or wood, but instead throw garbage with a low calorific value... [...] The energy crisis does not affect so many families, because many family does not feel the increase in gas prices, because it does not heat with it, but with a gas stove, a ceramic stove, and puts everything it can find on the fire. The government tried to support them, allegedly successfully, by giving them backyard farms and pigs to raise, thus giving their lives a purpose. A public works program is also useful in this respect. In cumulatively disadvantaged areas, the financing of OKJ trainings was also a great help for the people living there. So there is a governmental effort to do this and they are doing it. "Their opinion would not be useful in this regard, since [...] they would not know how to relate to this, because the solar panel is not an option there." (Male Hungarian citizen, 30 years old, Szeged)

4.2.10.7. Synthesis

According to Szeged's socio-ecological description in the Grant Agreement (GA, 2021, p.17-21), three main topics were identified as the main concerns to tackle during the ecological transition: sustainable planning, air quality and domestic heating. The previously analysed secondary and primary data reinforces all these concerns, which were expressed by the local diagnosis and stakeholders, but do not mention the concern related to social inequalities and ethnic diversity.

Some highlights regarding Szeged's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Social inequalities and unemployment – Youth and elderly people are those most affected by unemployment, and, consequently, by poverty. This can lead to the marginalisation of public spheres;
- Urban planning and water and air pollution – the increase of built infrastructure is posing risks to air quality and water pollution, causing floods in urban and agricultural areas– water and agricultural land were understood by the interviewees

as the most important natural resources in the territory and those that are being mostly affected;

- Waste and heating – due to the poor living conditions of certain groups of society, and due to the lack of adequate heat infrastructure, people tend to burn solid fuels and garbage to heat their homes. There is an urgent need to discuss this in participatory processes and to democratise the access to clean energy. This is a barrier to the energy transition, since it is related to structural barriers and individual habits– this issue divides civil society and is urgent to understand it as the main priority;
- Region's socio-cultural-economic differences – it is of utmost importance to recognize that, within the city, different ethnic groups are not excluded from participatory processes, since the counties that integrate them have profound differences that should be accounted for in the participatory process.

4.2.11. Tartu[31,32]

4.2.11.1. Sociodemographic

Population structure by sex and age group and ageing

Estonia has a population of 11728 inhabitants (Eurostat, 2022e), being mostly female (52.9%) and significantly younger compared to other European countries: 21.5% in the age group 0-15 years, 61.2% in the age group 15-64 years and 17.3% in the age group 65 years or more. The life expectancy at birth is of 79.7 years, and it is slightly different between females (83.7 years) and males (75.3 years) (Eurostat, 2022c).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Estonia is presented in Table 73. Sociodemographic data regarding this pilot are very scarce. Therefore, it can only be mentioned that Tartu is a young society, which can be a driver to adopt pro-ecological behaviours easily, and be more aware of the ecological transition measures that need to be implemented.

[31] In some indicators, this pilot data refers to the National level (Estonia).
[32] In Estonia, 12 interviews were collected.

Table 73 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Estonia

Vulnerabilities	Risks	Opportunities
Scarcity of data	Driver to change behaviours	Younger people's pre-disposition to ecological behaviours

4.2.11. 2. Natural resources

4.2.11.2.1. Secondary data on natural resources

Land use

The land use in Estonia has experienced a transformation from agricultural land to urbanisation and suburbanisation. This leads to an increase of built-up land by about 1.3%, and the construction activity is driven by demand for new housing and private interests, resulting in fragmented land use patterns (Sooväli-Sepping & Roose, 2022).

Water resources

Estonia holds about 1,200 natural lakes whose water area exceeds 1 ha, covering 4.7% of the territory and that are unevenly distributed throughout the territory. Most of the lakes are shallow, and only approximately 20 of them are deeper than 20 m. Due to the need to ensure the successful operation of water mills, Estonia created approximately 150 artificial water bodies. Estonia's climate conditions and relief lead to the formation of small inland water bodies, where the territory is divided into four bases: the drainage basin of Lake Peipus (38%), the drainage basin of the Gulf of Finland (excluding the Narva River; 21%), the Gulf of Riga (32%) and the islands of West-Estonia (9%). The most important watershed area in the region is Pandivere Upland.

Minerals and deposits

Estonia has an average level of mineral wealth, but not all mineral resources found in Estonia are mined. Due to their low efficiency, phosphorus, granite, and graptolite argillite are not mined. It is worth to remark that Estonia's most important energetic mineral resource is oil shale. Over 80% of the mined oil shale is used to produce electricity and heating. Additionally, oil shale is used to produce fuel oil, petroleum coke, pitch, bitumen, and other materials (Republic of Estonia and Ministry of the Environment, 2022a). The mining takes place in North-eastern Estonia, mainly in Ida-Viru County, and lately also in Lääne-Viru County. Due to the mining of oil shale in the country, there are several regulations applied in combustion plants and oil production, namely the Ambient Air

Protection Act and the Waste Act (Republic of Estonia and Ministry of the Environment, 2022a).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Estonia is presented in Table 74. The pilot holds a variety of water resources, both artificial and natural lakes, that contribute to reduce the risk of water scarcity and improve water efficiency. On the other hand, the high level or urbanisation has led to an alteration of the country's landscape, erasing the agricultural past that is considered to be irreversible. Therefore, the agriculture sector seems to be fragile, which can result in a dependence of food from the exterior. Regarding mining sector, there a risk of overexploitation of natural resources, especially oil shale. By from the other viewpoint, the existence of a high diversity of minerals with high efficiency can contribute to energy sovereignty and facilitate the ecological transition.

Table 74 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Estonia

Vulnerabilities	Risks	Opportunities
Dependence of exterior food production due to the fragility of agriculture sector	Food insecurity	Promote urban agriculture
Overexploitation of non-renewable resources	Socio-environmental conflicts	Energy sovereignty

4.2.11.2.2. Primary data: Social perceptions on natural resources

In Estonia, 16 natural resources have been identified by the interviewees as the most important in the country (Table 75).

Table 75 - Frequency of natural resources referenced by Rouen interviewees

	Sub-category	Frequency (n)	Percentage (%)
1	Forest	10	19.6
2	Water	8	15.7
3	Animals	7	13.7
4	Air	4	7.8
5	Land	4	7.8
6	Edible plants	3	5.9
7	Fertile soil	3	5.9
8	Sunlight	3	5.9
9	Natural gas	2	3.9
10	River	1	2.0
11	Fish	1	2.0

12	Shale oil	1	2.0
13	Wind	1	2.0
14	Biomass	1	2.0
15	Stone	1	2.0
16	Sand	1	2.0

Forests, water and animals are perceived by the interviewees as the most important natural resources in the region. In fact, from the secondary data, it was possible to identify that the country's natural lakes cover 4.7% of the territory, and the forest has been a source of attraction for nature-based tourism activities. The interviewees are also aware of those that are more available and scarcer in the territory (Table 76):

Table 76 – Natural resources availability and scarcity perceived by Estonia interviewees

Available	Scarce
Sand	Sunlight
Air	Land
Stone	Forest
Soil	Water
Biodiversity	Minerals

Several reasons have been pointed out by the interviewees to explain the scarcity of some natural resources. In the case of land, the high demand of people that wants to buy big properties in the countryside, trying to be more self-sufficient and not so reliable on electricity as in the city appears as the main reason. In the case of sunlight, its scarcity is mainly due to the long winters. Water is easily available according to the interviewees. In the case of forests, which are perceived by the interviewees as being of utmost importance resources for food, energy sources (firewood) and mental and physical well-being (fresh air, hiking opportunities), there is an increasing demand for wood, more and more forests are being cut down and also because the climate change

Regarding socio-environmental conflicts in Estonia, three of them have been identified through the interviews and some of them have been able to identify the actors involved (Table 77):

Table 77 – Conflicts about natural resources in Estonia identified through interviews

Type of conflicts	Actors involved
Nuclear power	Conservationists VS Energy experts
Trees cutting	City leaders VS citizens
Pulp mill	Conservationists VS Entrepreneurs

According to the interviewees, the conflicts around energy are quite significant. The biggest known conflict mentioned by an Estonian citizen 54 years old was the effective opposition of the city and the municipalities bordering Tartu to the establishment of a pulp mill,

causing opposition between nature conservationists and entrepreneurs. An Estonian worker at an NGO mentioned also the press in the protection of trees by city residents and the preference for buildings over forests by city leaders.

4.2.11.3. Socio-environmental concerns

4.2.11.3.1. Secondary data on socio-environmental concerns

Air pollution

Despite Tartu being considered the city with the most air pollution in Estonia, three Estonian cities are in the top 10 of the air cleanliness list: Tallinn, Narva and Tartu (Hankewitz, 2021), therefore, there are no significant issues regarding air quality.

Climate-related economic losses

The impacts of climate change in Estonia are relatively small compared to the southern and northern regions of Europe. Therefore, no significant consequences are expected for biodiversity or public health. Some species may disappear, and some new species will probably emerge, but these changes are quite negligible (ClimateChangePost, 2022). Perhaps this can explain the general opinion of Estonian people regarding climate change, where only 63% of Estonians consider climate change as one of the biggest challenges of humanity in 21st century, quite below the European average (81%) (European Investment Bank, 2022).

Farming types and scales of production

As stated previously, agricultural employment has been declining due to the urbanisation process that resulted in significant changes in the landscape and agricultural patterns. Therefore, fewer people are engaged in these activities. However, and due to the Estonian history, approximately 150,000 people work in rural areas, which comprises 20% of total employment. In 2018, the total value of agricultural production was 856 million euros; 49% of it came from livestock farming, while plant production formed 40%. The main industries are dairy production (28%) and the production of cereals and oil crop (18%) (Ministry of Rural Affairs, 2019). Some characteristics of agriculture in Estonia should be pointed out (European Commission, 2022):

- A polarisation between large-sized farms (755) and small traditional farms;
- Old farmers (only 6.9% of Estonian farmers are under 35 years old).

Concerning organic farming, the sector has been growing, alongside with the consumer's interest. Furthermore, the area that is used for organic farming is constantly growing, and the number of organic farmers is increasing – the agricultural area in Estonia forms 1,002,234 hectares, of which 679,000 hectares is arable land; 21% of this was under organic production in 2018, which made Estonia the front runner in the EU (Ministry of Rural Affairs, 2019). According to the registry of organic farming, there are 1,948 organic holdings. Also, the proportion of organic production in the agriculture sector has increased, and the export of organic production has almost doubled in the last three years. Childcare institutions tend to use organic products more during the last years: 15 schools and kindergartens offered organic food in 2018 (Ministry of Rural Affairs, 2019).

Energy

Estonia has a great potential in renewable energy, derived from bioenergy-based combined with heat and power generation, in wind power and the production of biomethane. There is also some information regarding small-scale hydro and solar power capacity (Elering, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Estonia is presented in Table 78. Socio-environmental concerns in Estonia are not significant, and when existing are seen as opportunities. There are no issues regarding air pollution and climate change impacts, which are quite reduced when compared with southern Europe, they are understood as an opportunity to emerge new species. In the case of agriculture, there is a great potential regarding organic farming and the interest of the population. The same happens with the energy sector, where oil shade extraction will be part of the transition process towards renewable energy sources, where the country also holds a great potential.

Table 78– Synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Estonia

Vulnerabilities	Risks	Opportunities
Climate change impacts (low)	Biodiversity reduction	New species emerging
Reduced people engaged in agriculture	Lack of food sovereignty	Potential in organic farming and people interest in organic products

4.2.11.2.3.2 Primary data: Social perceptions on socio-environmental concerns

Twelve socio-environmental risks in the region of Estonia have been identified by the interviewees (Table 79):

Table 79 - Frequency of socio-environmental risks referenced by Rouen interviewees

	Sub-category	Frequency (n)	Percentage (%)
1	Social inequalities	7	22.6
2	Loss of biodiversity	5	16.1
3	Global warming	5	16.1
4	Air pollution	4	12.9
5	Water scarcity	2	6.5
6	Heat and cold waves	2	6.5
7	Energy poverty	1	3.2
8	Waste management	1	3.2
9	Floods	1	3.2
10	Water pollution	1	3.2
11	Droughts	1	3.2
12	Food scarcity	1	3.2

Estonian interviewees are the first ones to put social inequalities at the top of the socio-environmental risks in the region. It is difficult to confirm this issue with secondary data since it is scarce. Also, the loss of biodiversity and water scarcity as a consequence of climate change is mentioned. In the case of air pollution, it is worth noting that this refers to the city of Tartu and the secondary data corroborate that despite Estonia holding low levels of air pollution, the city of Tartu is one of those with the worst air quality due to road traffic.

Of the 12 interviewees, 7 (the majority) have not heard about the ecological transition. However, only 3 were able to provide definitions, which are presented below (Table 80):

Table 80 – Ecological transition definitions according to Estonian interviewees

	Sub-category	Transcriptions
1	Ecological transition as a sustainable living pattern	*"…Sustainable living arrangements based on renewable resources."* (French male policymaker, 52 years old, Tartu)
2	Ecological transition as a change in the economic model	*"The search and implementation of new economic models to preserve environmental and natural resources, as an alternative to the idea of eternal economic growth."* (Estonian female citizen, 54 years old, Tartu)

3	Ecological transition as a new model to face ecological challenges	*"The concept, with a new social and economic model to combat ecological challenges."* (Estonia male citizen, Tartu)

It is an important clue to see that the majority of the interviewees have never heard about ecological transition which means that communication channels are not effective. Different viewpoints on who relies the responsibility for this transition are also visible in the interviewees' discourses (Table 81):

Table 81 – Responsibility perception on the ecological transition according to Estonian interviewees' discourses

	Sub-category	Transcriptions
1	Everyone	*"No transition can proceed only by the actions of one/one type of social actor, but by the combined effect of the actions of different actors.* (Estonian Female citizen, 54 years old, Tartu)
2	European institutions	*"European Commission; Government; Educational Institutions."* (Estonia male citizen, Tartu)
3	Public sector	*"The public sector must guide and coordinate the transition, foreseeing the tasks of the various parties in the process and encouraging/supporting the desired changes."* (Estonian female working at an NGO, 52 years old, Tartu)

Five interviewees believe that everyone plays a decisive role in the ecological transition. But contrary to other pilots, in the case of Estonian interviewees, there is a strong expectation regarding the role of European institutions and government to guide actions towards this transition.

Concerning the main challenges and obstacles, there is a common consensus that people's behaviours, similar to other pilots, are simultaneously the main challenge and obstacle to the success of the ecological transition. And to this joins the lack of awareness and commitment to change, which are factors that can undermine this transition according to the interviewees.

4.2.11.4. Sociocultural ecological behaviours

4.2.11.4.1. Secondary data on sociocultural ecological behaviours

Waste production and treatment

The last data available reveals that. on average, 343,793 tonnes of waste per year were collected from the territories of Tartu and the former Tähtvere rural municipality in 2015–2017 (Tark Tartu Smart City, 2022) - waste collected from the territory of the former Tähtvere rural municipality amounted to 17% of the collected waste on average. According to projections, 55% of municipal waste shall be recycled in Estonia by 2025. In 2018, this indicator was nearly 31% in Tartu (Tark Tartu Smart City, 2022).

Mobility

Car use in Estonia has been a rising trend and has been increasing at the expense of public transport and walking. The number of people going to work by public transport, on foot or by bike has fallen by 120,000 during last 18 years. Similarly, the number of registered cars has doubled (598 cars per thousand residents in 2019). This trend is more evident in rural areas, especially among the low paid, who are at risk of mobility poverty (i.e., a large part of their budget goes to the costs of a car). Furthermore, Estonia has set a target for the transport sector of total emissions of 1,750 kt of CO_2 in 2035, which is 28% less than the level of 2018. This implies a rapid turn away from the current trend must take place. The greenhouse gas emissions of the transport sector have increased steadily each year since 2014. (Foresight Centre, 2021).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Estonia is presented in Table 82. In the case of waste there no major concerns, since present and future trends are quite positive. On the other hand, the increase of private car usage poses some challenges not only related with GHG emissions and in climate change impacts, but also related to increasing mobility poverty among the elderly or social groups with more socioeconomic difficulties. There is a need to revert this trend and focus the mobility patterns on more sustainable ones.

Table 82 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Estonia

Vulnerabilities	Risks	Opportunities
High utilization of motor vehicles; lack of alternative mobility solutions outside urban areas;	Increase mobility poverty among elderly and other vulnerable socioeconomic groups	Co-design of solutions that restrict the circulation of motor vehicles in high density areas; Discuss the need of sustainable mobility solutions
	Increase of GHG emissions	

4.2.11.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

Several strategies have been suggested by the interviewees to improve collective ecological awareness as a driver of the implementation of the ecological transition. According to our interviewees, five different strategies can be used (Table 83):

Table 83 – Strategies considered most effective to improve ecological awareness according to Estonian interviewees' discourses

	Sub-category	Frequency (n)	Percentage (%)
1	Contact with Nature/education	5	38.5
2	Formal and informal education	5	38.5
3	State regulations	1	7.7
4	Arts	1	7.7
5	Scientific communication	1	7.7

From the strategies identified, contact with nature since childhood appears, together with formal and informal education, as the most effective strategies to improve ecological awareness. According to these interviewees, a greater connection of humans with nature is needed, suggesting the presence of urban nature, such as trees and parks that people an understanding of how it is useful. Another interesting strategy is the use of arts to improve ecological awareness. Despite only being mentioned once, the systematic literature review shows that cinema and painting provide different interpretations of society-nature relations that can be useful to raise ecological awareness and deepen the discussion on this issue.

Regarding the adoption of a more frugal lifestyle, the Estonian interviewees focused their discourse on sustainable mobility, especially the use of soft mobility – such as bicycles – with no emissions and no impact on the environment. However, they mentioned that this is facilitated due to the geomorphology of the territory.

4.2.11.5. Experiences in Nature

4.2.11.5.1. Secondary data on experiences in Nature

Protective functions of forests

Estonia's biological biodiversity is quite impressive and rich. A combination of climate conditions, the existence of island and continental sectors, the abundance of sea and inland water and the variety of base rocks with correspondingly diverse soil conditions, all of which formed the basis for the evolution and development of a wide diversity of ecosystems (ClimateChangePost, 2022) – in fact, "almost 40,000 living species are thought to be present in Estonia. So far about 26,600 or 67% of them have been found. The other 13,400 species or 34% of biota are yet to be discovered" (ClimateChangePost, 2022).

The existence of a high biodiversity is recognized in the country, where a significant part is protected nature and, some of them, unspoiled – 18% of land is under nature protection and 16.5% of the land is covered by Nature 2000 areas (ClimateChangePost, 2022).

Green areas

The cultural bond of northern European countries with nature, which is scientifically acknowledged (Kabisch et al., 2016), is translated through the Estonian cities' natural diversity, where Tartu stands out, with urban gardening and urban environmental movements that have become important in urban planning.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in Nature in Estonia is presented. Through the available data, it is not possible to identify significant vulnerabilities or risks associated with experiences in Nature. In fact, the indicators are very positive and show a cultural trend to value Nature and the outdoors, which contributes to the promotion of the rights of Nature debate.

4.2.11.5.2. Primary data: Social perceptions on experiences in Nature

Different understandings of Nature have been found in the interviewees' discourses and all were related to three different categories (Table 84):

Table 84 – Categorisation of Nature definitions according to interviewees' discourses

	Sub-category	Transcriptions	Words associated
1	Nature is everything	*"The living environment I belong to."* (Estonian female working at an NGO, 52 years old, Tartu)	*sea, forest, fields, birds, butterflies*
2	Nature is pristine and untouched by humans	*"Physical and biological world on the Earth, apart from humans and products of their activity."* (Estonian male citizen, 40 years old, Tartu)	*Pure, clean, self-organising, vital, caring*
3	Nature is the environment	*"The natural environment that surrounds us and the creatures that inhabit it."* (Estonian male scientist, 41 years old, Tartu)	*green, clean, shared, fragile, future*

A first one related to Nature as everything, where humans and non-humans are all part of it; a second related to Nature as pristine and untouched, pure and clean (not damaged by human intervention; a third one that understands Nature as the environment that surrounds us responsible for creating our habitat.

To describe the interviewees' experiences when in contact with nature, there is a common acknowledgement of the benefits they can get, physical and mental, but also to get peace and quietness, especially in the middle of dense urban areas. There is no mention of the contribution of nature to the identity construction, i.e. the experiences are only described according to the ecosystem services.

4.2.11.6. Inclusiveness

4.2.11.6.1. Secondary data on inclusiveness

Immigrants

Estonia is the home of people from almost 200 different nationalities, where the majority lives in very small communities of less than 100 people (Republic of Estonia and Ministry of the Environment, 2022b). Within the different nationalities, the largest ethnic group is Russians, followed by Ukrainians, Belarusians, and Finns (State Portal of Estonia, 2021). The population of the Russian minority is estimated to be about 30% of the whole population in Estonia. In fact, approximately 50% of Tallinn's population is comprised of ethnic Russians. Due to this cultural diversity, there is an Integration Foundation, established by the Republic of Estonia under the Ministry of Culture, that supports the development of an integrated and cohesive society. The Estonian language houses in Narva and Tallinn have been established

to support the learning of the Estonian language and culture (Official website of the Integration Foundation, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding inclusiveness in Estonia is presented. Through the available data, and due to the absence of data regarding citizen participation in environmental decision-making, gender pay gap and poverty, it is not possible to identify significant vulnerabilities or risks associated. The cultural diversity in Estonia and the efforts made by public authorities to preserve their tradition and inclusion are expected to also be visible in the participatory processes.

4.2.11.6.2. Primary data: Social perceptions on inclusiveness

The awareness of environmental decision-making in Estonia is quite limited – seven interviewees are not aware. The opportunity to intervene in environmental decision-making mainly happens through public consultation. However, some interviewees mentioned that this intervention is facilitated by joining a political party, but this has some risks:

"I think I could have more influence by joining an apolitical party and trying to become part of the local government. I have tried that previously, but it makes you more ready to accept compromises. Automatically you will be less idealistic and pursue environmental goals less vigorously. I have also been part of environmental organizations, but I never had the feeling to actually have any influence. Also it is very frustrating and time-consuming. I would like to dedicate my life to saving the world, but sadly, in the world as it is, I need to earn money so I can buy food from the store, and pay taxes and so on, so I just cannot." (Estonia female scientist, 27 years old, Tartu)

The need of considering the plurality of interests is crucial for all the interviewees, as well as the case of vulnerable groups:

"This is necessary if we value a harmonious society that treats all people equally." (Estonia female working at an NGO, 52 years old, Tartu)

"Yes, of course, because only then it is possible to make the most reasonable decisions, because the matter is seen from different points of view." (Estonia female citizen, 18 years old, Tartu)

However, the interviewees' advert that the forms of involvement must consider the different abilities to participate, and suitable ones must be found.

4.2.11.7. Synthesis

According to Estonia's socio-ecological concerns described in the Grant Agreement (GA, 2021, p.17-21), seven main topics were identified as the main concerns to tackle in the ecological transition: local engagement, resilient urban community, sustainable buildings and urban planning, climate change, energy, transportation, and protection of biodiversity. The secondary and primary data previously analysed reinforce some of these concerns, which were expressed by the local diagnosis and stakeholders, but do no enable to make considerations on local engagement. On the other hand, this does not include the huge potential of Estonia in organic farming.

Some highlights regarding Estonia's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Youth – Younger people are more likely to adopt pro-ecological behaviours, which means Estonia's society may be part of the ecological transition process with more ease;
- Organic farming – the transition to organic farming has a great potential in Estonia, where consumers are also aware of their importance and more willing to buy organic products. This topic should be further discussed in participatory processes;
- Climate change – climate change in Estonia is not seen as a major issue, since the impacts are considered to not be felt so heavily when compared to southern Europe; however, this should not create an illusion that Estonians are not a part of this global problem, and a debate on this topic should be stimulated to avoid risks associated with the attribution of a reduced importance to this matter;
- Mobility – the use of car is very common in the country. However, there is a risk associate with having a transportation system based on this, and the more evident risk is associated with the fact that vehicles can increase mobility poverty among elderly and socially vulnerable groups. In this sense, this topic should be considered for further discussion;
- Nature and biodiversity – biodiversity and rich Nature elements in Estonia have high importance due to their ecosystem services. Notwithstanding this importance, and considering the cultural aspect of the bond between northern Europeans and Nature, it would be interesting to take advantage of this and promote a discussion on the rights of Nature and how this is important to tackle in the ecological transition – forest and water are perceived by the interviewees as the most important natural resources in the region that are being threatened by deforestation and pollution.

4.2.12. Iceland[33]

4.2.12.1. Sociodemographic

Population structure by sex and age group and ageing

Iceland has a small population, currently 376.248 people, being the majority females (51.3%) and distributed by age group as follows: 18.7% between 0-15 years old, 66.6 % between 15-64 years old and 14.7% 65 years old or older (Eurostat, 2022e). Life expectancy at birth is the highest among the pilots (83.1 years), increasing in the females (84.6 years) and decreasing in the males (81.6 years) (Eurostat, 2022c).

Regarding education level, more than 35% of the population holds a higher education degree (Eurostat, 2021b).

Employment, unemployment and income

The unemployment rate in Iceland is relatively low when compared with the other pilots (6%) being more expressive among females (6.4%) than males (5.8%) (Eurostat, 2022g). Regarding income, Iceland presents one of the highest mean yearly incomes of the pilots (43 769 euros) with no significant differences between males (43 995 euros) and females (43 536 euros).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographic of Iceland is presented. Concerning sociodemographic data there are no major concerns. In fact, data available reveals a wealthy society, with low unemployment rate, high life expectancy and where differences on income between males and females are not significant – In Gini coefficient, Iceland currently ranks in fourth place amongst OECD countries, with a score of 0,250. Altogether, this profile may be a driver to the adoption of ecological transition measures.

4.2.12.2. Natural resources

4.2.12.2.1. Secondary data on natural resources

Land use

[33] In this pilot there are no interviews collected.

Due to the geomorphology of Iceland, the highland plateau has less than 5% vegetation covered, with some important exceptions: patches of vegetation in depressions that form "vegetated oases" and "sustain most of the biodiversity and include internationally important breeding grounds for several species of birds" (Denk et al., 2011). As influence of its geography and climate, Iceland's glaciers cover approximately 12% of the land area, the largest of which is Vatnajökull, located in the southeast of the island, with an additional 6% of the land area covered by lakes and rivers.

Water resources

In the case of water resources, it can be stated that there is no lack of groundwater throughout the country, reflected by the availability of cold springs in all areas. Rivers with hydro-power potential all originate from glaciers, and freshwater rivers are generally smaller with lower flow rates (Denk et al., 2011).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in Iceland is presented. Due to the data available, it is not possible to identify potential risks. The data available reveals that Iceland holds a unique Nature diversity, with plenty of water sources that do not appear to have the risk of scarcity.

4.2.12.3. Socio-environmental concerns

4.2.12.3.1. Secondary data on socio-environmental concerns

Air pollution

In the case of air pollution, there is no publicly available data or information on specific polluted locations in Iceland. Despite this, there is some knowledge on some of the most several locations of the country that experience higher pollution levels: the first one relates to the deficit on sewage, especially in areas that are more populated (The Environment Agency of Iceland, 2020); particularly air pollution, due to heavy road traffic and in areas near to heavy industry processes. As an example, the city of Reykjavik and other municipalities provide a public warning on days in which the level of toxins go above the recognised health limit (The Environment Agency of Iceland, 2017).

GHG emissions

According to Statistics of Iceland (2018), the country has the highest per capita carbon emissions, where "71% of household emissions were attributed to imported goods ... revealing that the GHG emissions burden of Icelandic consumption falls primarily on developing nations" (Clarke et al., 2017, p. 1175).

Climate-related economic losses

Climate in Iceland is characterised by being relative warm despite its northern geographic location and has a "cold-temperate oceanic" climate. Precipitation varies between the different regions of the country. Lowland areas near the coasts receive between 600-1500 mm per year. The central highlands, which have an elevation of 500 -700 m above sea level, and the island's northern area, mainly receive precipitation as snowfall in the winter months (Denk et al., 2011).

However, and due to the recent changing in climate, some changes are already visible: the mean annual temperature in Reykjavik between the years 1878 and 2002 was 4,3°C, while the mean temperature in Reykjavik for the year 2020 was 5,1°C and 5,4°C in 2021. Furthermore, the annual national mean temperature has increased significantly, 0,8°C per century since the middle of the 19th century, when formal measurements commenced and are in keeping with global warming for the same period. From 1980 to 2015, the annual mean temperature has risen by 0,5°C per decade (Icelandic Meteorological office, 2021).

Due to these projections, annual mean temperatures will continue to rise by 1,3-2,3°C by 2055 compared to 1986-2005. It is expected that the country will experience some changes: temperatures will likely increase more during the winter than in summer, and the northern part of the country will have higher temperature increases than the southern part. This means that droughts will be more frequent, which is aligned with the global trend.

Farming types and scales of production

Iceland holds a solid agricultural, livestock, and fisheries tradition, as vibrant sectors providing a relevant contribution to domestic food production: agricultural products accounted for 4% of national exports in 2021 and the contribution to GDP from agricultural products in 2021 was 0,9%. Despite this, a recent report by Sturludóttir et al. (2021) reveals that some concerns related with food self-sufficiency exist:

- Vegetable production accounts for 43% of the supply
- Meat production accounts for 90% of the supply
- Egg production accounts for 96% of the supply
- Milk-based product production accounts for 99% of the supply
- Grain production accounts for 1% of the supply
- Fisheries and fish farming fully meet demand – large exporting sectors

The same reports highlight that Iceland relies heavily on food imports to meet the demand for many foods. It worth to remark that, for example, there is no fruit production in Iceland,

so all fruit consumed in the country is imported. Therefore, the country is entirely dependent on imports for large portions of domestic food consumption.

In what concerns organic farming, Iceland does not have a strong tendency compared to other Nordic countries. This mainly happens due to the limited domestic demand for organic food products and unfavourable climatic conditions for many farmed crops (EFTA Surveillance Authority, 2020).

Fisheries

Fisheries sectors are managed through an individually transferrable system (ITS) or a quota system which is, to a certain extent, open to the market. Iceland's marine products accounted for 24% of national exports in 2021 and 7,2% of GDP. The total catch landed in 2021 was 1.153.683 tons, down from a peak of 2.198.813 in 1997 (Central Bank of Iceland, 2022).

Energy

The potential of renewable energy in Iceland derives from the abundant water stored in the island's glaciers and near-constant volcanic activity, which enables the sourcing of geothermal energy (Ministry of the Environment, Energy, 2022). 85% of Iceland's primary energy supply is produced domestically from renewable sources, mainly geothermal and hydropower. The remaining 15% of primary energy use is derived from fossil fuels used mainly by the transport sector, but also crucial in the agriculture and fisheries industries. 100% of the electricity produced and consumed domestically derives from renewable sources, 73% from hydropower, and 27% from geothermal. In addition, 85% of space heating of the housing stock mainly comes from geothermal sources, with the remaining 15% of space heating being provided through electricity (Ministry of the Environment, Energy, 2022).

Regarding domestic energy production, it covers 85% of domestic use, the remaining 15%, which is derived from fossil fuels, is utilised by transport, shipping, aviation, and agricultural sectors, and, in some instances, within processes in the heavy industry sector. However, the energy transition may face some cultural barriers, namely in lowering emissions domestically. Additionally, Icelanders are accustomed to the plentiful availability of hot water; therefore, consumption trends are high, with little public interest in limiting personal consumption (Ministry of the Environment, Energy, 2022; Thórhallsdóttir, 2007).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Iceland is presented in Table 85. Socio-environmental concerns in Iceland are mainly related with two issues: high GHG emissions, mainly from domestic energy consumption, which is a concern since there are cultural barriers that need to be considered; the low food self-sufficiency and the disinvestment in organic farming, which can result in food dependence on imports and lack of food sovereignty.

Table 85 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in Iceland

Vulnerabilities	Risks	Opportunities
High GHG emissions	Increase global warming	Adapt individual patterns to more pro-ecological behaviours
Low food self-sufficiency	Lack of food sovereignty and dependence on imports	Invest in organic farming

4.2.12.4. Sociocultural ecological behaviours

4.2.12.4.1. Secondary data on sociocultural ecological behaviours

Waste production and treatment

Data on waste management in Iceland shows signs of progress, despite being behind the European nations' patterns. The European Union target for landfilled solid waste is 10%. However, in Iceland, the landfilled amount reaches 60%. Various other fronts with regards to solid waste management show similar trends (Óskarsson et al., 2022) .

Mobility

Iceland is considered to be, in terms of mobility, as individualistic and car centric. A study conducted in 2017 (Þorvaldsson & Árnason, 2017) reveals that despite the existence of public transportation in urban areas and throughout the island connecting settlements, those trips accounted for 4% of all trips. Trips taken either as the driver or a passenger in a car accounted for 75% of trips taken.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Iceland is presented in Table 86. Due to cultural habits, Iceland population is car-centric and individualistic, which can be considered a barrier to share transport and/or use public transport. In the case of waste, there is a significant amount of waste in the country that is destined to landfills, which is a barrier to the circular economy and has negatives impacts on air and soil pollution, on biodiversity, but also in public health outcomes. There is a need to increase citizen awareness on both issues and to deeply discuss how cultural barriers may constrain collective actions and, therefore, constrain ecological transition.

Table 86 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in Iceland

Vulnerabilities	Risks	Opportunities
High utilization of motor vehicles; car-centric and individualistic society	Increase mobility poverty among elderly and other vulnerable socioeconomic groups	Co-design of solutions that restrict the circulation of motor vehicles in high density areas; Discuss the need of sustainable mobility solutions; Understand the cultural habits
	Increase of GHG emissions	
Waste destined to landfills	Negatives impacts in public and environmental health	Increase citizen awareness and strategies

4.2.12.5. Experiences in Nature

4.2.12.5.1. Secondary data on experiences in Nature

Tourism

The nature diversity in Iceland is directly related with the growing success of tourism in the country. Nature-based leisure activities play an important role in the sector, representing a significant portion of the national economy, accounting for 8% of GDP in 2019, the third highest percentage of OECD countries for that year (Túristi, 2022).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in Nature in Iceland is presented. Through the available data, it is not possible to identify significant vulnerabilities or risks associated with experiences in Nature. However, it can be said that the tourism sector in the country may pose some challenges regarding the

massification and consequently overuse of natural areas, which may cause negative impacts if not properly regulated. On the other, Iceland's natural diversity allows for contact with nature, which results in positive outcomes for mental, social and physical health, and that can enhance a more respectable attitude towards nature's rights and limits.

4.2.12.6. Inclusiveness

4.2.12.6.1. Secondary data on inclusiveness

Marginalised groups

According to a report by the Rauði krossinn á Íslandi (2014), the most marginalised groups that are the most socially and economically vulnerable in Iceland are disabled individuals, financially strapped elderly people, single and low-income parents, long-term unemployed people, young and uneducated men, migrants, and the children of migrants. However, since the publication of this report, the visibility of individuals struggling with substance abuse and LGBTQIA+ individuals has increased, and demonstrated their marginalisation. Additionally, an increased understanding of the intersectionality of marginalisation has further demonstrated that women of foreign origin and women with disabilities may suffer from additional exposure to discrimination. This unveils the cumulative patterns of discrimination.

Gender pay gap

As presented in the sociodemographic data regarding income by sex, there were no significant differences between males and females. In fact, Iceland has obtained the reputation of the most gender-equal nation on Earth. Compared to other nations, Iceland consistently ranks as the most gender-equal country in terms of the gender gap (Elliott, 2020) Currently, the adjusted gender-pay gap in Iceland is 4.1%. However, Einarsdóttir (2020) refers in her article that the gender equality narrative was used after the 2008 financial collapse as part of a nation branding effort. She highlights the impacts of austerity, following the financial collapse on society's sectors dominated by female workers, primarily in education and health, which further exacerbated women's contribution to homecare.

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Iceland is presented in Table 87. The situation in Iceland reinforces the absence of data regarding citizen participation in environmental decision-making which, once again, makes is impossible to adequately portray the current situation. Regarding the data on vulnerability and marginalisation, several social groups emerge - disabled individuals,

financially strapped elderly people, single and low-income parents, long-term unemployed people, young and uneducated men, migrants, the children of migrants and LGBTQIA+. Iceland also states an important issue regarding the *multivulnerability* or *multidiscrimination* situations associated with the accumulation of "qualities" that are more frequently discriminated, such as being woman, foreign and with disability. Therefore, it is necessary to make sure that these groups can be a part of the ecological transition and that they are not left behind.

Table 87 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in Iceland

Vulnerabilities	Risks	Opportunities
Absence of data regarding citizens' participation in environmental decision-making by gender, social status, age, and ethnic group	Discriminatory ecological transition	To create a system of monitorisation that enables to understand which social groups are included and excluded
Multi vulnerability of some social groups		

4.2.12. Synthesis

According to Iceland's socio-ecological concerns described in the Grant Agreement (GA, 2021, p.17-21), three main topics were identified as the main concerns to tackle in the ecological transition: protect and preserve Iceland's vast highland and natural resources, green policies, and common understanding of the value of Iceland's arctic spaces. The secondary data previously analysed reinforce some of these concerns, which were expressed by the local diagnosis and stakeholders, but go far beyond them, stating the need to consider cultural habits – energy, waste management and car use – as potential constrains towards ecological transition, as well as taking into account that marginalised groups and the intersectionality of marginalisation bring pivotal issues that should not be put aside of this debate, with the risk of being excluded from this process.

Some highlights regarding Iceland's socio-cultural-bio specificities to be considered in the participatory process and in the involvement of populations and stakeholders are:

- Cultural barriers – cultural barriers regarding individualistic, car-centric and energy habits towards the adoption of pro-ecological behaviours should be considered and further discussed in the participatory process;

- Organic farming – the transition to organic farming should be further emphasised, due to the low food self-sufficiency of the country that makes it more dependent on importations and vulnerable to food insecurity;
- Waste destined to landfills in the country is a serious issue, being quite below the European average and posing risks to the circular economy. Also, this brings the negative impacts on public and environmental health to the discussion;
- Nature, biodiversity and tourism – biodiversity and rich Nature elements in Iceland are unique and have high importance due to their ecosystem services. Also, it presents a significant contribution to the country's economy through tourism related activities. A balance between the economic value of Nature and its rights and limits should be discussed, to avoid the overexploitation of natural resources and consequent loss of biodiversity.

4.2.13. Cross-border Pilot "Gata-Malcata"[34]

4.2.13.1. Sociodemographic

This pilot has distinct characteristics from the other pilots. Firstly, it is a cross-border territory composed of municipalities of Portugal – Sabugal and Penamacor (Serra da Malcata) – and Spain (Gata) – Eljas, La Moheda de Gata, San Martín de Trevejo, Torre de Don Miguel and Valverde del Fresno. Due to the need to meet the project pilot's scales, this one was considered a regional pilot. Despite their specificities, these municipalities have in common a shared history of networking related to cultural and social issues and regional tourism promotion, as well as shared socio-environmental vulnerabilities, such as forest fires and water scarcity.

Population structure by sex, age group and ageing

- Malcata

'Serra da Malcata' has no resident population in its territory, thus all the subsequent information considers the two Portuguese municipalities of Sabugal and Penamacor.

Sabugal had 11 289 inhabitants in 2021 (about 10.1% less than in 2011), of which 52.8% were women and 47.2% were men, corresponding to a total of 4997 families (Pordata, 2021c). Population density has been gradually decreasing, being at 17.2 inh./km^2 in 2021 (Direção-Geral do Território, 2022). Approximately 7.1% of the population is between 0 to 14 years old, 47.9% is between 15 to 64 years old, and 45% is over 65 years old. The ageing index has been increasing since the 1960s, currently at 625.5 (Pordata, 2021a).

[34] In Cross-border Pilot "Gata-Malcata", 2 interviews were collected (only from the Portuguese side - Malcata).

Penamacor had 4768 inhabitants in 2021 (about 16.1% less than in 2011), of which 50.7% were women and 49.3% were men, corresponding to a total of 2339 families (Pordata, 2021c). Population density has been gradually decreasing, similar to Sabugal, being at 8.5 inh./km2 in 2021 (Direção-Geral do Território, 2022). Approximately 6.7% of the population is between 0 to 14 years old, 48.9% is between 15 to 64 years old, and 44.4 % is over 65 years old. The ageing index has been increasing since the 1960s, currently at 659.5 (Pordata, 2021a).

- Gata

According to the latest data available from 2021, the Spanish population of Gata region was 19,725 inhabitants (Instituto Nacional de Estadística, 2021), representing 2% of the total population of the region of Extremadura.

Differently from the Malcata region, the population living in Gata is characterised by a relative imbalance by sex, with a higher percentage of men than of women (Instituto Nacional de Estadística, 2021). Relatively to the population density, exists a prominent decline in inhabitants – between 2015 and 2021 the region lost 12.6% of its population - occurring over the last 60 years due to the crisis of traditional agriculture, emigration to other regions of Spain and the ageing of the population. Therefore, among the 19 municipalities, only 4 exceed 1,000 inhabitants and 7 of them do not exceed 500 inhabitants.

Alongside the population decline, the ageing phenomenon is very expressive since the population aged 65 and over exceeds 30% of the population in most of the 19 municipalities and 40% in four of them (Instituto Nacional de Estadística, 2021). Oppositely, in 13 municipalities of the Gata region, the population under 16 years of age does not reach 10% of the total population, that is, in 68% of the municipalities of the region.

Unemployment and income

- Malcata

Concerning the purchasing power per capita of Sabugal and Penamacor, both municipalities are below the national average, respectively 64.4% and 60%. In the case of Sabugal, the purchasing power per capita is over 15% less than the average of region Beiras e Serra da Estrela and almost 28% less than region Centro, suggesting that is a municipality experiencing poor socioeconomic conditions. This situation worsens in the case of Penamacor since the purchasing power is more than 30% less than the average of region Centro and region Beira Baixa.

In what concerns to employment, the activity rate in 2021 in both municipalities was well below the national (44.6% total, 49.5% men and 43.9% women) and region Centro (44.7% total, 47.8% men and 41.9% women) rates – however the employment rate was below the

national average in 2021 (8.1%), respectively 5.8% for Sabugal and 7.4% for Penamacor (Pordata, 2022i).

- Gata

The gross domestic product per inhabitant in Gata region does not exceed 9,000 euros in 2020. Most of the municipalities in the region have a gross domestic product per inhabitant of around 6,000 euros –three times lower than that of the province of Cáceres, which in 2020 was 18,301 euros and more than four times lower than the gross domestic product per inhabitant of Spain, 26,417 euros (Diputación de Cáceres (Observatorio Socioeconómico Provincial), 2016).

These socioeconomic discrepancies are reflected in the disposable family income per inhabitant, which is between 9,000 and 11,000 euros, almost like Cáceres and lower than the average for Spain (12,269 euros) (Diputación de Cáceres (Observatorio Socioeconómico Provincial), 2016).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographics of the Cross-border Pilot "Gata-Malcata" is presented in Table 88. Despite being a region composed of different municipalities, they share the same vulnerabilities and risks: there is a common process of ageing and depopulation that affects the regeneration of the territory – some projections pointed out that this process will lead to the disappearance of some of the municipalities in the coming years if new population settlements are not achieved, especially neo-rural and foreign populations, which could allow the recovery of birth rates – these can be the opportunities for this pilot. Also, employment is below the national average and therefore socioeconomic conditions are also poor, all factors that highlight the socioeconomic and environmental vulnerabilities of the territory.

Table 88 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociodemographics of Cross-border Pilot "Gata-Malcata"

Vulnerabilities	Risks	Opportunities
Depopulation	Disappearances of some municipalities	To discuss measures and policies to attract and fix new populations, namely neo-rural and foreign populations
Income inequalities	Economic barriers to adopting pro-ecological behaviours	To discuss the economic and structural barriers of ecological transition; Discuss policies to retain the younger population that is looking for employment opportunities

4.2.13.2. Natural resources

4.2.13.2.1. Secondary data on natural resources

Land use

In this pilot, the area can be classified as soil not susceptible to agricultural or forestry use. Regarding land use, this area is mostly composed of forestry (62.8%), uncultivated terrains (19.8%), infrastructures (9.2%) and agricultural areas (8.2%) (Direção-Geral do Território, 2022).

Water resources

- Malcata

Sabugal is drained by two international river basins, the Douro river basin represented by the Côa and Águeda river basins, and the Tagus river basin which appears in the Western part, represented by the Zêzere river basin. The Côa River is the main watercourse in the territory, one of the few rivers that run a South-North course in Portuguese territory, which has 3 dams, one of which is the Sabugal Dam, which supplies the entire municipality. The Tagus river basin is present in the Western part of the municipality and is represented in the municipality by small tributaries of the river Zêzere, of which the Bendada stream, the Quarta-Feira stream, the Valverdinho stream and the Casteleiro stream. There is also the river Noéme, which crosses a small part of the municipality and flows into the river Côa; all other water lines are streams (Direção-Geral do Território, 2022).

In Penamacor, the Meimoa stream – belonging to the hydrographic basin of the Zêzere river – runs 7.5km in the municipality from its source in Serra da Malcata. There is a dam in the territory, the Meimoa dam (localised in the Serra da Malcata Natural Reserve), which led to the formation of a reservoir that extends for several kilometres. The Bazágueda stream, in the Erges basin, like the Meimoa, has its spring at the Northern limit of the municipality and runs in a narrow valley with mountainous features towards the East. On this water line, there is another dam (medium size), the Bazágueda dam. In addition to these, mention should be made of the Arrancadinha (or Queijeira) stream, which occupies a very wide alluvial plain (over 1km on average), of exceptional regularity, which the importance of its current hydrographic network does not justify.

- Gata

Gata region is part of the Tagus River basin and has an important and well-preserved hydrological network with numerous small and medium-sized water courses, such as torrents and tributary rivers of the main valleys of the region. But partially it also participates in the Duero hydrographic basin where some of the tributaries and rivers of the

region come together (Diputación de Cáceres (Observatorio Socioeconómico Provincial), 2016).

The main river channel of the region is the Árrago river which, after joining the Rivera de Gata River, is the base of the Moraleja irrigable area, completing the hydrographic map with the Erjas, which serves as the border with Portugal and the Rivera de Gata, in addition to a significant number of streams and watercourses that collect water from the mountains and feed the (aforementioned) rivers.

In the southern part of the territory is the Borbollón reservoir, on the Árrago River, which supplies the Moraleja and Vegaviana irrigation systems, and the Rivera de Gata River reservoir.

Most of the water courses originate in the highest areas of the Sierra de Gata, the northern limit of the region, although there are streams that are born in other minor accidents that tilt from the Central System, with drainage to the west. On the other hand, the smaller streams and rivers suffer the impact of long and hot summers, which affects the ecology of the region's landscape and water management in the region (Diputación de Cáceres (Observatorio Socioeconómico Provincial), 2016).

Minerals and deposits

- Malcata

In Malcata, the municipalities of Sabugal and Penamacor are home of mining activities mainly related to granite used for ornamental purposes. In Penamacor, mineral resources gave rise to numerous explorations that are practically abandoned today. Standing out were cassiterite and wolframite. In the region South of Meimoa there is a breccia of clayey schist and greyvacuid mineralized by galena, with siderite and, in smaller proportions, pyrite and chalcopyrite (CCDRC, 2008).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in the Cross-border Pilot “Gata-Malcata” is presented in Table 89. The region holds a variety of water sources that are crucial to the maintenance of biodiversity and ecosystem balance. However, these resources have been affected by dry and hot summers that result in the alteration of the ecology of the region and water scarcity. Together with the significant part of the territory occupied by foresty and uncultivated areas (82.6%) makes it an extremely vulnerable region to forest fires, threatening the natural resources of the region.

Table 89 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the natural resources in the Cross-border Pilot "Gata-Malcata"

Vulnerabilities	Risks	Opportunities
Low agricultural activitiy	Lack of food sovereignty; depopulation; Abandonment	Increase agroecology activity; Attract younger and employment trough neo-rural
Dry and hot summers	Affects ecology; water scarcity; increase risk of fires	Integrate citizens and organisations in environmental decision-making; Develop an integrated strategy regarding efficient water management and fires prevention

4.2.13.2.2. Primary data: Social perceptions on natural resources

For the Cross-border Pilot "Gata-Malcata" we have two policymakers, one male and one female. They identified the most important natural resources in the region as the native forest, water, minerals, air, sunlight and soil.

As the secondary data also reveals, the interviewees highlight the risk of water scarcity due to climate change and the significant reduction in the annual rainy season. On the other hand, this situation also leads to opportunities for new biodiversity:

"The autochthonous forest of black oak has increased due to desertification and consequent abandonment of fields." (Portuguese male policymaker, 47 years old, Malcata)

Through the discourse of the female policy, there is a concern with the way that natural resources are been managed, mentioning the risk of forest fires due to the abandonment of rural areas and also the danger of water scarcity. However, her discourses also reveal an instrumental vision of natural resources and their profit:

"The forest is one of the resources with a high presence in the region, although, as mentioned above, it is poorly managed and as such is not valued and profitable as it should be. There is also an underutilization of the different resources associated with it, as is the case with resin, which constituted a supplementary income that helped with its management. With the abandonment of the rural world by people and with the climate changes that are translating into the alteration of the seasons of the year as they were, it has had implications in the number of rural fires that have contributed to a significant reduction of the forest area in the region. Water, as mentioned, is a present resource, and here we also have the issue of mineral waters that contribute to the economy, namely in the areas of health and well-being and water resources in general. There are also serious problems in the management of river basins, reservoirs, etc." (Female policymaker, 55 years old, Malcata)

In the case of conflicts concerning natural resources, both interviewees focused on the minerals, since for them they are critical raw materials, not only for Portugal and for Europe,

but for historical reasons. The interviewees pointed out the reasons that triggered these conflicts, namely the environmental liabilities existing in former and current mining explorations, the inadequacy of exploration methods, and the lack of transparency and articulation with local communities. Also, the policymakers refer that there is also the fact that extractive companies are not interested in using second-line resources through the use of circularity techniques because they consider it unprofitable. And to this are the impacts of mines/explorations on tourism activity and in the ecosystems and associated biodiversity.

4.2.13.3. Socio-environmental concerns

4.2.13.3.1. Secondary data on socio-environmental concerns

Air Pollution

- Malcata

Due to the regional scale of this pilot, data on air pollution is not very precise. However, there is some evidence which indicates that Malcata region presents low pollution indices because there are no polluting industries or intensive farming.

- Gata

The information on air quality in the Gata region, similar to Malcata, is usually available at the provincial level of Cáceres. In this case, the air quality assessment carried out in 2021 (Extremabiente, 2021) pointed out that the Ozone (O_3) target for the protection of health and vegetation has been exceeded. On the other hand, as a rural region, Extremadura is prone to the formation of tropospheric ozone, furthermore, favoured by nearby areas that emit high levels of NO_2, both in Spain and Portugal (Extremabiente, 2021).

Climate-related economic losses

- Gata

The impacts of climate change in the Gata region are increased due to the risk of desertification. Considering the violent fires of the last two decades that have aggravated the risk of desertification. 1,500,000 hectares, in the 2008 National Action Plan against Desertification (Gobierno de España - Ministerio de Medio Ambiente y Medio Rural Y Marino, 2008), were considered high-risk areas in Extremadura, of which 150,000 belong to the Gata region.

Farming types and scales of production

- Malcata

In Malcata region the most important sector is the primary sector (nuts, agriculture and livestock), with agriculture in the first place. More than 90% of agricultural production is exported, mostly going to the north of the country, with some specific products going abroad (like Chestnut to France, for instance). These sectors are mostly self-sufficient, except in times of drought. Imports only happen in times of drought and are mainly food for livestock/cattle (examples are hay or bale from Spain).

Following the national trend, the proportion of organic farming in the municipalities of Sabugal and Penamacor is low. In 2009, the proportion of farms with organic farming in Sabugal was 1.26% and in Penamacor was 0.35%, with very residual values. However, Sabugal had one of the highest percentages of organic farming, above the Centro region average of 0.35% and the national average of 0.41%. In 2019 it was possible to observe two different trends, while Penamacor saw an increase in its percentage of farms with organic farming, in Sabugal the opposite happened. Nevertheless, Penamacor with 0.77% still was below the regional (1.07%) and national (1.32%) averages, and Sabugal with 1.04 fell below those averages, as the number of organic farms was reduced.

As for the proportion of agricultural surface in organic farming, in 2009 these municipalities were well above the national average of 2.7% and the region Centro average of 4.6%, as Sabugal had 8.8% of its agriculture surface allocated to organic farming and Penamacor 16.5%. However, the evolution during the 2009-2019 period was not positive for both. While the Portuguese and regional averages rose, to 5.3% and 7.3%, respectively, the values in these municipalities fell. Thus, in 2019, Sabugal had a value of agricultural land in organic farming of 5.2% of the total agricultural surface and Penamacor maintained a greater than average value, but now with only 9.4%.

- Gata

The weight of the primary sector (agriculture, livestock, fishing, and forestry) in the economy of Gata region, as described by Pulido et al. (2019), barely accounts for 2% of the total agricultural area of the region. An indicator is the decline in farms between 1999 (6,853) and 2009 (3,234) in parallel to the ageing of the population, a third of the owners are women. 56% of farm owners are over 55 years of age. Only 5.8% of farm owners are under 35 years of age. This decline is cumulative to a “lack of information and bureaucracy that greatly hinder aid for the creation and maintenance of entrepreneurial activities in rural areas” (Pulido et al., 2019), undermining the fixation and development of agriculture activities. Given the importance of agriculture and livestock in the region, it can be stated that there is relative self-sufficiency in terms of the consumption of unprocessed food from agriculture, but high dependence on the consumption of semi-finished and, above all, processed food goods.

Energy

- Malcata

Sabugal increased its energy consumption between 2011 and 2020 by 57.3% (with a per capita consumption of about 2.7MWh) and Penamacor by 93% (with a per capita consumption of about 3MWh). As table 90 shows, overall, there was a reduction in energy consumption, the exception being extractive industries (Sabugal), manufacturing industries and catering and accommodation (Penamacor).

Table 90 - Energy consumption variation from 2011 to 2020 by sector of economic activity for the municipalities of Penamacor and Sabugal

	Penamacor	Sabugal
Total	-7.9	-20.1
Agriculture and Fishing	-49.5	-7.2
Extractive industries	-81.2	24.8
Manufacturing industries	7.7	-40.6
Construction	-59.9	-66.6
Wholesale and retail trade	-44.7	-3.1
Catering and Accommodation	3.4	-45.5
Transport	475.6	-83.5
Banks and Insurance	-28.3	-25.1
Others	-4.2	-17.2

Source: Elaborated by the Local Partner CFE/UC based on the Pordata (2022c)

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in the Cross-border Pilot "Gata-Malcata" is presented in Table 91. The region is paradoxically rich and diverse in biodiversity but at the same time is vulnerable to the uncertainty of socioenvironmental risks (forest fires and other impacts of climate change) as marked ageing of the population converges with the growing abandonment of the agricultural activity, only partially offset by rural tourism. This reveals a serious problem of generational change and a serious problem of abandonment of land or farms. This abandonment has not only caused economic and cultural losses but also an increase in vegetable fuel that multiplies the risks of wild forest fires.

Concerning organic farming, the data proves that has been losing strength over the last decade in these municipalities. The only positive note is the increase in the number of farms embarking on this organic farming in the municipality of Penamacor.

Table 91 – Synthesis of the main vulnerabilities, risks, and opportunities regarding the socio-environmental concerns in the Cross-border Pilot "Gata-Malcata"

Vulnerabilities	Risks	Opportunities
Ageing population	forest fires	Rich and diverse biodiversity
Abandonment of the agricultural activity	Climate change impacts; Economic losses; Culture losses	Deconstruct the negative representation of the agriculture sector; Attract new rural, younger and high-skill workers
Loss of strength of organic farming	Droughts - Reduction in the agricultural production	Implementation of sustainable farming systems
	Droughts - Impacts on water quality; Water scarcity	Implementation of efficient systems of use of water sources

4.2.13.3.2. Primary data: Social perceptions on socio-environmental concerns

The socio-environmental risks mentioned by the interviewees are somewhat linked with the threats to the natural resources stated in the previous research topic: water scarcity, depopulation, forest fires, loss of biodiversity, global warming and poverty are those highlighted.

Both interviewees are aware of the ecological transition and for them, everyone is responsible for it. Therefore, each one provides a definition. For the male policymaker, the focus is on a change of paradigm on the interaction with the environment:

"It means a change in the paradigm of how societies interact with the environment in a more sustainable perspective." (Male policymaker, 47 years old, Malcata)

For the female policymaker, there is a focus on the need to respect the planet's limits but also on the justice and fairness of this transition:

"The ecological transition presupposes the transition to a production and consumption system that does not take into account the finitude of the planet's existing resources, towards a production and consumption system that respects the planet and its limits and, at the same time, is compatible with a greater equity in the distribution of wealth." (Female policymaker, 55 years old, Malcata)

To its implementation, the interviewees mentioned the lack of knowledge on the issues, the economic interest and the lobbies associated, as well, as the lack of political capacity as the main barriers. The main challenge is consensual: the change of economic paradigm.

4.2.13.4. Sociocultural ecological behaviours

4.2.13.4.1. Secondary data on sociocultural ecological behaviours

Mobility

- Malcata

The issue of mobility in the municipalities of Sabugal and Penamacor presents the characteristic problems of rural areas: public transport services are extremely limited and cannot be considered a viable alternative to individual transport. In these territories, there is not enough population to make them an attractive market or to be able to justify an extensive transport network. The collective public transport service is provided on national connections, with a reduced number of routes, while the train system is also not an option, which results in a fragile offer. The strong use of automobiles in the day-to-day lives of populations is strongly related to this shortage of supply. However, road accessibility also has a poor offer, despite the proximity of two motorways A23 and A 25, which connect to Lisbon and the coast, the municipal and the connections with Spain are somewhat faulty (even the accessibilities towards Spain are dominated by a series of secondary roads), sometimes forcing people to make major detours to cross the border (Câmara Municipal de Penamacor, 2015; Câmara Municipal do Sabugal, 2016).

- Gata

Due to the low level of economic activity and the small population size of the Gata region, there is a high level of motorization, which is partly explained by the absence of public transport and the relative isolation of other population centres. With no rail, hardly any bus lines and limited road access, the infrastructure deficit has begun to reverse in recent years. The new roads built by the government of the Junta de Extremadura region have made it possible to improve the inter-regional connection with Portugal (Ex 205 road) and between the region and the province of Salamanca (Ex 109 road).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in the Cross-border Pilot “Gata-Malcata” is presented in Table 92. There is an urgent need to improve the access to the region which will favour both rural tourism and economic activity in general. At the same time, it removes the region from isolation and improves accessibility to it and from there to the region as a whole and Portugal. This is a structural problem in Portugal, a duality between Urban Vs rural areas, with a concentration of public services (transport, health, culture, employment, among others) on the first and a lack of public services in the last.

Table 92 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the sociocultural ecological behaviours in the Cross-border Pilot "Gata-Malcata"

Vulnerabilities	Risks	Opportunities
High utilization of motor vehicles; lack of alternative mobility solutions outside urban areas	Poor air quality	Co-design of solutions that restrict the circulation of motor vehicles in high-density areas; Discuss the need for sustainable mobility solutions; Develop a transport network public and accessible to all
	Increase in GHG emissions	

4.2.13.4.2. Primary data: Social perceptions on sociocultural ecological behaviours

To raise collective ecological awareness the interviewees believe that more work is needed from schools and the scientific community. The female policymaker deepens her opinion by stating that the Planet will always find a way to recover and that humans are those that currently may not be viable, i.e., are the main problem. Therefore, humans must use their intellect to make all elements, humans and non-humans, liveable:

"I believe that it is fundamental to have scientific knowledge produced and shared about the situation and about the best way to avoid the collective suicide of humanity as we know it - yes, I believe that the planet will find a way to continue, "we" are the ones who may not be viable in this new reality - to produce knowledge and technological innovation that allows a greater adaptation to existing resources and the viability of life - all existing life -. This knowledge should pass on to society in general and young people in particular, for this to happen and for respect for nature and the planet to be effective and not just "virtual", it is essential that contact with and taste." (Female policymaker, 55 years old, Malcata)

Regarding the adoption of a more frugal lifestyle, the interviewees are unanimous in the need to achieve a more careful management of water consumption, the crops that are planted and the reduction of superfluous energy consumption. However, the female policymaker emphasises that changing only individual lifestyles is not enough for the success of this transition – trust in the official organisations, the rejection of greenwash and the love for nature are crucial in the ecological transition. But the economic interest and political lobbies are those that should be the focus of the ecological "combat":

"I believe that if everyone did their part, it would be possible to find a new balance. I also do not doubt that it is still insufficient. I have the perception that there is some lack of trust in the official organisations, I also have the perception of a lot of "greenwash" that does not help with credibility, but to combat all this, knowledge, credible information and the love for nature in its many manifestations are the determining factors - this in the romantic view. In a more realistic view, I would say that the big

economic interests and the associated lobbies, namely political ones, are those that we have to influence through our habits." (Female policymaker, 55 years old, Malcata)

4.2.13.5. Experiences in Nature

4.2.13.5.1. Secondary data on experiences in Nature

Protective functions of forests

- Malcata

In Serra da Malcata the autochthonous forest is dominated by Pyrenean oak (*Quercus pyrenaica*), holm oak (*Quercus rotundifólia*) associated with strawberry tree (*Arbutus unedo*), ash tree (*Fraxinus* spp.) on the banks of the main water courses, alder tree (*Alnus glutinosa*) and willow (*Salix* spp.). Of the various formations that occur, the following stand out: bushes (highest density), oak forests, strawberry trees, holm oaks, riparian forests, and pine forests. Serra da Malcata also is home to more than 200 species of vertebrates, the flagship and the highest priority for the conservation efforts of the Nature Reserve, the Iberian lynx (*Lynx pardinus*). Besides that, it has a high diversity of species in its territory, 9 species of fish, 14 amphibians, 18 reptiles, 140 birds, 32 non-flying mammals (21 rodents, insectivores and lagomorphs, and 11 carnivores) and at least 5 (but potentially 16) bat.

The Forest Management Plan foresees potentiating the use of some resources, specifically: to adapt forest spaces with landscape value and potential for recreation to their use for recreational and leisure activities linked to nature; to develop the silvopastoral activity, namely, improve the beekeeping resources, activity and integration in the chain of certified products; to reduce the horizontal continuity of vegetation to minimise the spread of fire; and to promote the production of non-wood products, namely arbutus, mushrooms, honey and aromatic, condiment and medicinal herbs (Instituto de Conservação da Natureza e Florestas, 2015).

Due to its importance and its resources, it was created the Special Conservation Zone (ZEC) area of Malcata (PTCON0004) classified by Regulatory Decree No. 1/2020, 16th March, with the total area of 79 380 ha extended through the municipalities of Almeida, Sabugal and Penamacor. Within the scope of the Natura 2000 Network, there is also the Serra da Malcata Special Protection Zone (SPZ) (PTZPE0007), classified by Decree-Law No. 384-B99, 23rd September, with an area of 16 347 ha (Direção-Geral do Território, 2022).

Sabugal has an agrosilvopastoral landscape: on the plateau, there are large plots of cereal crops and pasture/fodder, often separated by lines of trees or bushy hedges, sometimes accompanied by loose stone walls. Pyrenean oak, ash, brambles and hawthorn appear as frequent species in these alignments, constituting a compartmentalization network that, as it is not very dense, does not avoid the dominant character of an open and inhospitable landscape. In areas with a high density of granite outcrops, herbaceous and shrubby

vegetation develops in the interstitial spaces, used as extensive pasture. About 60.5% of the municipality territory integrates protected areas or the Natura 2000 Network. This Sabugal part of Natura 2000 area also includes 4 vacant lands (known as '*baldios*' in Portugal): '*Baldios*' of Aldeia Velha (543.3ha), Fóios (703ha), Malcata (349ha) and Quadrazais (503.7ha).

- Gata

The natural areas of the Gata region are of high ecological value. As a transition zone between river basins and mountain and peneplain areas, it has a wide diversity of natural resources that have made the region a progressively protected area, with reserve areas due to their high ecological value, and suitable for the development of an ecological agrarian economy and tourism development[35]:

a) Area of Priority Interest (ZIP) (Extremabiente, 2021) such as ZIP 1 (Alto de la Carbonera-El Espinazo and Jálama), elevated areas with abundant grasslands and heaths; ZIP 2 (Sierra de las Pilas, Sierra del Moro and Sierra de Los Ángeles), a mid-mountain area with communities of forest birds (black vultures) and arborescent scrub; ZIP 3 (Embalse del Prado de las Monjas or La Cervigona) with a community of Odonata; ZIP 4 (La Cumbre and La Madre del Agua) includes two independent forest areas that have the forest buzzard bat as a key element; ZIP 5 (Teso de la Nave) a mid-mountain area with streams and floodings with temporary Mediterranean ponds; ZIP 6 (Castañar O'Soitu and Arroyo de la Vega) is an area of varied forests (mainly chestnut trees); and ZIP 7 (Río Malavao and Arroyo de los Hoyaritos) in the Duero River basin with large communities of forest birds.

b) Existing resources in the so-called Zones of High Interest (ZAI): ZAI 1 (La Cumbre-Madrelagua) Mid-Mountain wooded area with the presence of the forest buzzard bat. The Carbonell lizard is also present as a value of interest; ZAI 2. (La Malena) Mid- Mountain area with plains and gentle slopes dominated by heather, Montagu's harrier, and a community of forest birds (black vulture).

c) The current vegetation in the CSG is made up of broad-leaved forests, meadows, areas of scrubland and grassland, together with surfaces that have been completely transformed, creating dryland (especially olive groves) and irrigated areas. Among the natural resources in which human activity has been and is fundamental, the following should be highlighted: The "melojares" or oak forests that characterise various municipalities in the region; the "dehesas" or farms in which oak predominates, as ecosystems of very high ecological value; the typical "cork oaks" in various areas of the Region of Extremadura; the "oak forests" almost completely integrated into the pastures; "riparian vegetation" or groves, characteristic of the medium-high courses of the rivers (Diputación de Cáceres (Observatorio Socioeconómico Provincial), 2016).

[35] This classification was provided by the Cross-Border pilot Local Partner.

Tourism

- *Malcata*

Regarding tourism, both Sabugal and Penamacor value development strategies are linked to this activity, following the postulated plans and strategies for the regional development of the Center region. Betting on the preservation of natural resources to attract people and boost tourism, but also cultural development. With this in mind, the European Charter for Sustainable Tourism of Terras does Lince (CETS) (Câmara Municipal do Sabugal, 2015) was born. It is a project that involves both municipalities and has taken an important role in developing regional tourism, aiming to consolidate the territorial identity and image of Terras do Lince as a Nature Tourism destination, to produce and provide information about/for the territory of Terras do Lince and promote the training of human resources in the tourism sector, and to organise and sell the tourist offer of the Terras do Lince territory as a Nature Tourism destination. Furthermore, both municipalities integrate the Regional Development Association Territórios do Côa, in which the main strategies for development are related to tourism and local and regional branding.

- Gata

The development of services linked to rural tourism is on the rise and could develop if the conservation and reproduction conditions of the different protected areas for birds and forests are maintained. Support services for caring for the forests (training, surveillance technologies, among others) and care for the elderly have opened another avenue of stable employment (Diputación de Cáceres (Observatorio Socioeconómico Provincial), 2016).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding the experiences in Nature in the Cross-border Pilot “Gata-Malcata” is presented in Table 93. The pilot holds a significant variety of forests and protected areas supported by official plans and legislation. This is a main attraction, especially for rural and ecotourism in the region. However, it should be noticed that as stated before, the region experiences a continuous abandonment of the territory which increases the vulnerability to forest fires and climate change impacts. Therefore, an integrated plan should be considered during the implementation of the ecological transition that both encompasses the biodiversity of the territory and the local social phenomena.

Table 93 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the Experiences in Nature of the Cross-border Pilot “Gata-Malcata”

Vulnerabilities	Risks	Opportunities
Abandonment	Biodiversity loss; forest fires	Ecosystem services; ecotourism

4.2.13.5.2. Primary data: Social perceptions on experiences in Nature

For the two policymakers, nature is understood as something wild, pristine and absent of human intervention – something separated from humanity, outside of it. Therefore, they chose words associated with nature that reflects this viewpoint: plants, water, soil, animals and air. Along the same line, they describe their experiences when in contact with nature through the ecosystem services benefits – instrumental vision -, such as relaxation, mental and spiritual wellbeing, environmental ecological awareness and financial profit. It would be important to also consider the relational value of nature beyond the instrumental one, recognizing nature's limits and rights, and respecting all living beings to assure which should be at the core of the ecological transition. In fact, this instrumental vision of nature has brought an unsustainable situation that appeals to a shift of paradigm, and the policymakers' sector should also be part of this commitment.

4.2.13.6. Inclusiveness

4.2.13.6.1. Secondary data on inclusiveness

Vulnerable groups

- *Malcata*

There are no reported vulnerable groups in the study area, nevertheless, the elders can be considered the most vulnerable ones. As it was seen, the level of ageing is extremely high. so, seniors are a significant portion of the population. In 2021 the elder dependency index in Sabugal was 94 and in Penamacor was 90,7. This population across rural Portugal and interior areas have the same problems, namely, low wages, low education levels, difficult access to health care, physical isolation, mobility impairment and loneliness – suggesting the Inverse Care Law proposed by Hart (1971) where the availability of good medical or social care tends to vary inversely with the need of the population served, moreover a situation already identified in Portugal (G. M. Oliveira et al., 2019; Santana, 2000; Vidal et al., 2018). Although being in an ageing trajectory for the last decades, the aid and support to this population fall short of their needs in both municipalities, in Sabugal only 42% and in Penamacor only 19% of elders receive some support from the municipality (social services).

- *Gata*

Two groups are particularly vulnerable: older people, most of them very long-lived, who live alone or relatively isolated and, secondly, middle-aged women who assume the burden of care, to which must be added young women who seek employment outside the region.

Isolation and loneliness in the rural world of the Gata region are softened or slowed down by the weight of traditional community solidarity and the caregiving role of women. However, the organisation of care for the elderly is a major social problem. The municipal

social services and organised social volunteering contribute to alleviating the burden of care that the women of the region assume almost alone. Many of these caregivers combine care with work in agriculture and livestock activity, mostly older women since younger people migrate to urban centres. This implies women caregivers' problems of overload work and high opportunity costs assumed by a moral of traditional responsibility (Diputación de Cáceres (Observatorio Socioeconómico Provincial), 2016).

People at risk of poverty

- *Gata*

The poverty risk rate in Extremadura has been the highest in Spain, together with Andalusia. The poverty risk rate in Spain in 2020 is 21.7%. The poverty risk rate in Extremadura is 32% (Junta de Extremadura, 2021).

Gender pay gap

- *Malcata*

In 2021 women constituted the majority of the population in both municipalities, 52.8% in Sabugal (with over 111 women per 100 men) and 50.7% in Penamacor (with almost 103 women per 100 men). In Sabugal the activity rate was 32.7%, however, the disparities between men and women were rather significant, as men showed a 36.7% activity rate and women only 29.1%. In Penamacor the same pattern emerged, the activity rate was 31.9%, but men presented a rate of 35.9% and women 28.1%. As for the unemployment rate, the same asymmetries between genders were present, and the studied municipalities showed rates - in most cases - a little lower than the national (8.1% total, 7.4% men and 8.9% women) and region Centro (6.0% total, 5.3% men and 6.8% women) rates. In Sabugal the unemployment rate was 5.8%, while men had a rate of 5.6% and women of 6.0%, while in Penamacor the unemployment rate was 7.4%, while men had a rate of 6.9% and women 8.0% (Pordata, 2022i). Furthermore, the difference in wages by sex is also a fact both in Sabugal and in Penamacor, in the first, female individuals earn around 89.1% of the average salary of male individuals, and in the second, around 83% (Pordata, 2021b).

- *Gata*

The situation of women in the Gata region is in a process of transition. On the one hand, as we have pointed out, older women oversee the informal care economy, generally unpaid, and part of the jobs in agriculture and livestock activity. On the other hand, the young women either emigrate from the region or, if they remain, they are mostly women who are employed or participate in training programs for employment and some initiatives of artisan companies. Women under 40 years of age have taken on the challenge of labour integration and the achievement of gender equality. The existing gender gap in the region

tends to close economically de facto to the extent that women are necessary for the development of economic activities such as agriculture and tourism. Women demand employment above all in agriculture (31% of the demand), followed by cleaning activities (13%) and formal care (2%) and peonage in the manufacturing industry (8%), the rest of the demand for employment is mainly in the sales and tourism sector. Men also have agriculture as their first demand for employment, but construction is their second demand (Diputación de Cáceres (Observatorio Socioeconómico Provincial), 2016).

Vulnerabilities, risks, and opportunities

A synthesis of the main vulnerabilities, risks, and opportunities regarding inclusiveness in the Cross-border Pilot "Gata-Malcata" is presented in Table 94. The absence of data regarding citizen participation in environmental decision-making, similar to that that happens in Portugal, is a considerable gap that disables to provide a picture of the current situation. Anyway, the existing data enables us to identify the main vulnerable groups in Portugal: the elderly and women. The exclusion of these groups from the participatory and environmental decision-making processes brings risks to the ecological transition, worsening in areas of low population density and far from the polis and the centre of decisions. The gender gap is visible in the income difference between males and females, in the unemployment rate but also in the occupations - women predominate in the cleaning sector and men in the construction sector.

Table 94 - Synthesis of the main vulnerabilities, risks, and opportunities regarding the inclusiveness in the Cross-border Pilot "Gata-Malcata"

Vulnerabilities	Risks	Opportunities
Absence of data regarding citizens' participation in environmental decision-making by gender, social status, age, and ethnic group	Discriminatory ecological transition	To create a system of monitorisation that enables one to understand which social groups are included and excluded
Vulnerability of elderly and women		
Structural gender inequalities		

4.2.13.6.2. Primary data: Social perceptions on inclusiveness

Since both interviewees are policymakers they are aware of the environmental decision-making related to natural resources management in their region. However, surprisingly,

both refer that they do not have the opportunity to intervene since these decisions are made publicly available later which undermines any participation.

The relevance of the diversity of perspectives and knowledge in the decision-making process is acknowledged by the two interviewees to achieve a balance decision. Nevertheless, when it comes to expressing their opinion on the integration of socially vulnerable groups in the decision-making process, the two interviewees disagree: For the female policymaker, these groups need to be part of the decision since they are also affected by it; for the male policymaker the integration of these groups may suggest some kind of discrimination:

"No, because decision-making must take into account society as a whole without discrimination." (Male policymaker, 47 years old, Malcata)

However, perhaps the question was misunderstood by the interviewee since the aim was not to differentiate the groups but to give voice to all of them, independently of the socioeconomic and cultural background, in an equitable way and recognizing the symbolic and social barriers that historically marginalised groups have faced over the time.

4.2.13.7. Synthesis

According to the Cross-border Pilot "Gata-Malcata" socio-ecological concerns described in the Grant Agreement (GA, 2021, p.17-21), four main topics were identified as the main concerns to tackle the ecological transition: high vulnerability to forest fires, high vulnerability to water scarcity, landscape planning and management and valorisation of biodiversity and ecosystem services. The secondary and primary data previously analysed reinforces all these concerns, which were expressed by the local diagnosis and stakeholders, but unveils other issues that characterise this pilot: the phenomena of depopulation, ageing and isolation that alongside a high vulnerability to climate change impacts highlight the main barriers to the ecological transition that also acts as opportunities to benefits from its measures. No less important are the social inequalities in the region, of income, employment, age and gender type, all to be considered in the participatory process to meet the fairness and inclusiveness of this transition.

Some highlights regarding the Cross-border Pilot "Gata-Malcata" socio-cultural-bio specificities to be considered in the participatory process and the involvement of populations and stakeholders are:

- Sociodiversity - consider the sociodiversity of people in environmental decision-making and their involvement through the creation of integration and monitoring

strategies – involve men and women, older and younger, in symbiotic inter and intragenerational exchange to benefit the ecological transition;

- Climate action – the impacts of climate change are extremely high in the territory, increasing the risk of forest fires and water scarcity. The development of transnational strategies in this region, with the involvement of citizens and stakeholders, would be highly beneficial since local communities are aware of the bio specificities of the territory;
- Vacant lands and forests – despite a significant part of the region being legally protected, the number of vacant lands and forests are under a paradox: from one hand their presence is very important due to the ecosystem services and resilience that they can provide; on the other hand, and due to the abandonment of territory, there are vulnerable to extreme weather events. Therefore, it would be important to involve local communities in the management of these areas.
- Agriculture and organic farming – the agriculture sector in the region, similar to what happens at the national level, is experiencing some difficulties regarding its generational sustainability and regeneration. This is also visible in the small presence of organic productions. The increase in the awareness of sustainable and respectful food production could be a source of attracting newcomers and new neo rural that could help to improve and rejuvenate the sector, which could also be driven by the increase of local incentives.
- Mobility – the adoption of shared and sustainable mobility patterns is constrained by the inexistence of public transport and alternatives to the private car. This is a traditional barrier in rural and interior areas in Portugal, a structural inequality issue that implies a commitment from central and local governments.

4.3 Attitudes toward environmental issues and climate change: RtC questionnaire[36]

4.3.1. Readiness to change levels in Estonia, France, Hungary, Italy, and Portugal

As a first step, we analysed Readiness to Change (RtC) levels in each country involved in the data collection. As reported in Figure 22, the average score of each of the 7 RtC dimensions was higher than the theoretical mean (i.e., 2.5) in all countries, suggesting substantial readiness of people in the 5 countries that are going to be involved in pilots. Another quite clear trend emerged from the data. The dimensions of “Perceived importance”, “Action” and “Perceived readiness” had the highest average scores compared to the others while the “Social Support” dimension appeared to have the lowest mean. This average score

[36] This section was developed by Andrea Guazzini (VirtHuLab, UNIFI) and Mirko Duradoni (VirtHuLab , UNIFI).

distribution of the RtC dimensions was observed in all countries without exceptions suggesting a high awareness of the importance of dealing with climate change and promptness to do so, but a low perception of support from others.

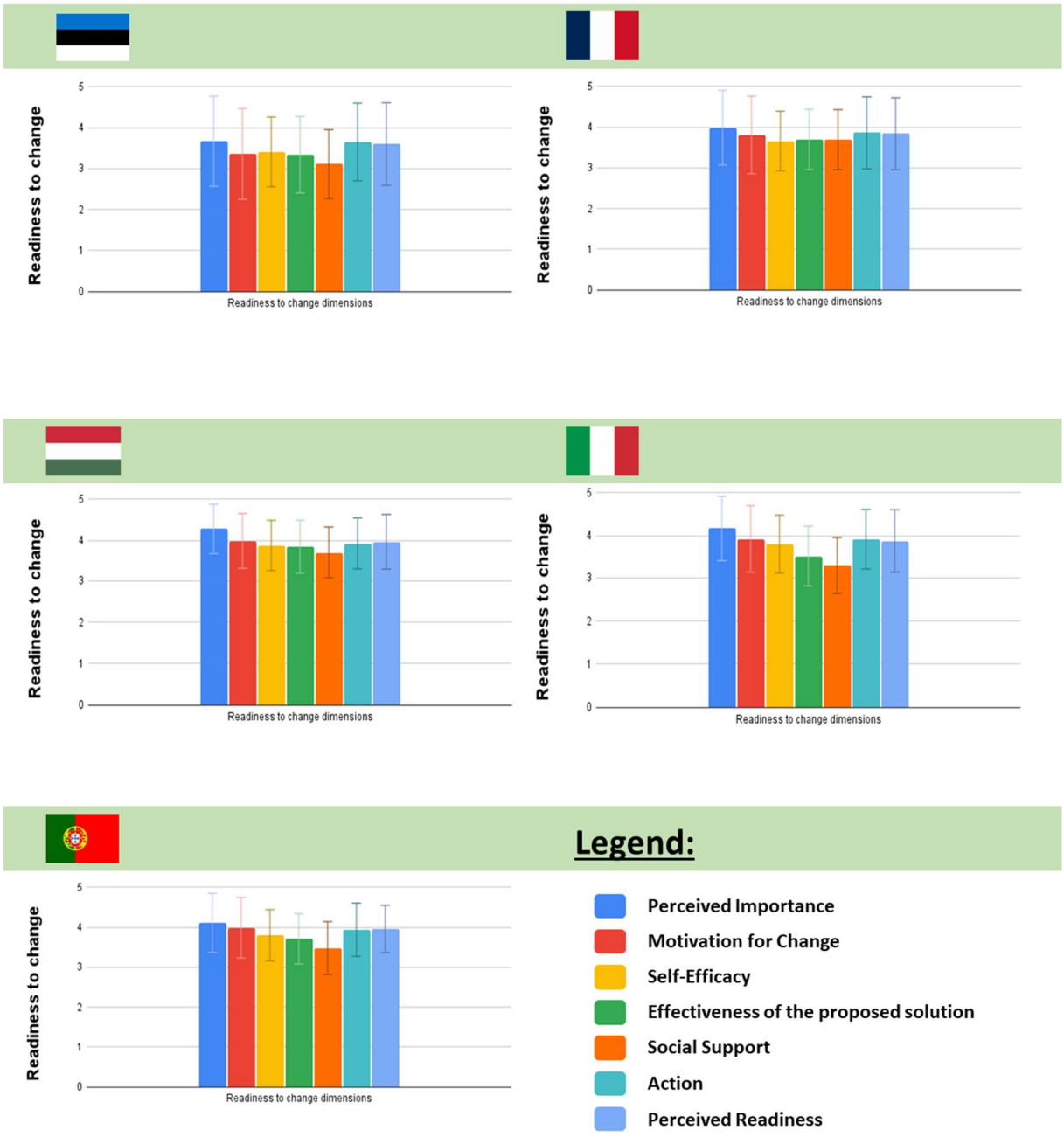

Figure 21 - Readiness to Change levels in the 5 countries involved in the data-collection. This image is high resolution. Please zoom in to have a clearer vision of all the information and details.

4.3.2. Cross-country comparison on Readiness to Change levels

Subsequently, we compared through ANOVA and post-hoc pairwise comparisons the five countries for each RtC dimension. As we can gather from Figure 23, in general, no substantial discrepancies emerged among the countries with a few exceptions. Estonia had on average

lower scores than the other countries in all the RtC dimensions[37]. In terms of effect size, we observed medium-large differences in Estonia for Motivation for Change (i.e., Cohen's d on average higher than 0.5 in pairwise comparisons), medium differences for Perceived Importance and Social Support (i.e., Cohen's d on average around 0.5 in pairwise comparisons), and medium-small differences in Self-Efficacy, Effectiveness of the Proposed Solution, Action, and Perceived readiness (i.e., Cohen's d on average between 0.5 and 0.2 in pairwise comparisons). In addition, participants from Italy reported lower levels of Social Support than France[38], and Hungary[39], while still having higher levels than Estonia[40] .

Figure 22 - Comparison of the five countries on RtC dimensions. This image is high resolution. Please zoom in to have a clearer vision of all the information and details.

4.3.3. Cross-country comparison on Readiness to Change levels

The same type of analysis was carried out by comparing the 5 countries involved in the data collection on the two dimensions defining people's explicit attitudes toward climate change

[37] Perceived Importance: $F_{(4; 924)} = 16.13$; $p. < 0.001$; Motivation for Change: $F_{(4; 924)} = 21.23$; $p. < 0.001$; Self-Efficacy: $F_{(4; 924)} = 14.32$; $p. < 0.001$; Effectiveness of the proposed solution: $F_{(4; 924)} = 12.39$; $p. < 0.001$; Social Support: $F_{(4; 924)} = 21.03$; $p. < 0.001$; Action: $F_{(4; 924)} = 5.88$; $p. < 0.001$; Perceived Readiness: $F_{(4; 924)} = 7.65$; $p. < 0.001$

[38] Mean difference = -0.38; $p. = 0.001$; Cohen's d = -0.40

[39] Mean difference = -0.40; p.< 0.001; Cohen's d = -0.42

[40] Mean difference = 0.20; $p. = 0.05$; Cohen's d = 0.21

(i.e., Belief and Intention). As shown in Figure 24, similarly and coherently with the results about RtC, people from Estonia reported to believe less that climate change is changing due to anthropic actions[41] and that acting against climate change is doable[42] . The difference regarding the Belief dimension can be deemed as a medium, while the one on Intention was big. The other countries achieved no statistically significant different scores on these two dimensions.

Figure 23 - Comparison of the five countries on explicit attitudes.

4.3.4. Sex-related differences on RtC and Explicit Attitudes Toward Climate Change

In line with the sex-sensitive approach of the project, we analysed data and subsequently report them in a sex-sensitive way. Due to the low number of records for transgender and non-binary people, we were able to compare with enough statistical power just cisgender males and cisgender females. As reported in Table 95, cisgender females appeared to have higher levels of both RtC and positive explicit attitudes toward climate change compared to cisgender males. Except for RtC Self-Efficacy and Social Support where the difference is more nuanced (i.e., the effect size can be considered small), all the other dimensions appeared statistically different between cisgender females and cisgender females with a medium effect size.

[41] Belief: $F_{(4; 924)} = 32.21$; $p. < 0.001$
[42] Intention: $F_{(4; 924)} = 108.42$; $p. < 0.001$

Table 95 - Welch's t-test to assess sex-related differences on Readiness to Change and Explicit Attitudes Toward Climate Change.

Variable	Sex	M	s.d.	*t*	df	*p.*	Cohen's d
RtC: Perceived Importance	Males	3.70	1.1	-7.18	478.9	<0.001	-0.53
	Females	4.19	0.7				
RtC: Motivation for Change	Males	3.44	1.1	-7.30	516.9	<0.001	-0.53
	Females	3.95	0.8				
RtC: Self-Efficacy	Males	3.55	0.7	-3.55	550.2	<0.001	-0.29
	Females	3.75	0.7				
RtC: Effectiveness of the proposed solution	Males	3.38	0.9	-5.45	545.2	<0.001	-0.38
	Females	3.69	0.7				
RtC: Social Support	Males	3.27	0.8	-2.84	591.0	0.005	-0.21
	Females	3.43	0.7				
RtC: Action	Males	3.61	0.8	-5.93	491.2	<0.001	-0.48
	Females	3.97	0.7				
RtC: Perceived Readiness	Males	3.58	1.0	-6.41	500.1	<0.001	-0.46
	Females	3.98	0.7				
EA: Belief	Males	37.25	9.0	-5.94	456.3	<0.001	-0.44
	Females	40.54	5.4				
EA: Intention	Males	21.93	6.2	-6.02	492.6	<0.001	-0.45
	Females	24.30	4.2				

Note: N = 870; RtC = Readiness to Change; EA = Explicit Attitudes Toward Climate Change; s.d. = standard deviation; df = degrees of freedom.

5. Limitations

Secondary data

Some limitations regarding the secondary data should be pointed out. Firstly, it is visible a transversal scarcity of secondary data through the pilots, worsening as the scale of analysis reduces. If at the national level, it is possible to have a considerable amount of data, at the regional and local level this situation reverts. Therefore, the absence of data at the local level compromises the possibility to identify the socio-cultural-environmental-economic specificities of each territory, which is a core issue of the PHOENIX project. Secondly,

regarding the nature of data, some are fragmented or collected differently by country, which does not allow a reliable comparison. Based on this limitation, there is a need to reinforce resources oriented to collecting and managing information on public official databases, especially at a time when we are struggling to implement an ecological transition and when continuous and rigorous monitoring of its implementation is needed to ensure its efficiency and that anyone is left behind.

Written interviews

In the case of written interviews, some limitations can be highlighted. The identification of the interviewees according to our target group's definition was a difficult task for the Local Partners. This has resulted in a collection of 39 out of 61 interviews, quite below the pre-defined number. However, the interviews number (n=61) was not a core issue; this was an output of the definition of the target group's profile to collect a diversity of perceptions and representations among different social groups. Thus, even though having more interviews could be, in the first attempt, a positive point, might not represent more diversity of data.

The high level of educational qualifications of respondents should also be mentioned. Although expected due to the definition of the target group, this may have been reflected in the interviewee's narratives. Still on target groups and considering the gender balance achieved in the sample, it is worth noting that when crossing the target group profile with gender, it is observed that policymakers or governmental/municipal technicians are mostly male (n=4), as well as scientists (n=5) which unveils the gender gap regarding top positions in society. Once again, this situation may also some reflection on the interviewee's narratives.

6. Conclusions

The D2.3 – Research report on Society and Nature – is an analytical framework of societies and their embeddedness to Nature, and the results achieved will be used to deliver considerations for WPs 3, 4 and 5 on designing the approach for PHOENIX pilots. Due to its complexity and combination of secondary and primary data, the main conclusions drawn will address the three general objectives.

Nature and Environment as sociocultural constructions

Through the systematic literature review where 161 documents were analysed, the aim was to conduct the first systematic analysis of how Nature and Environment concepts were represented in scientific production and how Nature-Society-Culture relations were described. Considering this first attempt to categorize the representations of Nature and the

Environment it is important to highlight the dominant view in science, profoundly extractivist and Western, which contributed to an impoverishment of knowledge, hiding plural visions and knowledge. This results in a weakening in the response to socio-ecological challenges as it disregards other possibilities of relationship with Nature and its cycles, hindered the necessary processes of societal transformation, ecological and epistemic, with obvious environmental and climatic, political, social, economic and ethical consequences. And this is how, in this western modern capitalist view of the world, humans have understood nature sometimes as a resource to be exploited, sometimes as an obstacle to obtaining it, and sometimes as a deposit for the residues that result from all of this.

Allied with the previous first reflection, there is the fact that the concept of Nature is not universal, being empirically false since opposing and conflicting views on Nature coexist at the same time. Thus, we propose to use the concept of "Natures" as a way of considering the different possibilities of social constructions about the concept and the socio-psycho-cultural contexts in which they are elaborated. From the analysed production, the concept of Nature has been used as a form of exclusion and moralization of certain groups, humans and non-humans, subjugating them to power relations that place dominant and dominated on opposite sides. But on the other hand, disruptive voices arise that contradict this vision and consider Nature as a living and autonomous entity, independent of human action, endowed with agency. Since Europe is a multicultural territory, with sociocultural mosaics at different scales, only by integrating the plurality of knowledge and views that a fair, plural and transformative ecological transition will become possible.

Deconstruct the main concepts of Nature and Environment in each pilot

The way that individuals and institutions relate to Nature and Environment in each pilot is crucial at two levels: firstly, to analyse the fundamental psychological dimension required to assess the perceptions, implicit and explicit attitudes, and behaviours related to environmental issues and climate change; and secondly to identify in each pilot how Nature and Environment are represented and described in law and public politics.

In the first level, the results of the RtC survey have shown, across all pilots, that people are ready to change but there is a perceived lack of support to do it. This unveils the need to involve all sectors of society and to give support to transformation actions: people want to change but structural barriers constrain their efforts due to the feeling of lack of support. It is worth noting that the Estonia pilot is less sensitive to the change regarding ecological issues which can be somewhat related to the fact that they are less worried about climate change and in disbelief that anthropic actions are the main contributors to it – this subject deserves further attention in the future to explore the underlying reasons behind this perception. This raises the question of the need to implement ecological measures side by

side with pilot specificities, involving society as a whole to ensure the transformative power of this transition.

At a second level, the analysis of how Nature and the Environment are represented and described in law and public politics through the Matrix of Rights to/of Nature revealed a clear trend: the nature concept definition is absent in law and politics being substituted by the concept of environment or natural resources. Added to this is the fact that across all pilots the rights of nature are not recognized nor mentioned, prevailing in an anthropocentric and instrumental viewpoint. Contrary to the Rights of Nature, the human right to Nature is widely recognized across the pilots, referring to the right of all to have access to and live in a healthy environment. Despite its importance as a matter of equity and fairness, the unrecognition of nature's rights and limits appears as a possible barrier to the ecological transition. A transition implies a paradigm shift, which is the substitution of the current one that no longer fits the need to contribute to the liveability of all species and that has guided us to the socioecological challenges that we are all facing. It is necessary for the involvement and participation of all sectors of society and social groups, independent of their background, in the co-creation of joint solutions that result from different perspectives and the plurality of knowledge.

Different sociocultural constructions of Nature and Environment condition the implementation of EGD's measures.

The combination of secondary and primary data from desk research and written interviews was an important step after the previous analysis. With this data it was possible to characterise each pilot through its biophysical profile and to identify their main vulnerabilities, risks and opportunities according to the five research topics – natural resources, socio-environmental concerns, sociocultural ecological behaviours, experiences in nature and inclusiveness – and completing with the social perceptions that, in some cases, provide new information. Some environmental concerns and barriers are transversal to all pilots, namely the vulnerability to climate change, the lack of food sovereignty, the risk of water scarcity, the population ageing and social inequalities. On the other hand, some specificities have been found that are linked with the sociocultural behaviours of the territory, such as burning waste in Szeged to keep the homes warm during the winter – due to energy poverty and the lack of ecological awareness –, the conflicts on lithium exploitation in Portugal and the conflicts around energy transition in France, the risk of fire in the cross-border pilot, the tourism pressure and the impacts of climate change in Tavira and the immigrants' exploitation in the agriculture sector in Odemira.

From the interviews, it was clear that the adoption of pro-ecological behaviours is not only dependent on individual choices – lack of awareness or giving up on personal comfort. The

interviewees highlight the financial barriers as the main constraints – both at an individual level and the macro level, i.e. the economic interests of companies -, as well as the lack of support of institutions as role models in this ecological transition. More importantly, a general perception of the ineffectiveness of traditional participation models was visible, limiting the possibility of intervention, especially for vulnerable social groups. People want to make part of this transition, but this can only be achieved through mechanisms of participation grounded in fair, inclusive and plural processes. And to this their understanding of Nature is not universal too, as the systematic literature review identified: sometimes as something pristine and savage distant from civilization, sometimes as a resource to be exploited and, sometimes, as part of humanity and all their interdependencies.

The transformative policy postulated by the ecological transition must be based on in-depth knowledge of the biophysical and socio-economic-cultural characteristics of territories, which is the information provided in this report. Therefore, there is a need to give a meaningful voice to the voiceless, highlight good governance processes and citizen participation and ensure solidarity in the involvement in environmental decisions. These are prerequisites for the ecological transition that require transformative processes at individual and structural levels.

7. Next steps and connections with other WPs

The D2.3 - Research Report on Society and Nature – results from close cooperation with Task 2.4. The results of Task 2.3 will be used by WP3, namely by Task 3.2 to create scenarios on the society and its embeddedness in nature which will be further combined with other Tasks outputs on the design of the methodological approach to responding to specific socio-spatial issues identified in the territories for each issue, i.e. the Tangram portfolio. The D2.3 results will also be useful to WP4, more specifically for Task 4.1 which will be in charge to create a Territorial Commission for Co-Design (TCCD) and will ensure the co-creation and co-implementation process of pilots, as well as an evaluation of how to include ICTs in each pilot-context and how to merge it with offline and more traditional approaches. Within Task 4.1. and based on D2.3 results, Local Partner will invite, mobilise and engage citizens from different backgrounds, experts, institutions, and policy-makers to take part in the TCCD.

Our focus on the socio-cultural-environmental specificities of each pilot territory is also closely connected with WP5 - Evaluation and Impact Assessment – since the definition of monitoring and evaluation framework (Task 5.1) will involve the preparation of all methodological and logistical material to monitor and evaluate based on the PHOENIX's research, innovation and engagement activity (WP2 and WP6), but also the codesign

processes (Task 4.1) and the Tangram methodology (WP3), both tasks and outputs where our results will be integrated. The last step will involve the participatory testing, localisation and optimisation of the evaluation plan (Task 5.2) where the codesign process (TCCD) described in Tasks 3.5 and 4.1 will assist PHOENIX with finalising the impact evaluation framework, as well as the combination of the literature review on key performance indicators (Task 5.1) and academic fieldwork (Tasks 2.3 and 2.4).

The interdependency among all WPs that compose the PHOENIX project is visible in Appendix 8.

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Appendices

Appendix 1. Matrix: the Rights of Nature (RoN) and the Human Right to Nature (RtN)

QDR_ Right of Nature / to Nature		GUIDELINES	
1	1.1.In the legislation there are legal norms that protect nature/natural resources for their intrinsic value [Rights of Nature (RoN)], regardless of the interest they have for humans?	Yes	No
	1.2.If yes, give some examples?	Indicate the name of laws, official documents, and the transcription (direct quotation) of that norm, etc.	

2	2.1. Are the Human Right to Nature (RtN) recognized and regulated? (ex: access to urban green spaces, a healthy environment, a balanced climate)	Yes	No
	2.2.If yes, give some examples?	Indicate the name of laws, official documents, and the transcription (direct quotation) of that norm, etc.	

3	3.1 Are duties of legal persons and individual persons towards Nature specified in the above-mentioned regulations?	Yes	No
	3.2. If yes, give some examples?	Specify and please use a direct quotation from the document	

4	4.1. Are duties of public authorities (national, regional, or local scale) towards Nature specified in the above-mentioned regulations?	Yes	No
	4.2. If yes, give some examples	Specify and please use a direct quotation from the document	

5	5.1. Please indicate if there is any definition of Nature in the above-mentioned regulations?	Yes	No
	5.2. If yes, give some examples.	Please, use a direct quotation from the document.	

6	6.1. Please indicate if there is any definition of Environment in the above-mentioned regulations?	Yes	No
	6.2. If yes, give some examples.	Please, use a direct quotation from the document.	

7	7.1. Are participation mechanisms foreseen for citizens and organisations during the environmental law-making process?	Yes		No
		Please, use a direct quotation from the document.		
	7.2. If yes, are those participation mechanisms defined as voluntary participation or mandatory participation?	Voluntary	Mandatory	Both
	7.3. In the case of a mandatory participation, who is required to participate?	Please specify who is required to participate		

8	8.1. Are there foreseen mechanisms for participation in the implementation of environmental laws?	Yes	No
		Please, use a direct quotation from the document.	
	8.2. If yes, give some examples.	Please, use a direct quotation from the document.	

Appendix 2. Secondary data indicators

II – Agency/Intersubjective level This level will analyse the social perceptions about Nature and the Environment through the stakeholder's narratives (individual and collective). Those perceptions will be related to the cultural ecosystems' services, climate change, social and gender inequalities, health and well-being. This intersubjective level is divided in two dimensions: perceptions (subjectivities) and the psychological processes (dimension that will be studied by the Virtual.LAB/UNIFI to assess the implicit and explicit attitudes related to environmental issues and climate change)																	
				Pilots													
				Portugal		**France**		**Italy**				**Hungary**				**Estonia**	**Iceland**
				Scale		**Scale**		**Scale**				**Scale**				**Scale**	**Scale**
				National	**Local Odemira**	**National**	**Local Rouen Metropole**	**Regional Emilia Romagna Region**		**Local Bologna**		**Regional Central Transdanubia Region**		**Local Szeged**		**Local Tartu**	**National**
Research topics		**EGD Topics[b]**	**Indicators[c]**	**Indicators description**													
0. SOCIODEMOGRAPHICS	Social and demographic factors that define people in a specific pilot	All	Population by age group	Share of population in a certain age group compared to the total population.													
		All	Population structure by sex	Average population during a calendar year is calculated as the arithmetic mean of the population on 1 January of two consecutive years.													
		All	Population by educational attainment level, sex and age (%)	Data on the highest level of education successfully completed by the individuals of a given population by sex and age.													
		All	Unemployment by sex and age	Percentage of population in the labour force unemployed, annual, From 15 to 74 years, by sex and age.													
		All	Ageing index	The ratio of the number of elderly persons of an age when they are generally economically inactive (aged 65 and over) to the number of young persons (from 0 to 14).													
		All	Life expectancy at birth	The mean number of years that a new-born child can expect to live if subjected throughout his life to the current mortality conditions (age-specific probabilities of dying).													
		All	Human development index	The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalised indices for each of the three dimensions.													
		All	Religious identity	Religious affiliation or, in the case of religious minorities, the ethnic identity.													

		All	Mean and median income by age and sex	Mean and median income by age and sex in European countries
1. NATURAL RESOURCES	Relevance of resources, their accessibility and effects by climate change	6	Main farm land use	The data describe the structure of agricultural holdings providing the general characteristics of farms and farmers and information on their land, livestock and labour force. They also describe production methods, rural development measures and agro-environmental aspects that look at the impact of agriculture on the environment.
		7	Population connected to public water supply	% of Resident population connected to wastewater collecting systems and to wastewater treatment plants.
		7	Water productivity	Water productivity indicates how much economic output is produced per cubic meter of fresh water abstracted (in EUR per m3 or PPS per m3). It serves as a measure of the efficiency of water use.
	Social struggles and expectations for natural resources	7	Data on existing socio-environmental conflicts	Cases reported on socioenvironmental conflicts on: Nuclear; Mineral ores and building materials extraction; Waste management; Biomass and land conflicts (forests, agriculture, fisheries and livestock management); Fossil fuels and climate justice /energy; Water management; Infrastructure and built environment; Tourism recreation; Biodiversity conservation conflicts; Industrial and utilities conflicts.
2. SOCIO-ENVIRONMENTAL CONCERNS	Main socio-environmental risks and concerns	3;8	Air Pollutants emissions by sector (energy; industry; agriculture; waste; land use)	Air pollution inventory for the year t-2 and within the area covered by its Member States. Under the Convention, parties are obliged to report emissions data for numerous air pollutants. This dataset includes data on air pollutants: sulphur oxides (SOx), ammonia (NH3), nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOCs), particulate matters (PM10, PM2.5), Lead (Pb), Cadmium (Cd), Mercury (Hg), Arsenic (As), Chromium (Cr) Copper (Cu), Nickel (Ni), Selenium (Se) and Zinc (Zn), as reported to the European Environment Agency (EEA).
		8	GHG emissions by sector (energy; industry; agriculture; waste; land use)	The indicator measures total national emissions (from both ESD and ETS sectors) including international aviation of the so called 'Kyoto basket' of greenhouse gases, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and the so-called F-gases (hydrofluorocarbons, perfluorocarbons, nitrogen triflouride (NF3) and sulphur hexafluoride (SF6)) from all sectors of the GHG emission inventories (including international aviation and indirect CO2).
		1	Climate-related economic losses by type of event (total losses by meteorological, hydrological and climatological events)	The indicator measures the overall losses from weather and climate-related disasters. It is based on data from the NatCatSERVICE managed by Munich Reinsurance Company.
		1	Precipitation	Annual precipitation in million cubic metres.
		8	Farming types and scales of production: (intensive, extensive, conventional, organic, subsistence and industrial)	Data on farming types and scales of production: (intensive, extensive, conventional, organic, subsistence and industrial) at national, regional and local levels.
		6	Employment in fisheries and aquaculture	Individuals employed in the fisheries and aquaculture sector
		6	Captured fish	Fish catch refers to catches of fishery products including fish, molluscs, crustaceans and other aquatic animals, residues and aquatic plants, that are taken: for all purposes (commercial, industrial, recreational and subsistence); by all types and classes of fishing units (including fishermen, vessels, gear, etc.); that are operating in inland, fresh and

				brackish water areas, and in inshore, offshore and high-seas fishing areas. Production from aquaculture is excluded.
		6	Fishing fleet by age, length and gross tonnage	The data are on the total number, tonnage and power of fishing vessels broken down by tonnage, length, age and power classes, and by gear categories.
		8	Urban population exposure to air pollution by particulate matter	The indicator shows the population-weighted concentration of PM10 and PM2.5 to which the urban population is potentially exposed.
		2;4	Share of population living in a dwelling not comfortably cool during summer time	Percentage of population living in a dwelling not comfortably cool during summer.
		2;4	Share of population living in a dwelling not comfortably warm during winter time	Percentage of population living in a dwelling not comfortably warm during summer.
	Major environmental challenges related to the EGD's transition pathway	4	Energy efficiency	The indicator measures the level of energy consumption and distance to 2020/2030 targets. The energy saving could improve the security of the energy supply by reducing the dependence on fuel imports. The improvement in energy efficiency also improves the competitiveness of European industry and services; for households it reduces the energy bill. Energy saving could also contribute to reducing the GHG emissions from fuel combustion.
		4	Share of renewable energy in gross final energy consumption	The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. This indicator is calculated on the basis of Directive 2009/28/EC on the promotion of the use of energy from renewable sources.
		7	National expenditure on environmental protection	Resources used by resident units in a given period for protecting the natural environment. It is calculated as a sum of current expenditure on environmental protection (EP) activities and investments for EP activities, including net transfers to the rest of the world.
		1	Investments in environmental education programs	National, regional and local investments on environmental education programs.
3. ECOLOGICAL BEHAVIORS	Relevance in adopting ecological behaviours	3;8	Treatment of waste by waste category, hazardousness and waste management operations	Data on the generation and treatment of waste is collected from the Member States. The information on waste generation has a breakdown in sources (19 business activities according to the NACE classification and household activities) and in waste categories (according to the European Waste Classification for statistical purposes). The information on waste treatment is broken down to five treatment types (recovery, incineration with energy recovery, other incineration, disposal on land and land treatment) and in waste categories.
		5	Distribution of population by level of difficulty in accessing public transport	Self-reported measure on the difficulty of the accessibility level to public transport.
		5	Persons who cannot afford a regular use	Self-reported measure on the difficulty to afford a regular use of public transport by employment status and income quintile.

			of public transport by employment status and income quintile	
		5	Number of passengers cars	Passenger cars per 1 000 inhabitants.
	Imagine strategies to support ecosystems and incentive Individual behavioural changes on environmental issues	1	People integrating NGOs	Percentage of people involved in NGOs
4. EXPERIENCES IN NATURE	Nature non-material benefits	7	Area of green spaces per inhabitant	Area of green spaces per inhabitant at national, regional and local levels in square meters.
		7	Protective functions of forests	Forests, by their very presence and operation, protect the natural resources within them, especially the soils and water which are the foundation of their functioning. Thus, the land protection of forests protects by definition the functions of the ecosystem. The protection level provided by forests is even clearer when they are used to protect human interests (protection of people, infrastructures, crops, etc.) against natural risks (avalanche, erosion, falling blocks, landslides, etc.).
		7	Terrestrial and marine protected areas	Terrestrial protected areas are defined as totally or partially protected areas of at least 1,000 hectares that are designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, and areas managed mainly for sustainable use. Unclassified areas, littoral (intertidal) areas, and sites protected under local or provincial law are excluded. Marine protected areas are areas of intertidal or subtidal terrain - and overlying water and associated flora and fauna and historical and cultural features - that have been reserved by law or other effective means to protect part or all of the enclosed environment.
		7	Tourism and ecotourism offer and demand	Data on tourism and ecotourism offer and demand at national, regional and local levels.
5. INCLUSIVENESS	Perceptions on the lack of inclusiveness of marginalized groups, Human rights promotion and gender equality in the deliberative and participative settings on environmental issues	All	Citizens' participation in environmental decision-making by gender, social status, age and ethnic group	Statistical information on the percentage of citizen's participation in national, regional and local environmental decision-making. If possible, data disaggregated by gender, social status, age and ethic group.
		All	Immigrants by age and sex	Number of immigrants by sex and age at a specific territory.
		All	Immigrants by labour force status	Number of immigrants by labour force status (employed, unemployed, inactive and unknown)

		All	People at risk of poverty or social exclusion by sex age	Main indicator on risk of poverty or social inclusion, AROPE, which is the main indicator to monitor the EU 2030 target on poverty and social exclusion and was the headline indicator to monitor the EU 2020 Strategy poverty target.
		All	Gender pay gap in unadjusted form	The indicator measures the difference between average gross hourly earnings of male paid employees and of female paid employees as a percentage of average gross hourly earnings of male paid employees.

Notes:

[a]A matrix regarding the Rights of and to Nature was previously sent to provide information to the Local Partners on how to collect the required data.

[b]EGD topics: 1.Increasing climate ambition, 2.Clean, affordable and secure energy, 3.Industry for a clean and circular economy, 4.Energy and resource efficient buildings, 5.Sustainable and smart mobility. 6.Farm to fork, 7.Biodiversity and ecosystems, 8.Zero-pollution, toxic-free environments;

[c]Hyperlinks of the indicator's sources are presented when available.

Appendix 3. Systematic Literature Review Table

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Rutherford & Shafer, 1969)	USA	Engineering	Survey	General population	Not clear											
(R. Williams, 1972)	UK	Cultural studies	Essay	N.A.	Not clear											
(Watanabe, 1974)	Japan	History	Essay	N.A.	No											
(Worster, 1977)	USA	History	Essay	N.A.	Not clear											
(Ullrich & Ullrich, 1976)	USA	Psychology	Interviews	Canoeists and fishermen	Not clear											
(Wohlwill, 1983a)	USA	Psychology	Essay	N.A.	Not clear											
(Talbot & Kaplan, 1986)	USA	Psychology	Mixed-Methods	General population	Not clear											
(Dake, 1992)	USA	Psychology	Essay	N.A.	Yes											
(Riviere, 1992)	Africa	Anthropology	Ethnography	Africans	No											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Hartig, 1993)	USA	Psychology	Literature review	N.A.	Yes											
(Tickell, 1993)	UK	History	Essay	N.A.	Not clear											
(Whatmore & Boucher, 1993)	UK	Geography	Mixed-Methods	Key actors in the development of rural land	No											
(Aitken & Zonn, 1993)	USA	Geography	Document analysis	N.A.	Not clear											
(Greider & Garkovich, 1994)	USA	Sociology	Essay	N.A.	No											
(Starik, 1995)	USA	Management	Essay	N.A.	Yes											
(Richardson, 1995)	USA	Theology	Essay	N.A.	Not clear											
(Freudenburg et al., 1995)	USA	Sociology	Essay	N.A.	Yes											
(Rikoon, 1996)	USA	Sociology	Essay	N.A.	Not clear											
(Mausner, 1996)	USA	Psychology	Interviews	General population	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Lamb, 1996)	USA	Philosophy	Essay	N.A.	Not clear											
(Vandergeest, 1996)	USA	Ecology	Document analysis	N.A.	No											
(Frank, 1997)	USA	Sociology	Mixed-Methods	N.A.	Yes											
(Luke, 1997)	USA	Political Science	Essay	N.A.	No											
(Schnell, 1997)	Israel	Geography	Essay	N.A.	No											
(Simmons, 1998)	UK	Geography	Essay	N.A.	No											
(McHenry, 1998)	Ireland	Economy	Interviews	Farmers	Not clear											
(Locke, 1999)	India	Political science	Document analysis	Women	Yes											
(McIsaac & Brün, 1999)	USA	Environmental Sciences	Essay	N.A.	Not clear											
(Ciccantell, 1999)	Brazil	Sociology	Mix-Methods	Corporate executives industries; governme	No											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
				nt executives and local residents												
(O'Rourke, 1999)	France	Geography	Interviews	Catalan farmers, neo-rural, wealthy outsiders and administrators and academics	Yes											
(Peterson, 2000)	USA	Theology	Essay	N.A.	Yes											
(Jewitt, 2000)	India	Geography	Mixed-Methods	Local residents of Ranchi District, Bihar	Yes											
(Salmón, 2000)	Mexico	Anthropology	Essay	Indigenous people	Yes											
(Till, 2001)	Mexico	Geography	Essay	N.A.	No											
(Linnros & Hallin, 2001)	Nordic countries	Geography	Mixed-Methods	NGOs	Yes											
(Eden, 2001)	UK	Geography	Essay	N.A.	No											
(Hull et al., 2001)	USA	Environmental Sciences	Interviews	Local educators and environmentalists	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Horowitz, 2001)	New Caledonia	Geography	Interviews	Kanak people	No											
(O'Brien, 2002)	USA	Environmental Sciences	Essay	Shifting cultivators	Not clear											
(Kleese, 2002)	USA	Environmental Sciences	Essay	N.A.	No											
(Woods, 2003)	UK	Sociology	Interviews	Windfarm farmers	No											
(Ghaffari & Hall, 2004)	USA	Robotic	Essay	N.A.	Yes											
(Atran et al., 2005)	Guatemala, Mesoamerica and North America	Psychology	Mixed-Methods	Local communities	Not clear											
(Schroeder, 2005)	USA	Linguistics	Essay	N.A.	Yes											
(Evanoff, 2005)	Japan	Philosophy	Essay	N.A.	No											
(Hovardas & Stamou, 2006a)	Greece	Ecology	Survey	Growth coalition members and visitors to the Dadia Forest Reserve	No											
(G. Williams & Mawdsley, 2006)	India	Geography	Essay	N.A.	Not clear											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Husband, 2006)	Russia	History	Document analysis	Soviet children's literature	No											
(Costanza et al., 2007)	USA	Ecology	Essay	N.A.	No											
(Kheraj, 2007)	Canada	History	Essay	General population	Yes											
(Clayton, 2007)	USA	Psychology	Survey	Garden center users	Yes											
(Broderick, 2007)	Australia	Geography	Mixed-Methods	Town residents, rural residents and landholders, business and industry representatives and local and State government officers	Yes											
(Shangpliang, 2008)	India	Anthropology	Ethnography	Khasi people	Yes											
(Lauderdale, 2008)	USA	Sociology	Essay	Indigenous people	Yes											
(Ferguson, 2008)	Jamaica	Geography	Document analysis	Curriculum Guides for Grades 1 through 6	No											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Edgington, 2008)	USA	History	Essay	N.A.	Not clear											
(Stamou et al., 2009)	Greece	Linguistics	Document analysis	Textual information regarding the Dadia forest in Greece	Yes											
(Ruiz-Ballesteros et al., 2009)	Spain	Anthropology	Ethnography	Farmers and Miners	Yes											
(Horton, 2009)	Costa Rica	Sociology	Mixed-Methods	Key figures active in ecotourism and community issues, as well as local nongovernmental organization and government official	Yes											
(Hajdu, 2009)	Hungary	Literature	Essay	Hungarian literature	Yes											
(Redclift, 2009)	UK	Sociology	Essay	N.A.	No											
(Breitenbach, 2009)	UK	Philosophy	Essay	Kant's works	Not clear											
(Note, 2009)	Belgium	Philosophy	Essay	Heidegger and	Not clear											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
				Levinas works												
(Meyer, 2010)	South Africa	Literature	Essay	N.A.	Not clear											
(Mentz, 2010)	USA	Literature	Essay	King Lear	Yes											
(Liechti et al., 2010)	Switzerland	Geography	Document analysis	Newspaper articles published in the Walliser Bote (WB)	Yes											
(Mathisen, 2010)	Norway	Tourism	Essay	Sámi people	Yes											
(Fischer, 2010)	UK	Psychology	Survey	General population	Yes											
(Jasanoff, 2010)	USA	Engineering	Essay	N.A.	No											
(Froude et al., 2010)	New Zealand	Environmental Studies	Literature review	N.A.	Yes											
(Čapek, 2010)	USA	Sociology	Essay	N.A.	No											
(Guyot, 2011)	France	Geography	Document analysis	Environmentalists and green stakeholders	Yes											
(Figgins & Holland, 2012)	New Zealand	Geography	Document analysis	Red deer	Not clear											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Youngs, 2012)	USA	History	Document analysis	Curt Teich Company postcards of Grand Canyon National Park	Not clear											
(Laschefski et al., 2012)	Brazil	Geography	Interviews	Small farmers	Yes											
(Robinson & Jorgensen, 2013)	USA	Cinema	Document analysis	Disney animated films	Yes											
(Saunders, 2013)	Sweden	Geography	Essay	N.A.	Yes											
(Lemoni et al., 2013)	Greece	Geography	Document analysis	School textbooks for Grades 1–4	Yes											
(Valcuende et al., 2013)	Spain	Anthropology	Mixed-Methods	Population of the Parque Natural Cabo de Gata-Níjar and to the different agents and social actors involved	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Millington, 2013)	USA	Geography	Document analysis	Photographers and journalists works from Detroit	Yes											
(Schlosberg, 2013)	Australia	Political Science	Essay	N.A.	Yes											
(Newman & Dale, 2013)	Canada	Geography	Essay	N.A.	Yes											
(Li & Qiu, 2013)	China	Engineering	Essay	"Unity of Man and Nature" Chinese thoughts	Yes											
(Yarde, 2013)	Commonwealth of Dominica	Geography	Mixed-Methods	Population of Dominica	Not clear											
(Jørgensen et al., 2013)	Nordic countries	History	Essay	N.A.	No											
(Pollini, 2013)	USA	Geography	Essay	Bruno Latour “Politiques de la Nature“	No											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Bennett, 2014)	USA	Landscape Architecture	Essay	N.A.	Yes											
(Castrechini et al., 2014)	Spain	Psychology	Document Analysis	La Vanguardia and El País newspapers	Not clear											
(Natarajan & Khoday, 2014)	Egipt and Arabian States	Law	Document analysis	N.A.	No											
(Liu & Lin, 2014)	Taiwan	Education	Mixed-Methods	University students	Yes											
(Retnowati et al., 2014)v	Indonesia	Geography	Mixed-Methods	Farmers	No											
(Beery & Wolf-Watz, 2014)	Sweden	Psychology	Survey	General population	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Dominationon: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Mthatiwa, 2014)	Malawi	Literature	Essay	Poetry of Bart Wolffe	Yes											
(do Couto Chipoletti Esteves & Goncalves, 2015)	Brazil	Education	Document analysis	Brazilian National Curriculum Parametes: Natural Sciences and Environment and Health	Not clear											
(Adams & Savahl, 2015)	South Africa	Psychology	Mixed-Methods	Students	Not clear											
(King, 2015)	Australia	Anthropology	Ethnography	Visitors of Australian National Botanic Gardens	Not clear											
(Yilmaz & Kahraman, 2015)	Turkey	Psychology	Document analysis	Students	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Prévot-Julliard et al., 2015)	USA	History	Document analysis	Disney animated films	Yes											
(Houdayer, 2015)	France	Sociology	Essay	Serge Moscovici	No											
(Kaltner, 2015)	USA	Theology	Essay	N.A.	Yes											
(Magallanes-Blanco, 2015)	Mexico	Communication	Document analysis	Indigenous videos	Yes											
(Onwudinjo, 2015)	Nigeria	Literature	Essay	Eco-poet Tanure Ojaide	Yes											
(Burke et al., 2015)	USA	Anthropology	Document analysis	Appalachian newspaper	Yes											
(de Giacomini Martínez & Beling	Brazil	Education	Interviews	Criciúma population	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
Loose, 2015)																
(Lawrence, 2016)	UK	Cinema	Document analysis	Andrea Arnold's 2011 film version of Emily Brontë's Wuthering Heights	Yes											
(Veselkova et al., 2016)	Russia	Sociology	Mixed-Methods	Youngers	Yes											
(Bravi, 2016)	Argentina	Communication	Document analysis	Newspaper El Litoral of Santa Fe (Argentina)	Yes											
(Perez-Marin, 2016)	Colombia	Communication	Document analysis	International treaties and/or conventions and Colombian legislation regarding the	Not Clear											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
				protection of nature and natural resources and the environmental policy present in the documents of the National Institute of Natural Resources, Inderena												
(Armstrong, 2016)	Canada	Theology	Essay	Farmers	Not clear											
(Neto & Lima, 2016)	Brazil	Law	Mixed-Methods	Indigenous leaders	Not clear											
(Jia et al., 2016)	China	Education	Document analysis	Mobi Dick	Not clear											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Velassery & Patra, 2016)	India	Philosophy	Essay	N.A.	Yes											
(Harris, 2016)	USA	Theology	Essay	N.A.	Not clear											
(Gervais, 2016)	France	Sociology	Interviews	Small-scale farmers	Not clear											
(Sousa et al., 2017)	Portugal	Biology	Document analysis	Books directed at six-to eight-year-old children	Not clear											
(P. Vieira, 2017)	Portugal	Cinema	Document analysis	"Estado Novo" filmography	Not clear											
(Dutra E Silva et al., 2017)	Brazil	History	Document analysis	Literature of Bernardo Élis	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Elliot, 2017)	New Zealand	Psychology	Survey	University students	Yes											
(Bhan & Trisal, 2017)	USA	Anthropology	Essay	N.A.	Not clear											
(Miranda & Robaina, 2017)	Brazil	Education	Essay	N.A.	Not clear											
(Kodir et al., 2018)	Indonesia	Sociology	Observation	Rembang	Not clear											
(Thomsen, 2018)	Denmark	Cinema	Essay	Lars Von Trier's Antichrist movie	Yes											
(Profice, 2018)	Brazil and USA	Psychology	Document analysis	Children	Not clear											
(Previato, 2018)	Tibete	Geography	Mixed-Methods	Kham Tibetan and Mosuo minorities	No											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
				of northwestern Yunna												
(van Holstein & Head, 2018)	Australia	Geography	Document analysis	Australian Conservation Foundation's magazine Habitat (1973–2016)	Not clear											
(Tavilla, 2018)	Spain	Philosophy	Essay	The Book of Divine Works by Hildegard of Bingen	Not clear											
(Aslanimehr et al., 2018)	Canada and Germany	Psychology	Mixed-Methods	Children	Yes											
(Shields, 2018)	Canada	Sociology	Mixed-Methods	General population	Yes											
(Duarte, 2018)	Brazil	Philosophy	Essay	N.A.	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Kloek et al., 2018)	The Netherlands	Ecology	Mixed-Methods	Dutch immigrants' and nonimmigrants'	Not clear											
(Llosa, 2019)	Argentina	Geography	Mixed-Methods	General population	Not clear											
(D. S. Silva & Santos, 2019)	Brazil	Education	Mixed-Methods	Children	Yes											
(Lahl, 2019)	Germany	Cinema	Document analysis	Video games	Not clear											
(Munõz-Rodríguez et al., 2019)	Spain	Education	Document analysis	General population	Not clear											
(Aldeia & Alves, 2019)	Portugal	Sociology	Essay	N.A.	No											
(Blatt, 2019)	UK	Literature	Essay	Story of Albina and her sisters	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Sekerák, 2019)	Czech Republic	Political Science	Essay	N.A.	Not clear											
(Bravo Silva, 2019)	Brazil	Anthropology	Observation	Amazon population	No											
(Šorytė & Pakalniškienė, 2019)	Lithuania	Psychology	Focus group	Children	Yes											
(Huanca, 2019)	Bolivia	Law	Essay	N.A.	No											
(Tillmann et al., 2019)	Canada	Geography	Focus group	Children	Not clear											
(De Vreese et al., 2019)	Belgium	Geography	Interviews	Stakeholders actively involved in the use and management of a peri-	Yes											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
				urban areas												
(Abarghouei Fard & Saboonchi, 2020)	Iran	Landscape Architecture	Ethnography	Population of Kamu Village	Yes											
(Yarova, 2020)	Sweden	Literature	Document analysis	Patrick Ness's A Monster Calls	Not clear											
(N. Vieira et al., 2020)	Cape Verde	History	Document analysis	Cape Verde whales	Not clear											
(Di Bianco, 2020)	Italy	Cinema	Document analysis	Alice Rohrwacher's Lazzaro Felice	Yes											
(Gilebbi, 2020)	Italy	Cinema	Document analysis	Paolo Sorrentino's La grande bellezza (The Great Beauty) (2013)	Not clear											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
				and Youth (2015)												
(Fraijo-Sing et al., 2020)	Mexico	Psychology	Document analysis	Children	Yes											
(Guida & de Melo, 2020)	Brazil	Literature	Document analysis	Mia Couto book "A princesa russa"	No											
(Dwivedi, 2021)	India	Literature	Essay	uttararĀmacarita	Not clear											
(Rey-Goyeneche & Alexander, 2021)	Brazil	Education	Document analysis	Children	Yes											
(Thevenin et al., 2021)	Brazil	Geography	Mixed-Methods	Religions that make the ritual use of Ayahuasca tea in the State of Rondônia/Brazil	Not clear											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Prendergast et al., 2021)	Australia	Literature	Document analysis	N.A.	Not clear											
(Solar, 2021)	Chile	Literature	Essay	Raúl Zurita Poetry	Not clear											
(Dincă et al., 2021)	Romania	Geography	Survey	Crișana Province population	Yes											
(Gugssa et al., 2021)	Ethiopia	Education	Document analysis	Environmental Science primary school textbooks	Yes											
(Dienstag, 2021)	USA	Political Science	Essay	N.A.	Not clear											
(Probst, 2021)	France	History	Essay	N.A.	Not clear											
(Mocellim, 2021)	Brazil	Sociology	Essay	N.A.	No											
(L. C. Smith, 2022)	USA	Geography	Literature	N.A.	Not clear											

Studies information						Social representations of Nature			Concepts associated							
Reference	**Geographic area**	**Scientific area**	**Methodology**	**Target group**	**Nature and Environment as synonymous**	**Opposition: Nature against Society**	**Domination: Nature is subordinate to Society**	**Interdependence: Nature united with Society**	**Social Nature**	**Ecofeminism**	**Socioenvironmental conflicts**	**Denature**	**Patriarchalism**	**Colonialism**	**Nature agency**	**Capitalism**
(Pohl & Helbrecht, 2022)	Canada	Geography	Mixed-Methods	Population of Vancouver, British Columbia	Not clear											

Appendix 4. Interview guidelines: master English version

INTERVIEW QUESTIONS AND CORRESPONDING GUIDELINES		
SECTIONS	**QUESTIONS**	**GUIDELINES TO THE INTERVIEWER**
SECTION A NATURAL RESOURCES	1. What are the most important natural resources in your nation/region/city?	- Perceptions of existing natural resources (ex. Natural gas, Metals, Stone, Sand, Air, Forest, Sunlight, Soil, Water, Animals, Plants, and Land, among others)
	2. Among those natural resources, can you please specify which are more available and which are scarcer? Can you explain the reasons behind these increases or decreases?	- Perceptions of the availability and scarcity of the natural resources - The reasons behind it (ex. the impact of Climate Change, or others)
	3. Are you aware of the existence of environmental conflicts related to the natural resources of the nation/region/city? Can you please specify which type of conflicts and between whom these conflicts occur?	- Perceptions of existing socio-environmental conflicts - Types of socio-environmental conflicts (ex: nuclear, mineral ores, waste, land conflicts, fossil fuels, water, tourism, biodiversity, land, etc.) - Among which social actors do those conflicts occur.
SECTION B SOCIO-ENVIRONMENTAL CONCERNS	4. Thinking about your nation/region/city, are you aware of the socio-environmental risks? Which ones do you consider to be those that will deserve more attention in the near future?	- Awareness of the socio-environmental risks (encompass risks that simultaneously impact social and environmental dimensions and that can be of human or natural origin, putting the entire ecosystem, human and non-human, at risk) - Perceptions on those that are most important to be addressed in a near future. (ex: global warming, air pollution, water scarcity, desertification, biodiversity loss, social inequalities, poverty, fires, among others)
	5. Have you ever heard about the ecological transition? If yes, what do you mean by that?	- The interviewee's awareness about the ecological transition. - If the interviewee does not know what is the ecological transition, explain what it is in the context of the Green Deal: to boost the efficient use of resources by moving to a clean, circular economy and stop climate change, revert biodiversity loss and cut pollution.
	6. Who is, in your opinion, responsible for the ecological transition? Can you explain your choices?	- Perceptions on who is responsible for the ecological transition (ex: Private sector, public sector, civil society organisations, citizens, European Commission, Governments, Educational Institutions, NGOs, among others). - Interviewee justification.
	7. Considering your nation/region/city, what is the biggest obstacle to the ecological transition? Can you explain your opinion, please?	- Identify the main obstacles to the ecological transition. - Interviewee justification.
	8. Considering your nation/region/city, which are the main challenges? Can you please explain why?	- Identify the main challenges regarding the implementation of the ecological transition (ex: economic paradigm shift; actions to mitigate and adapt to climate change impacts, reduce fossil fuels consumption, adopt soft and sustainable mobility, consume local food products, and safeguard biodiversity, among others). - Interviewee justification.

SECTION C **SOCIOCULTURAL ECOLOGICAL BEHAVIOURS**	9. What do you consider the most effective strategies to improve collective ecological awareness? Can you please explain your opinion?	- Perceptions of the most effective strategies to improve collective ecological awareness (ex: scientific grounding, formal education, informal education, environmental education programs, contact with Nature since childhood, considering Nature as having the same rights as humans, social media, social movements, arts, among others). - Interviewee justification.
	10. Would you be willing to adopt a more frugal lifestyle? Can you please detail the behaviours that you consider more easily to be adopted? Can you please detail the main barriers that you may face during this process?	- Willing to embrace a lifestyle change. - Behaviours that are easier to be adopted (ex: reducing energy consumption, using public transport, buying sustainable products, choosing native plant species, etc) - Barriers found during this process (ex: giving up of personal comfort, lack of alternative solutions, financial constraints, cultural barriers, religious barriers, institutional barriers, legal barriers, disbelief in the effectiveness of this transition, distrust in official organisations, the perception that individual efforts are meaningless, etc).
SECTION D **EXPERIENCES IN NATURE**	11. Can you please define as best as possible what you mean by Nature?	- Access to the interviewee's perception/s of Nature.
	12. Can you please choose **five words** that come to your mind when thinking about Nature?	- List the five words in the order that the interviewee presents them.
	13. Thinking about your contact with Nature, can you please describe that experience? What kind of benefits do you get from it?	- The interviewee's description of his/her experience when in contact with Nature. - Benefits from it (ex: mental, spiritual, psychological, intellectual, aesthetic, recreational, symbolic, identity, environmental, ecological awareness, financial, etc).
SECTION E **INCLUSIVENESS**	14. Considering your nation/region/city, are you aware of the environmental decision-making related to natural resources management?	- Awareness of the environmental decision-making processes concerning natural resources management.
	15. Considering the environmental decision-making related to natural resources management in your nation/region/city, do you have the opportunity to intervene? If Yes, can you please identify the main ways of your participation, and the main barriers that you face (if you face any)?	- The interviewee opportunity to participate in environmental decision-making related to natural resources management. - Identify the main ways of his/her experience of participation. - Identify the main barriers found during his/her experience of participation.
	16. Do you consider the diversity of perspectives and knowledge produced by the different social agents relevant to the decision-making processes? Can you please explain your answer?	- Perceptions of the importance to integrate into the environmental decision-making process the diversity of perspectives and knowledge produced by different social agents (ex: general public, academics, experts, politicians, farmers, fishermen, industry, etc) - Interviewee justification.
	17. Do you consider the diversity of perspectives and knowledge produced by the vulnerable social groups relevant to the decision-making processes? Can you please explain your answer?	- Perceptions of the importance to integrate into the environmental decision-making process the diversity of perspectives and knowledge produced by vulnerable social groups (ex: women, immigrants, ethnic/racial communities, elderly population). - Interviewee justification.

SECTION F SOCIODEMOGRAPHIC DATA	18. What is your **gender**?	☐ Female [1] ☐ Male [2] ☐ Other/s [3]. Please, specify:_____ ☐ Prefer not to say [4]
	19. What **year were you born**?	(yyyy)_____
	20. What is your **marital status**?	☐ Single [1] ☐ Married [2] ☐ Facto union [3] ☐ Divorced [4] ☐ Widow [5] ☐ Other [6]. Please specify:_____
	21. What is your **education level**? (Choose the most recent education you completed)	☐ Primary education [1] ☐ Secondary education [2] ☐ Tertiary education Bachelor's [3] ☐ Tertiary education Master's [4] ☐ Tertiary education Doctoral [5] ☐ Tertiary - short course [6] ☐ General/academic [7] ☐ Vocational/professional [8] ☐ None [9] ☐ Other [10]. Please specify:_____
	22. Can you please specify your **education/academic background**?	☐ Natural sciences [1] ☐ Social sciences [2] ☐ Technical/Technological sciences [3] ☐ Arts and Humanities [4] ☐ None [5] ☐ Other [6]. Please specify:_____
	23. Can you please describe as objectively as possible your **occupation** or, in the case of being unemployed, the last one performed?	_____
	24. What is your **place of residence?** (country, region, and city)	_____
	25. What is your **nationality**?	_____
	26. Do you have an **ethnic-racial identity**?	_____
	27. Do you consider yourself **spiritual or religious**?	☐ Spiritual [1] ☐ Religious [2] ☐ Both [3] ☐ Neither religious nor spiritual [4] ☐ Prefer not to say [5]

	28. What is your **current religion**?	☐ Agnostic [1] ☐ Atheist [2] ☐ Believer, but without religion [3] ☐ Catholic [4] ☐ Evangelical or other Protestant [5] ☐ Hindu [6] ☐ Jain [7] ☐ Jehovah's Witnesses [8] ☐ Mormon [9] ☐ Muslim [10] ☐ Orthodox [11] ☐ Sikh [12] ☐ Other [13]. Which one?_____ ☐ Indifferent [14] ☐ Prefer not to say [15]
	29. Please indicate which category the interviewee fall into the most: (**NOTE: THIS QUESTION SHOULD BE ANSWERED BY THE INTERVIEWER**)	☐ Policymaker or Governmental technician [1] ☐ Scientific community [2] ☐ Social movements [3] ☐ NGOs (Civil society organisations, Environmental NGOs, immigrant, and vulnerable populations NGOs, etc.) [4] ☐ Citizens (including youth, women, elderly, and vulnerable groups, such as ethnic minorities and immigrants) [5] ☐ Economic groups (relevant economic activities) [6]

Appendix 5. Ethics approval letter and consent form

Ethics approval letter

Centro de Estudos Sociais Universidade de Coimbra | Centre for Social Studies University of Coimbra

PARECER

A Comissão de Ética do Centro de Estudos Sociais (CE-CES) recebeu um pedido de parecer por parte da investigadora Sheila Holz, no âmbito do projeto de investigação *PHOENIX – The rise of citizens voices for a greener Europe*, a decorrer no Centro de Estudos Sociais da Universidade de Coimbra e com financiamento do programa Horizonte 2020 da União Europeia, ao abrigo do contrato nº101037328.

O estudo da responsabilidade do investigador Giovanni Allegretti, ao qual este parecer se reporta, tem por objetivo aumentar o potencial transformador das Inovações Democráticas para abordar áreas políticas específicas do *Green Deal Europeu*, enfrentando os principais desafios que estas podem colocar aos diferentes *stakeholders* e à sociedade. Os resultados esperados são: o aumento do sentimento de pertença e envolvimento através da participação e deliberação dos cidadãos em toda a Europa; a identificação participativa de soluções que contribuam para o *Green Deal Europeu*; o maior envolvimento dos cidadãos na implementação do *Green Deal Europeu* e das futuras missões da Horizon Europe; o reforço da confiança dos cidadãos nas instituições políticas e científicas; o compromisso e a adesão de um amplo espectro de grupos sociais em toda a Europa em apoiar os objetivos do *Green Deal Europeu* e se empenhar na cocriação e co-implementação de vias de transição.

O projeto irá desenhar metodologias de participação e deliberação que serão testadas em processos participativos e deliberativos promovidos por autoridades de diferentes níveis governamentais nos 11 territórios envolvidos no projeto. Para isso, no primeiro ano, será feita pesquisa de campo e serão aplicadas entrevistas a *stakeholders (decision-makers*, membros de ONGs, representantes de movimentos sociais, etc.). No segundo e terceiro ano, as metodologias desenhadas serão testadas nos territórios piloto e incorporadas em processos participativos promovidos pelos governos locais/regionais ou nacionais. Para acompanhar a implementação destas metodologias, será criada em cada um dos territórios piloto uma comissão territorial para co-design (TCCD). Os participantes nos dados primários serão membros das autoridades locais, regionais e nacionais envolvidos como pilotos PHOENIX. Para as entrevistas, os parceiros locais convidarão membros das autoridades locais, regionais e nacionais a fornecer informações sobre as práticas e características dos territórios. Outros grupos de participantes, tais como movimentos ambientais/sociais, serão identificados utilizando técnicas de bola de neve com recomendações de outros participantes e *gatekeepers* locais.

Analisados os documentos submetidos (formulário de escrutínio ético e declaração de consentimento informado a apresentar às/aos participantes no estudo), confirma-se que o protocolo de investigação cumpre com os requisitos éticos formais necessários para o desenvolvimento de uma investigação de acordo com as melhores práticas de investigação.

NIF 500 825 840

Coimbra, 24 de outubro, 2022

Assinado por: VIRGÍNIA DO CARMO FERREIRA
Num. de Identificação: 02319461
Data: 2022.10.25 00:44:06+01'00'

Virgínia Ferreira
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Consent form

You are invited to participate in the project PHOENIX – The rise of citizens' voice for a green Europe (https://phoenix-horizon.eu/). PHOENIX is a 42-month research and innovation action funded by the European Commission under the Horizon 2020 programme, Grant Agreement nº 101037328. It began in February 2022 and will come to end in July 2025 (more information about the project can be found in the Information statement). It is developed within an international consortium, coordinated by Centre for Social Studies, at the University of Coimbra. PHOENIX Principal Investigator is Giovanni Allegretti.

This interview/questionnaire aims to understand the psycho-social-cultural construction of Nature. Giving this interview/questionnaire is completely voluntary – you do not have to take part on it. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else in the PHOENIX project.

You can stop the interview/questionnaire at any time. You can refuse to answer questions that you do not wish to answer. If you decide to give the interview/questionnaire and later change your mind, you can ask to withdraw your interview/questionnaire transcript from the study by contacting the interviewer. Upon refusal, the data will no longer be available for research, study, and/or purpose of the project.

If in between, the information you have provided has been analysed and published, the data cannot be reviewed. We do not expect any risks, and there will be no costs associated with the participation in this interview.

The interview/questionnaire provide you with the opportunity of giving a personal view, as a citizen, a politician or even as an activist and contribute to the design of methodologies to tackle important issues related to climate change in your territory.

By providing your consent, you are agreeing us to collecting personal information about you for the purpose of this study. Unless you consent otherwise, your information will only be used for the purposes outlined in this Information Statement.

All information will remain confidential. We will not record your name and interview/questionnaire will be codified so we can guarantee the anonymization of interviewees. Your name or any details that might identify you will not be published nor transcribed. All personal information you provide will be kept confidential, anonymous and treated according to the EU regulations on personal data ownership.

We thank you in advance for your cooperation. Your participation is very important for us!

If you have any questions, you can address them to Fátima Alves (fatimaa@uab.pt) and Diogo Guedes Vidal (diogoguedesvidal@hotmail.com), from Centre for Functional Ecology - Science for People & the Planet (CFE), University of Coimbra, Portugal.

To participate in this study please confirm the following:

I agree to participate in the research study. I understand the purpose and nature of this study and I am participating voluntarily. I understand that I can withdraw from the study at any time, without any penalty or consequences.

By answering (non-mandatory) questions or providing information about your alleged racial or ethnic origin, political opinions, religious or philosophical beliefs, trade union membership, health or sex life or sexual orientation, you consent to the processing of this data strictly for the purposes of the PHOENIX project.

Appendix 6. Questionnaire RtC: master English version

Disclaimer
Dear Participant,
We are asking for your participation in research of the European project PHOENIX. It will take about 7 minutes. Please note that your answers are TOTALLY ANONYMOUS and therefore we will not collect any personal data. It will never be possible to trace your identity or associate your answers with it. Please note that you can decide to stop filling out the questionnaire at any time, and NO answers will be saved in this case.
Thank you for your participation.

Self-Certification and Consent to Proceed
Dear participant, to participate in the research, you must be fluent in your country's language and be over 16 years old. Click "Yes" if you meet the criteria and wish to continue with data collection, otherwise select "No."

Do you want to proceed? YES/NO

Socio-demographic Information
Please fill out the following question with your information. Please remember that your answers will remain anonymous.

- **How old are you?** Possible error message: please insert an integer number.
- **Sex** (Description: Cisgender is a person who identifies with his or her assigned gender at birth. A person born biologically male and who identifies as such is cisgender. Transgenders are those individuals who have a gender identity and/or gender expression that deviates from the sex assigned at birth. Identifying with the non-binary gender means not identifying with the traditional male/female distinction):
  - Cisgender Male
  - Cisgender Female
  - Transgender Male
  - Transgender Female
  - Non-Binary
  - I prefer not to answer

Section A
Please answer the following questions regarding the **ADOPTION OF SUSTAINABLE BEHAVIOURS** by indicating your degree of agreement from 1 - Strongly Disagree to 5 - Strongly Agree:

ADOPTION OF SUSTAINABLE BEHAVIOURS	1 Strongly Disagree	2 Disagree	3 Neither agree nor disagree	4 Agree	5 Strongly Agree
This change is very important for me					
At this point I feel the need to change					

I think it is appropriate to change my behaviour					
My life would be worse if I didn't change					
I am determined to change my habits					
I feel motivated to undertake this path of change					
I have many reasons to change					
I want to change this aspect of my life					
I am confident in my ability to change habits					
I feel capable of overcoming any challenge related to my change					
I will be able to stay true to my new routine					
If I am going to have a setback, I am confident that I will be able to overcome it					
I think I have the resources to make this change					
I think there are effective ways of dealing with this change					
I have faith in the paths proposed to support my change					
I am aware of strategies / techniques / methods that could help me change					
I think what was proposed to me might work					
I feel supported by the people close to me in this change					
I think my community would help me on this path					
The people around me would approve of my change					
I know who to turn to among the people close to me for help in changing					
I am already doing something to solve my					

problem					
Sometimes I try to find solutions that can work					
I changed my behaviours to fix the problem					
I started my journey to try to do something					
I am ready to change					
I think I'm ready to change my habits					
I believe I am ready to tackle the problem					
In all honesty, I don't feel like I'm ready to really change my life					

Section B

Please answer the following questions regarding the **CLIMATE CHANGE ATTITUDE**, by indicating your degree of agreement from 1 - Strongly Disagree to 5 - Strongly Agree:

CLIMATE CHANGE ATTITUDE	**1 Strongly Disagree**	**2 Disagree**	**3 undecided**	**4 Agree**	**5 Strongly Agree**
I believe our climate is changing.					
I am concerned about global climate change.					
I believe there is evidence of global climate change.					
Global climate change will impact our environment in the next 10 years.					
Global climate change will impact future generations.					
The actions of individuals can make a positive difference in global climate change.					

Human activities cause global climate change.					
Climate change has a negative effect on our lives.					
We cannot do anything to stop global climate change.					
I can do my part to make the world a better place for future generations.					
Knowing about environmental problems and issues is important to me.					
I think most of the concerns about environmental problems have been exaggerated.					
Things I do have no effect on the quality of the environment.					
It is a waste of time to work to solve environmental problems.					
There is not much I can do that will help solve environmental problems.					

Appendix 7. Matrix - Legislation and public policies on Right of Nature / Human Right to Nature

Questions	Portugal	France	Italy	Hungary	Estonia	Iceland
1.In the legislation there are legal norms that protect nature/natural resources for their intrinsic value [Rights of Nature (RoN)], regardless of the interest they have for humans?	No	**Convention sur la diversité biologique -> traité ratifié (1993)** Aware of the intrinsic value of diversity biological and value of diversity and its constituent elements on the environmental plans, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic. Also aware of the importance of diversity biological for the evolution and for the preservation of systems that sustain the biosphere. Affirming that the conservation of biological diversity is a common concern of humanity, reaffirming that States have sovereign rights over their biological resources,	No	No	**Nature Conservation Act** To protect the natural environment by promoting the preservation of biodiversity by ensuring the natural habitats and the populations of species of wild fauna, flora, and fungi at a favourable conservation status (Nature Conservation Act, 2004)	No
2. Are the Human Right to Nature (RtN) recognized and regulated? (ex: access to urban green spaces, a healthy environment, a balanced climate)	**The Portuguese Constitution** 66th article: "Everyone has the right to a human life environment health and ecologically balanced and the duty to defend it" (Assembleia da República Portuguesa, 2021) **Law Nr. 19/2014, 14th April** Art. 5th, 1 "Everyone has the right to the environment and quality of life, in constitutional terms and internationally	**Charte de l'Environnement -> inscrite dans la Constitution (2004):** Article 1. Everyone has the right to live in a balanced and healthy Environment (République Française, 2004).	**"Codice dell'Ambiente", enacted with the DL n. 152 of 2006.** It aimed at unifying and reorganizing the entire legal framework on environmental issues and, for this reason, it encompasses many different topics. The law's main goal is to "guarantee a high-quality level to human life, through the safeguard and improvement of environmental conditions and the watchful and rational usage of natural resources" (art. 2). More specific laws forbid or regulate fires	**Act 1995/LIII. - On the general rules for the protection of the environment** "The Parliament, considering that the natural heritage and environmental values are part of the national wealth, the preservation and protection of which, and the improvement of their quality, are a basic condition in terms of the living world, human health and quality of life; without this, the harmony between human activity and nature cannot be maintained, failure to do so	**Nature Conservation Act** In 1994, Estonia ratified the Convention on Biological Diversity. It is the largest convention on nature conservation and covers all traditional aspects of nature conservation, along with environmental protection covering anything from gene protection to the protection of ecosystems. The entire country is responsible for implementing this convention to sustain a	No

	established" (As Bases Da Política de Ambiente, 2014).		(L353/2000), forestry (DL 227/2001), pollutant activities, waste disposal, and other potential hazards to the environment (Codice Dell'Ambiente, 2006).	endangers the health of present generations, the existence of future generations and the survival of many species" (A Környezet Védelmének Általános Szabályairól [on the General Rules for the Protection of the Environment], 1995). "The purpose of the law: § 1 (1) The purpose of the law is to establish a harmonious relationship between man and the environment, to protect the health of the environment as well as its elements and processes at a high level, in a coordinated manner, and to ensure sustainable development. (2) According to the principle of predictability and fair burden-bearing, the law creates appropriate frameworks for the enforcement and promotion of constitutional rights to a healthy environment (A Környezet Védelmének Általános Szabályairól [on the General Rules for the Protection of the Environment], 1995).	healthy and habitable environment. This directive is the basis for the Estonian Nature Conservation Act (Nature Conservation Act, 2004)	
3. Are duties of legal persons and individual persons towards Nature specified in the above-	**Law Nr. 19/2014, 14th April** Art.8th, 1 "The right to the environment is indissociable from the duty to protect it, preserve it and respect it, so that long-term sustainable development is ensured,	**Charte de l'Environnement -> inscrite dans la Constitution (2004):** Article 3. Any person must, under the conditions defined by law, prevent the attacks that it is likely to cause harm to the	No	**Act 1996/LIII. - On the protection of nature** "§ 5 (1) All natural and legal persons, as well as other organizations, have the duty to protect natural values and areas. To this end, they are obliged to contribute to the	**Nature Conservation Act** Until the approval of the protection rules of a protected area or protected natural monument provided by this Act, the minister responsible for the field	No

mentioned regulations?	namely for future generations." Art.8th, 2 "Environmental citizenship consists in the duty of contributing for the creation of a healthy environment and ecologically balanced and, in the point of view of efficient use of resources and considering the progressive improvement in quality of life, for its protection and preservation." (As Bases Da Política de Ambiente, 2014)	environment or, failing that, to limit the consequences. Article 4. Everyone must contribute to the reparation the damage it causes to the environment, the conditions defined by law (République Française, 2004).		extent expected of them in preventing dangerous situations and damage, mitigating damage, eliminating its consequences, and restoring the state before the damage. (2) Natural values and areas can only be used and utilized to the extent that the functionality of natural systems and their processes, which are fundamental to their operation, is maintained, and biological diversity is sustainable." (A Természet Védelméről [on the Protection of Nature], 1996).	will authorise the Environmental Board to administer the protected area or protected natural monument (Nature Conservation Act, 2004)	
4.Are duties of public authorities (national, regional, or local scale) towards Nature specified in the above-mentioned regulations?	**Law Nr. 19/2014, 14th April** Art.2,2 "It is the duty of the State to execute environmental policies, through the direct actions of its bodies and agents at diverse scales of local, regional, national, European and international decision, as well as through mobilisation and coordination of all citizens and social forces, in a participated process and settled in the full exercise of environmental citizenship." Art. 15th, 3 "The public and private entities are responsible for fulfilling their active duties of environmental information, presuming its fault in case of omission."	**Convention sur la diversité biologique -> traité ratifié (1993):** Reaffirming also that States are responsible conservation of their biological diversity and sustainable use of their biological resources (Nations Unies, 1992). **Charte de l'Environnement -> inscrite dans la Constitution (2004):** Article 6. Public policies must promote sustainable development. To this end, they combine protection and enhancement of the environment, economic development and social progress (République Française, 2004).	**"Codice dell'Ambiente" (DL 152/2006).** Art. 5 "Valutazione Ambientale Strategica" (VAS) is a procedure defined as follows: it is "the elaboration of a report concerning the environmental impact deriving from the implementation of a plan or program yet to be approved, the realization of consultations, the evaluation of the report and the consultation results in the approval process of a plan or program, and the provision of information on the decision" (Codice Dell'Ambiente, 2006).	**Act 1995/LIII. - On the general rules for the protection of the environment** § 2. (1) The scope of the law covers: a) for living organisms (their communities) and non-living elements of the environment, as well as their natural and human-made environment; b) in accordance with the provisions of this Act, uses, burdens, endangers the environment, or engages in polluting activities. (2) The scope of the law covers those natural and legal persons and organizations not entitled to legal personality a) those who have rights related to the environment according to point a) of paragraph (1), or whom they represent burdens;	**Nature Conservation Act** For preserving biological diversity and for ensuring the favourable status of threatened species and habitats, 18% of Estonia's land area and 26% of the water area have been taken under protection. As of December 31, 2016, Estonia had a total of 3,883 protected natural objects, see above. The primary objective of the management system is to establish an updated management procedure for all protected natural values and achieve the defined conservation objectives. The management procedure of protected areas is established in the Nature	No

	Art. 21st "The State exercises the control of activities susceptible of a negative impact in the environment following its execution through monitoring, inspection aiming, namely, secure the implementation established in the instruments and environmental normative and prevent environmental illicit" (As Bases Da Política de Ambiente, 2014).			b) those who carry out activities according to point b) of paragraph (1) (hereinafter: environmental use). (3) The scope of the Act extends to the performance of environmental protection tasks arising from international treaties, unless an international treaty provides otherwise. "§ 8. (1) An environmental user who endangers or damages the environment must immediately end the endangering or damaging activity. (2) The user of the environment is obliged to ensure the elimination of environmental damage caused by his activities and the restoration of the damaged environment." (A Környezet Védelmének Általános Szabályairól [on the General Rules for the Protection of the Environment], 1995)	Conservation Act and conservation rules of the specific protected areas. The conservation rules must be read in conjunction with the Nature Conservation Act. The manager of the areas taken under the protection by the Government of the Republic is the Environmental Board. The protected areas set up by the local municipality are managed by the respective local government organisation. Protection rules must be read in conjunction with the Nature Conservation Act, as under the act activities are prohibited in the conservation zones and strict nature reserves, unless provided otherwise in protection rules (Nature Conservation Act, 2004)	
5.Please indicate if there is any definition of Nature in the above-mentioned regulations?	No	No	No	**Act 1996/LIII. - On the protection of nature** "§ 4. In the application of this law: a) natural value: the natural resource, the living world and its inanimate environment necessary for its survival, as well as other environmental elements that do not qualify as natural resources, as defined in this law, including protected natural value; b) natural area:	No	No

				all land areas that are primarily characterized by near-natural conditions; (…) e) protected natural value (nature conservation value): an individual, developmental form, stage, derivative of a living organism declared to be protected or highly protected by this law or other legislation - receiving priority nature protection protection - as well as the living communities of living organisms, as well as a cave, mineral, mineral association, fossil; (…) k) natural (ecological) system: the dynamic and natural unity of living organisms, their living communities, and their inanimate environment (…)" (A Természet Védelméről [on the Protection of Nature], 1996)		
6.Please indicate if there is any definition of Environment in the above-mentioned regulations?	No	**Code de l'Environnement, Titre 1er (2000)** "Spaces, resources and natural terrestrial environments and sea life, the sounds and smells that characterize them, the sites, the diurnal and nocturnal landscapes, the quality of air, water quality, living beings and biodiversity…" (République Française, 2000).	No.	**Act 1995/LIII. - On the general rules for the protection of the environment** "§ 4. In the application of this law: 1. environmental element: land, air, water, wildlife, as well as the built (artificial) environment created by man, and their components; 2. environment: environmental elements, their systems, processes, structure; 3. natural resource: environmental elements or their individual components that can be used to satisfy social needs — with the	No	No

				exception of the artificial environment;" (A Környezet Védelmének Általános Szabályairól [on the General Rules for the Protection of the Environment], 1995)		
7.1. Are participation mechanisms foreseen for citizens and organisations during the environmental law-making process?	**Law Nr. 19/2014, 14th April –Art.6th** 1 "Everyone has rights of intervention and participation in administrative procedures related to the environment, in the legally established terms". 2, a) "The citizens' right to participation, of non-governmental organisations and other interested parties, in terms of environment, in the adoption of decisions relative to authorisation procedures or related to activities that may have significant environmental impacts, as well as plan preparation and environmental programmes" (As Bases Da Política de Ambiente, 2014).	**Charte de l'environnement :** Article 7. Everyone has the right, under the conditions and the limits defined by law, to access the environmental information held by public authorities and to participate in the development public decisions having an impact on the environment (République Française, 2004).	No	**Act 1995/LIII. - On the general rules for the protection of the environment** "The rights of environmental associations § 98. (1) Associations operating in the area of influence, which are not classified as political parties or interest representatives established to represent environmental protection interests, have the legal status of the client in the environmental protection state administration procedures in their area of operation. (1a) In the application of paragraph (1), the procedures contained in paragraph (1) of § 66 and paragraph (1) of § 66/A are considered to be administrative procedures for environmental protection. (2) The organization also has the right to represent the interests of its members a) contribute to the development of land development, spatial planning plans and environmental protection programs affecting its area of operation or activity; c) comment on drafts of state and local government legislation	Yes	Yes

				related to the environment. d) comment - considering the provisions of the separate legislation - the draft and environmental evaluation of the plan or program that affects the area of operation or activity and is subject to an environmental assessment. (3) In order to enforce its right contained in point c) of paragraph (2), the organization shall notify the ministry preparing the legislation or the local government of its request for an opinion (A Környezet Védelmének Általános Szabályairól [on the General Rules for the Protection of the Environment], 1995).		
7.2. If yes, are those participation mechanisms defined as voluntary participation or mandatory participation?	Voluntary and Mandatory	Voluntary	N.A.	Voluntary	Voluntary and Mandatory	Voluntary
7.3. In the case of a mandatory participation, who is required to participate?	**Law Nr. 19/2014, 14th April** Art.4, e) Principles of environmental public policies "Of information and participation, that oblige the involvement of citizens in environmental policies, privileging disclosure and sharing of data and studies, adoption of monitoring	N.A.	N.A.	N.A.	**Estonian Human Development Report 2019/2020** Environmental democracy in Estonia is supported by a good legal framework and comprehensive environmental data; on the other hand, it is hampered by apathetic citizens and the complicated	**Samráðsgátt** The goal of Samráðsgátt is to increase transperancy and the public's and shareholders ability to

	actions of policies, the foment of a transparency and responsibility culture, in search of a high degree of respect for environmental values by the community, at the same time that ensures citizens the full right to intervene in the elaboration and monitoring of the application of environmental policies" (As Bases Da Política de Ambiente, 2014).				presentation of information (Kutsar & Saar, 2020).	participate in planning, the formulation of legislation, and decision making within the government and public sector. Samráðsgátt operates a portal through which all legislative material is accessible to view and for commenting (island.is, 2022).
8. Are there foreseen mechanisms for participation in the implementation of environmental laws?	**Law Nr. 19/2014, 14th April** Art.4, e) Principles of environmental public policies "Of information and participation, that oblige the involvement of citizens in environmental policies, privileging disclosure and sharing of data and studies, adoption of monitoring actions of policies, the foment of a transparency and responsibility culture, in search of a high degree of	No	No	**Act 1995/LIII. - On the general rules for the protection of the environment** "§ 39. The Parliament, in order to protect the environment: a) enforces environmental protection interests in its legislative work; b) adopts the National Environmental Protection Program and evaluates its implementation every two years; c) decide on the report to the Government on the state of the	**Citizen Initiative Portal** The Citizen Initiative Portal enables to write proposals, hold discussions, compose and send digitally signed collective addresses to the Estonian Parliament (Riigikogu) and the local government. A collective address sent to the Riigikogu should have at least 1,000 signatures in support, given by at least 16-year-old citizens of Estonia. For the local	No

	respect for environmental values by the community, at the same time that ensures citizens the full right to intervene in the elaboration and procession of the application of environmental policies" (As Bases Da Política de Ambiente, 2014).			environment; (…) e) defines the environmental protection tasks of the Government and local governments; f) approves resources for solving environmental protection tasks and controls their use." "§ 42. (1) The minister responsible for environmental protection in ministerial capacity a) manages: aa) environmental protection activities referred to by law or government decree, ab) the implementation of environmental protection tasks arising from international agreements, ac) the environmental protection administration within its tasks and powers; b) analyzes and evaluates: ba) the state of the environment and the state of its protection, bb) natural resource management processes, bc) experiences of environmental protection, regulated use and planned development, bd) environmental protection professional activities for the prevention of the development of an environmental hazard, as well as the prevention of an environmental hazard and disaster, in cooperation with the competent bodies;	government, the collective address needs to collect the signatures of at least 1% of its registered population (Rahvaalgatus.ee, 2022) .	

				c) based on the experience of the evaluation carried out in accordance with point b), it develops and submits the Draft Program to the Government; d) contributes to the development of professional policy concepts regarding the use of natural resources; e) contributes to the development and operation of the environmental protection professional qualification system." (A Környezet Védelmének Általános Szabályairól [on the General Rules for the Protection of the Environment], 1995).		

Appendix 8. UC Team responsibilities (in green) in PHOENIX project and interconnections with other tasks